

ESSAYS ON MONETARY INTEGRATION IN SOUTHERN AFRICA

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**A THESIS
IN
THE DEPARTMENT
OF
ECONOMICS**

Presented in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy at

Concordia University

Montreal, Quebec, Canada

September 2008

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Your file Votre référence
ISBN: 978-0-494-45655-2
Our file Notre référence
ISBN: 978-0-494-45655-2

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ABSTRACT

Essays on Monetary Integration in Southern Africa

Twahibu Kambi Djabir, Ph.D.

Concordia University, 2008

Following the successful introduction of the euro in Western Europe, several regional economic blocs in Africa are planning to launch a common currency as an intermediary step towards the emergence of a single currency for the entire continent. The purpose of this dissertation is to tackle several economic issues related to monetary integration and empirically apply it to the context of the Southern Africa Development Community (SADC).

In the first essay, we estimate trade potentials for southern African countries using the gravity model approach. More specifically, we use the level of intra-regional trade as predicted by the gravity model and compared it with the observed trade in order to assess the trade potentials in the region, as well as the South Africa's trade potentials with its SADC partners. Our results demonstrate that the observed trade flows among SADC countries are largely greater than the ones predicted by the empirical model. We also found that other SADC member countries over-trade with respect to South Africa. However, there are still some unexploited trade potentials for several pairs of SADC countries.

The second essay deals with the issue of the choice for the optimal nominal currency anchor to which the national currencies of the region have to be pegged to. Using a panel of 63 countries, we obtained OCA indices *à la* Bayoumi and Eichengreen for SADC countries vis-à-vis five potential nominal anchor currencies, and we find that the

optimal nominal currency anchor for these countries is the US dollar. We also find several pairs of SADC countries which are suitable for a common currency on the basis of the estimated OCA indices.

In the last essay, we empirically assess the expandability of the CMA within the SADC by investigating the convergence of monetary policies of each SADC member to that of South Africa, a proxy for CMA. Empirical tests show evidence of long-run relationship between South Africa and two countries, namely Botswana and Mauritius suggesting that these countries may be able to follow the leadership of the South African Reserve Bank. Following the results of the Granger-causality test, the leadership hypothesis in the strict sense is rejected for the case of Mauritius and Botswana. However, the only other country which shows evidence of following the South Africa's leadership in terms of Granger-causality is Malawi.

ABRÉGÉ

Essais sur l'intégration monétaire en Afrique australe

Twahibu Kambi Djabir, Ph.D.

Concordia University, 2008

L'introduction d'une monnaie commune entre certains pays membres de l'Union Européenne a suscité de l'intérêt pour ce genre d'arrangements dans d'autres régions du monde. Plusieurs blocs économiques régionaux en Afrique projettent de lancer une monnaie commune comme une étape intermédiaire vers l'avenement d'une monnaie unique pour le continent Africain. Le but de cette thèse est d'aborder certaines questions économiques liées à l'intégration monétaire et de les appliquer empiriquement dans le contexte de la Communauté de développement de l'Afrique australe (SADC).

Dans le premier essai, nous utilisons le modèle gravitationnel afin d'estimer les flux potentiels des échanges commerciaux entre les pays de l'Afrique australe dans l'hypothèse que ces derniers adoptent une monnaie commune. Nos résultats démontrent que les flux des échanges commerciaux actuellement observés sont, dans l'ensemble, plus élevés que les prédictions du modèle empirique. Les mêmes conclusions s'appliquent pour les flux commerciaux des autres pays de la région, pris séparément, envers l'Afrique du Sud.

Le dernier essai examine la question du choix de la monnaie d'ancrage nominal pour les différentes monnaies des pays de la SADC selon les prédictions de la théorie des zones monétaires optimales. A l'aide d'estimations économétriques en coupe telles que

proposées par Bayoumi et Eichengreen (1997), et sur un échantillon de 63 pays, l'analyse empirique démontre que les pays de l'Afrique australe devraient privilégier le dollar américain comme monnaie d'ancrage nominal. Sur la base des indices calculés à partir du modèle théorique, nous avons également trouvé que certains pairs de pays de la région sont compatibles pour adopter une monnaie commune.

Dans le dernier essai, nous évaluons empiriquement l'élargissement de la zone monétaire commune (CMA) pour inclure d'autres pays de la SADC en se basant sur la convergence des politiques monétaires de ces derniers pays à celle de l'Afrique du Sud. Les résultats empiriques mettent en évidence la relation de long terme entre le taux de croissance de la base monétaire de l'Afrique du Sud avec celui de deux pays, à savoir Botswana et les Îles Maurice, suggérant de ce fait que ces pays devraient être capables de suivre la politique monétaire de la banque centrale sud-africaine. En se basant sur les résultats du test de Granger-causalité, le seul autre pays pouvant suivre la politique monétaire de la banque centrale sud-africaine est le Malawi.

DEDICATION

This thesis is dedicated to the memory of my father, El Hadj Kambi Bin Djabir, who taught me that even the largest task can be accomplished if it is done one step at a time.

This thesis is also dedicated to the memory of my brothers, Djabir Amisi Bin Kambi and Djabir Abibu Bin Kambi, and my sisters Zainati Kambi and Djabir Bora Binti Kambi, who always believed in me, and for their support.

Finally, the thesis is dedicated to my beloved mother, Laini Mwapiza Kimasi.

ACKNOWLEDGEMENTS

“In the name of Allah, Most Gracious, Most Merciful”

All praise and thanks due to Allah, Lord of the worlds, for His innumerable bounties and favors. This dissertation would not have been accomplished without the will of Allah and then the help of many people.

Professor Eckhard Siggel, you have been a pillar in my struggles to successfully complete my studies. Without your faith in me and your support I would not have been able to reach this far. I would also like to extend my gratitude to the members of my thesis committee Professor Michael Sampson and Imai Susumu, for their valuable suggestions.

My special thanks go to the Graduate Program director, Dr Nikolay Gospodinov, for his support. I am grateful to all the faculty of the Economics department at Concordia University. It has been great being here. I wish to acknowledge their dedication to us, students. I had excellent professors whose teachings will remain with me.

My gratitude goes to my uncles Mufaume Kambi Bin Djabir, Diolacia Ramazani Mwenyewe, Amisi Bin Assumani Kambi and their families for being there for me.

To my home boys in Montreal, namely Dodos, Chira, Deo Magorwa, Dr Pene Kalulumia, Roger Risasi, Dr Aaron Nsakanda, Fabien Salisi, Benoit Songa, Zantoko Weber, Dr Zantoko Zat, Etienne Kambu and my friends Yves Lamothe and James “Radio Hong Kong” Yu for their friendships and unconditional support for this achievement.

Last, but not least, my deepest gratitude goes to my wife, Claudette, and my beloved children Kambi, Laini and Henriette-Bolaya, for their unconditional love and support over the years.

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CHAPTER ONE: INTRODUCTION

The recent experience of the European Economic and Monetary Union (EMU) has stimulated the debate over currency union, and reinforced the incentive for the emergency of currency blocs in other regions of the world. Indeed, it is the first time that large industrialized countries give up their national currencies to create a new, common currency. Several studies have been conducted to investigate whether the EU experience is a blueprint for regional integration that can be applied directly and entirely to other regions. Examples of these studies include for Latin America and North America (Yeyati et al., 2000; Courchene and Harris, 2003; and Salvatore, 2003), for Asia (Bayoumi and Eichengreen, 1999; Bayoumi and Mauro, 1999; Lee, Park and Shin, 2003; Saxena, 2005; Wyplosz, 2001) and for Africa (Honohan and Lane, 2003; Bayoumi and Ostry, 1995; Mkenda, 2001; Sparks, 2002; Grandes, 2003; and Masson and Pattilo, 2005).

Regional economic integration has been a major element in most discussions of economic development in Africa, and its promotion dated back since colonial times. Shortly, after the independence of many African countries in the 1960s and at the inception of the Organization of African Unity (OAU) in 1963, the prospect of an economic and monetary union has been one of the objectives to be achieved by the continental organization. The concept of a single monetary zone for Africa was for the first time proposed in the Organization of African Unity's Treaty in 1991 (The *Abuja Treaty*). The *Abuja Treaty* establishing the African Economic Community (AEC) outlines six stages¹ for achieving a single monetary zone for Africa. In the early stages, regional cooperation and integration within Africa would be strengthened, and this could involve

¹ We present in Appendix 1.1. the different stages as outlined in the *Abuja Treaty*.

regional monetary unions. The African Union's plan for an African monetary union relies on the earlier creation of monetary unions in five existing regional economic communities: The the Arab Monetary Union (AMU); the Common Market for Eastern and Southern Africa (COMESA); the Economic Community of Central African States (ECCAS); the Southern African Development Community (SADC) and the Economic Community of West African States (ECOWAS)². The proposed regional monetary unions can be the starting point, and once these unions would be strengthened, they would ultimately merge towards a unified economic and monetary system by creating a single central bank and a common currency for the entire continent (Masson and Pattillo, 2005)³. We should notice, at the outset, that there exist two functioning monetary unions in Africa: the CFA franc zone⁴ and the Common Monetary Area (CMA).

The Southern African Development Community (hereafter SADC) is a recent regional economic integration scheme, which evolved out of the Southern African Development Coordination Conference (SADCC)⁵, was established in 1992 with a view, among others, to promote economic co-operation and integration, and to harmonize economic development among Southern Africa countries. At the time of its formation, SADC excluded apartheid South Africa from membership, and its key objective was to reduce the region's economic dependence on South Africa. Following the end of apartheid and democratic elections in South Africa, the country was admitted to SADC in 1994. DR Congo and Seychelles joined the SADC later. The organization has actually

² See Appendix 1.2 for the list of country members of the different proposed regional monetary unions.

³ Furthermore, the African Union's 1999 *Sirte Declaration* retained the African economic and monetary union agenda, but made a case for an accelerated implementation of the process for creating institutions of the union, especially, the African Central Bank.

⁴ CFA franc zone is composed mainly of former French colonies, with the currency linked to the euro.

⁵ The SADCC was created in 1980 and was more intended to provide a bulwark against the Apartheid system prevailing in South Africa than to foster a regional trade arrangement.

14 member states⁶. In the original structure of the SADC, each member state was given responsibility for an economic sector and South Africa had responsibility for the Finance and Investment Sector. South Africa also chaired the SADC Committee of Central Bank Governors (CCBG)⁷. In 2002, the SADC governments agreed on a set of economic indicators which would allow them to monitor progress toward macroeconomic convergence, and emphasis has been placed on the reduction of the rate of inflation to low and stable levels, therefore laying the groundwork for an eventual common monetary policy (Masson and Pathillo, 2005). From the form of monetary cooperation outlined above, it has to be recognized that the issue of monetary integration is not new in the region and it has already received considerable attention. The SADC agenda is to create a free trade area by 2008, a SADC customs union by 2010, a common market by 2015 and a monetary union by 2016 with a single currency and central bank.

Several studies have been conducted to assess whether a monetary union is feasible among southern African countries (Bayoumi and Ostry, 1997; Jenkins and Thomas, 1998; Horwath, 1997; Khamfula and Huizinga, 2004; Masson and Pattillo, 2005). These studies differ, however, in terms of methodology, focus, sampling period and countries coverage. Bayoumi and Ostry (1997), for instance, focus on the size and correlation of real output disturbances and the level of intra-regional trade across Sub-Saharan African countries to investigate the possibilities for closer regional monetary

⁶ By the time we started this dissertation, SADC had 14 member states. In 2005, Madagascar joined the group. Notice also that in late 2004, Seychelles left SADC, but it was readmitted again in 2007. Thus, for this dissertation, we only consider the former 14 member states.

⁷ The projects for which the CCBG is involved include the following: to develop a common database of monetary and financial statistics, to develop payment systems in SADC countries, to examine the impact of exchange controls, to coordinate training, and to analyze difference in legal and operational frameworks among central banks.

arrangements in the region in the future. They find that the real output disturbances⁸, have low correlations among Southern African countries⁹. Coupled with an extremely low level of intra-regional trade, this casts doubt on the desirability of monetary union within Africa.

Horvath and Grabowski (1997) attempted to empirically determine whether or not temporary and permanent shocks influence various African nations in a symmetric or asymmetric manner. With respect to southern African countries¹⁰, they found that while South Africa has symmetric demand shocks with almost each country, it has no symmetric shocks in real supply. Therefore, they concluded that the scope for a currency union is quite limited for most of Africa.

Jenkins and Thomas (1998) use the convergence hypothesis, in terms of *sigma*- and *beta* convergence (Barro and Sala-i-Martin (1991, 1992)) and a Markov chain-type methodology (Quah, 1993), to investigate the possibility of monetary integration in the region using a set of 12 SADC countries and a sample period from 1960 to 1990. Their results show a lack of economic convergence in terms of per capita income for the whole set of countries. However, they find evidence of per capita income convergence for subsets of countries, the five member states of the Southern African Customs Union (SACU) as well as for the CMA countries.

⁸ estimated as residuals from a regression of real output per capita growth on its first and second lags.

⁹ Their sample of Southern African countries included eleven present members of SADC, namely Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

¹⁰ Their sample of Southern Africa includes the following countries: South Africa, Zimbabwe, Botswana, Lesotho, Swaziland, Madagascar and Mauritius.

Sparks (2002) uses annual data covering mostly the years 1995-1998 and focuses on six potential criteria that are essential for the feasibility of a monetary union¹¹ and finds evidence of convergence for only two criteria. Based on this result, he concluded that unless there is more convergence, the chances for a successful monetary union are low. Sparks (2002) added that if CMA expands, it will probably be gradually, one new member at a time, and Botswana, Mauritius or Seychelles, may individually negotiate joining.

Agbeyegbe (2003) has sought to investigate the feasibility of monetary union in SADC by looking at evidence of nominal exchange rate and inflation convergence. He applied the methodology of time-varying parameter estimates (Kalman Filter) analysis to study ten, non-CMA, member countries of SADC, and based on the analysis to determine whether the member country indicators point towards a direction of being able to join a new single currency system. He examines the convergence of exchange rates to that of South Africa, the leading country in the CMA, and also the convergence of inflation rates to the average of the CMA members. He found evidence suggesting non-convergence among the SADC members examined, and argued that the chances of SADC member countries satisfying some form of Maastricht-type criteria is presently quite low.

Khamfula and Huizinga (2004) employed a Generalized Auto-Regressive Conditional Heteroskedasticity (GARCH) model to consider the share of the variation in real exchange rates (RERs; vis-à-vis South Africa) that can be explained by the divergence in monetary and fiscal policies. They find that monetary integration would substantially eliminate real exchange rate variation due to different monetary policies for

¹¹ The following criteria were used: currency exchange rate fluctuations, inflation rates, public debt as a percentage of GDP, foreign economic assistance per capita, foreign economic assistance as a percentage of

some members and conclude that a monetary union that embraces all SADC members would amass large costs relative to the benefits and hence would not be desirable. However, the following countries would be suited to form a monetary union today: South Africa, Botswana, Lesotho, Malawi, Mauritius, Namibia, Swaziland, and Zimbabwe¹².

Finally, Masson and Patillo (2005) simulate and calibrate a theoretical model for the existing monetary union in the region, the CMA, assuming that monetary policy is set by South Africa. In fact, the model results indicate that compared to independently floating currencies, the CMA is in the interest of all participants given their close trade links and the generally large positive correlation of shocks. Each of the CMA countries would prefer to be a member than to pursue its own, independent monetary policy. When they consider whether adding other SADC countries individually to the CMA is incentive compatible, both for the new member and for the countries that form the existent CMA, and assuming that the current asymmetric arrangement would continue, the authors found that all countries except Mauritius would find joining CMA in their interest, on the basis of the economic criteria in their model. Moreover, the existing CMA members would all gain, if any country (including Mauritius) joined.

One weakness of most of these above mentioned studies¹³ is that the discussion has been centered on whether these countries or regions satisfy a limited range of the optimum currency area criteria, from which strong conclusions have been drawn on whether monetary union is feasible or not. Based on available evidences, the African regional economic arrangements do not satisfy the text-book OCA conditions. However, the OCA theory has been recently criticized for being static since it is mainly concerned

GDP and trade

¹² Due to data scarcity, Angola, Mozambique, Seychelles and DR Congo were excluded in their analysis.

with an analysis of the costs and benefits of monetary integration given the present economic conditions. It ignores changes in economic activity that are induced through a policy of integration (Volz, 2006). Frankel and Rose (1998) introduced the notion of endogeneity and argued that a group of countries that does not qualify as an OCA *ex ante*, may evolve into one *ex post*, by virtue of adopting a common currency¹⁴.

Moreover, these previous studies do not take into account political considerations. Several economists, such as Mintz (1970), Cohen (1972, 2003) and Willet (2004), have argued that political factors also need to be considered since country characteristics alone fail to wholly explain the choice of exchange rate regime¹⁵. Therefore, the fact that the African economic integration arrangements fail to satisfy the OCA criteria *ex ante* does not represent an obstacle to the African integration effort, because the OCA conditions could still be met *ex post* if there is a strong political commitment and the need to achieve sound macroeconomic policies and adherence to the pre-set convergence criteria.

In the African case, Masson and Milkiewicz (2005) argue that there are basically two major motives that could probably explain the quest for monetary union. First, it is obvious that the successful commencement of the *euro* zone has stirred interest in other regions and that monetary union is therefore perceived as a way of strengthening regional solidarity and signifying dedication to regional harmony. A second important reason to create a monetary union may be to improve on the monetary policies provided by national central banks by delegating monetary policy to insulate it from pressures to

¹³ The study by Masson and Pattillo (2005) does not use an OCA approach.

¹⁴ They contended that countries with closer trade links tend to have more tightly correlated business cycles and thus, would converge towards the ideal conditions for monetary integration.

¹⁵ Cohen and several other economists have argued that the formation of the European Economic and Monetary Union (EMU) was not purely based on economic considerations, but also on political factors. Willet (2004) also argues that economic policy decisions are made through a political process, and political considerations dominate OCA theory when it comes to the formation of currency unions.

finance governments¹⁶. Moreover, Yehoue (2005) demonstrates that the case for monetary integration is even stronger for Africa in addressing the problems of multiplicity of currencies and exchange rate variability¹⁷ that often impede trade flows among African countries¹⁸. Khamfula and Huizinga (2004) argued that some current members of SADC have major problems due to monetary and fiscal instability, and these countries need to make monetary and fiscal adjustments as a basis for sustainable long-term growth. In fact, these adjustments are among the required measures which are prerequisites for forming a monetary union. Therefore, the argument can possibly turn around as follows: In order to attain monetary and fiscal adjustments SADC countries should enter a monetary union which would set binding constraints to monetary and fiscal policies. The union would pressure them to adjust, thus the monetary union would work like a nominal anchor. Similarly, Roy and Betz (2000) argue that it is important to ask whether and in what ways monetary integration can contribute to overcoming structures that present obstacles to economic development. Finally, in the African case, Hohonan and Lane (2000) stated that economic and monetary union can be viewed from four perspectives: these relate to the extent to which the cooperation arrangement fosters the development of an agency of restraint to the government, the extent to which the arrangement deepens the financial system, the extent to which the arrangement reduces the probability of speculative pressures, and the extent the arrangement deepens integration of economies, via the creation of a single economic space.

¹⁶ Most African central banks have typically fallen to resist from pressures to finance government deficits, resulting in high inflation and depreciation of national currencies.

¹⁷ In this respect, Yehoue argues that the majority of national currencies in Africa are not convertible and highly volatile. Moreover, African countries are characterized by exchange rate policies which are, in most cases, unstable and unpredictable.

¹⁸ In a study of intra-regional trade in West Africa, Ogunkola (1998) estimates that the level of unrecorded trans-border trade is several times larger than the reported trade flows.

Unlike several other studies which focused on the feasibility or desirability of southern African countries to form a monetary union, the purpose of this dissertation is to tackle several economic issues related to monetary integration and empirically apply it to the context of the major regional economic grouping in Southern Africa (SADC). In the light of the literature on monetary integration, three different economic issues¹⁹ are investigated in this thesis, and they provide answers to the following research questions:

(i) Assuming that the SADC countries were sharing a common currency, what would be the effects (of sharing the same currency) on their intra-regional trade? What about the trade flows of other SADC members with South Africa, the dominant economy in the region?

(ii) Many monetary integration projects around the world are trying to use the European EMU as blueprint. The European experience demonstrates that before launching a common currency, European countries started to co-ordinate their exchange rates through the Exchange Rate Mechanism (EMS) by pegging their bilateral nominal exchange rates. In this case, what would be the appropriate nominal currency anchor²⁰ to which all SADC countries would peg their national currencies?

(iii) In southern Africa, there exists a long-standing monetary union, the CMA²¹. Assuming that there is possibility for expanding membership of the current monetary arrangement to other SADC members, what would be the potential new members of the monetary union?

¹⁹ The three issues are: the trade effect of a common currency, the choice for an optimal nominal currency anchor for a group of countries and the possibility for new members entering an existing monetary arrangement.

²⁰ The nominal currency anchor may be a regional (from a member state) or a major currency, external to the region.

²¹ Strictly speaking, the CMA is not a full-fledged monetary union. It is like a currency board (Grandes, 2003).

Starting from the seminal paper by Rose (2000), several authors²² have found that the use of a common currency increases trade. These studies have applied the gravity model of trade to discuss the effect of sharing a common currency on intra-regional trade. Due to the fact that Southern African countries are aiming to form a monetary union, and therefore, share a common currency, in the first essay, we investigate whether the fact of having a common currency will have an impact on the intra-regional trade. More specifically, we use the level of intra-regional trade as predicted by the gravity model and compared it with the observed trade in order to assess the trade potentials in the region, as well as the trade potentials of each individual SADC country with the Republic of South Africa, the dominant economy of the region.

In southern Africa, some national currencies are not convertible and highly volatile²³. Given the fact that these countries are mostly primary commodity producers, hence competitors in third markets, and are also willing to strengthen their intra-regional trade, an exchange rate mechanism seems to be appealing. Chapter four deals with the issue of the choice for the optimal nominal currency anchor to which the national currencies of the region have to be pegged to. This essay follows the literature on optimum currency area and employs the methodology developed by Bayoumi and Eichengreen (1997a, 1997b). To the model specified by Bayoumi and Eichengreen, we added other variables which are relevant for the countries under consideration. We also use the normative approach developed by Benassy-Quere et al. (1998) to choose the optimal nominal currency anchor for SADC countries.

²² Rose (2000), Glick and Rose (2001), Engel and Rose (2002) as well as Frankel and Rose (2002) have generated a substantial literature on the relationship between currency integration and intra-regional trade.

²³ This situation is common to many African countries.

Finally, it is worth to consider whether the African Union's strategy of creating regional monetary unions which would merge to form a single monetary zone is rational. In fact, Masson and Patillo (2005) suggest that achieving a single currency for Africa can be promoted through successful selective expansions of existing currency areas within African regional Economic Communities²⁴ by adding to them countries that have demonstrated their commitment and ability to deliver sound economic policies by satisfying convergence criteria for a significant length of time. In the case of southern Africa, extending the CMA may be a more attractive possibility in the short run²⁵. Chapter five explores the possibility for the other ten SADC countries to join the existing regional monetary union (CMA). For these countries, their membership in the existing monetary union (CMA) will depend on their ability to align themselves with the institutions and the macroeconomic policies of the CMA. In this chapter, we examine whether these countries will be able to achieve the necessary stability between their exchange rates and those of their CMA partners. We proceed by investigating the extent to which they have been able to achieve some measure of convergence between the evolution of their money supply growth rates and that of South Africa, a proxy for the CMA. This would be done by investigating whether there exists a long-run relationship

²⁴ Currently the existing currency areas within the African Regional Communities are:

- West African Economic and Monetary union (WAEMU) among French-speaking countries of the Economic Community of West African States (ECOWAS). A new monetary zone, West African monetary zone, comprised of English-speaking countries of ECOWAS, was expected to begin operations in 2005.

- The Common Monetary areas (CMA) in the Southern African Development Community (SADC)

Other African Regional communities namely the Arab Monetary union, The common Market for Eastern and Southern Africa (COMESA) and Economic Community of Central African States (ECCAS) do not have a currency area within them

²⁵ However, many SADC members are, with a few exceptions, too far from the macroeconomic stability necessary to converge with South Africa. An expanded monetary zone could involve shared monetary policy responsibility by South Africa's Reserve Bank with neighboring central banks.

between the money supply of the potential candidates and that of South Africa using the Johansen cointegration approach.

This dissertation contributes to the discussion of the implementation of a single currency in southern Africa by providing additional evidences on issues regarding a monetary union in the region. One contribution of this research is the assessment of the effect of a common currency in the trade flows among SADC member states. From the outcomes of several studies which find that sharing a common currency increases bilateral trade flows, our goal is to assess whether a single currency in SADC can be justified on this ground. However, our analysis demonstrates that, in general, SADC countries over-trade using data on current trade flows.

A second contribution of this research is the use of the theory of optimum currency areas to empirically find the optimal nominal currency anchor for the SADC member states. We combine the OCA index approach of Bayoumi and Eichengreen (1997a,b), and the normative approach of Benassy-Quere et al. (1998) to choose the optimal currency anchor among five currency candidates.

Another query that this dissertation considers is whether the logic behind the “German dominance” in the European Monetary System (EMS), among a group of industrialized countries, can be imported to developing countries. South African’s leadership in the SADC has been investigated in terms of the convergence in money supply growth rates between South Africa, a proxy for the Common Monetary Area (CMA), and its SADC partners taken individually. A finding of a long-run relationship among the money supply is an evidence for future membership of a SADC (non-CMA) country to join the existing monetary union in the region.

Due to data limitations, in some cases, we exclude a set of SADC countries in our analysis. We are also limited to the choice of the sample period since South Africa, the major economic of the region, has been on international economic sanctions. Finally, the choice of the choice of variables has been affected by lack of time series data.

The rest of this dissertation is organized as follows. The second chapter provides general background information to southern African economies. The third chapter deals with the issue of trade effect of a common currency for SADC countries. The optimal currency peg for southern African currencies is the subject of the fourth chapter. The expandability of the CMA to the other SADC members, based on the convergence of their monetary policy, is discussed in chapter five. The last chapter provides a summary of the findings.

CHAPTER 2: BACKGROUND TO SOUTHERN AFRICAN ECONOMIES

2.1. Regional Integration Arrangements in Southern Africa

There are five major regional economic integration schemes in the Southern and Eastern African region. These are the Southern Africa Customs Union, the Common Monetary Area, the Southern African Development Community, the Common Market for Eastern and Southern Africa and the Cross Border Initiative. Table 1 shows the country membership of these regional integration schemes.

(a). Southern African Customs Union (SACU):

Originally, the SACU was formed in 1910 with South Africa and the BLS (Botswana, Lesotho and Swaziland) and the agreement was renegotiated in 1969 with the independence of the three smaller countries. Namibia formally joined SACU in 1990²⁶. Under the SACU agreement, there is a duty free movement of goods among members and a common external tariff (CET) is applied on imports into the union. One of the main features of SACU agreement is the revenue sharing formula which includes a 42% enhancement factor to compensate the BLNS countries. A renegotiation of the SACU Agreement was concluded in 2002, but it still has to be ratified by all parties. The new SACU Agreement provides for a more democratic institutional structure; a dispute settlement mechanism; the requirement to have common policies on industrial development, agriculture, competition and unfair trade practices; and a new system for the common revenue pool and sharing formula.

Table 2.1: SADC countries' Membership of Regional Groupings

COUNTRY	SACU	SADC	COMESA	CMA	CBI
Angola		#	#		
Botswana	#	#			
Congo, DR		#	#		
Lesotho	#	#		#	
Madagascar			#		#
Malawi		#	#		#
Mauritius		#	#		#
Mozambique		#	#		
Namibia	#	#	#	#	#
Seychelles		#	#		#
South Africa	#	#		#	
Swaziland	#	#	#	#	#
Tanzania		#	#		#
Zambia		#	#		#
Zimbabwe		#	#		#

(b). Common Monetary Area (CMA)

In order to understand the functioning of the CMA and the outstanding role of the Republic of South Africa, we need to take into account the historical framework in which the Common Monetary area has been set from the beginning. At the establishment of the South African Reserve Bank (SARB) in the 1920s, the South African pound already became legal tender in the so-called BLS-states²⁷. In 1961, the South African Rand (ZAR) was introduced. After the independence of the BLS-states from Great Britain, negotiations between them and South Africa resulted in the first official agreement about

²⁶ Namibia has been a de facto member of SACU.

the establishment of a Rand Monetary Area (RMA) in 1974, and the Rand remained legal tender in all these countries. Although Botswana participated in the negotiations, it opted out in favor of a managed floating of its currency. Since then, however, Botswana has pegged its national currency to a basket of currencies with an estimated weight of 60% to 70% for ZAR²⁸. Swaziland and Lesotho began to issue their own currencies in 1974 and 1980 respectively. The Common Monetary Area (CMA) replaced the Rand Monetary Area in July 1986 under the terms of a Trilateral Monetary Area agreement between the three countries accommodating changes in the position of Swaziland. This trilateral agreement was replaced by the present multilateral monetary area agreement (MMA) in February 1992, when Namibia formally joined the CMA.

According to Grandes (2003), the CMA is a hybrid of a currency board and a monetary union. Even though the rand is the dominant currency, member countries have not made an irrevocable commitment to keep a given parity. This makes the arrangement a less than fully-fledged one. On the other hand, it is a currency board because foreign assets back domestic currency issuance and the monetization of fiscal deficits is not allowed. However, unlike an orthodox currency board, the monetary systems are administered by Central Banks which perform functions such as extending loans to their respective governments.

Concretely, the CMA arrangement covers the following features: (see Van Zyl (2003), Grandes (2003) and Sparks (2002)).

- Each of the four members has its own central bank, which is formally responsible for monetary policy within the respective country, and issues its own currency.

²⁰ BLS-states: Botswana, Lesotho and Swaziland.

²⁸ This is the reason why Botswana is often called a *de facto* member of the current CMA.

- Both Lesotho and Namibia have to back their currency issues by South African rand assets. In order to maintain financial stability within the CMA, the South African Reserve Bank acts as a lender of last resort.
- In both Lesotho and Namibia the ZAR serves as legal tender; Swaziland abolished the legal status of the ZAR in 1986, although *de facto* it is still widely used. By contrast, none of the other currencies is legal tender in South Africa, nor are they commonly used within South Africa. A clearing system repatriates ZAR coins and notes circulating in the other member countries.
- Already in 1986, South Africa committed itself to making compensatory payments to members in return for circulating the ZAR within their currency areas; therefore Lesotho and Namibia partly share the seigniorage of the ZAR; this does not apply to Swaziland.
- The national currency of Lesotho and Namibia are all pegged at par to the ZAR; Swaziland abolished this commitment in 1986, but it is still valid *de facto*.
- Within the CMA, there are no restrictions on capital movements, *vis-à-vis* the rest of the world. CMA members apply a common exchange control system, determined by the South African Department of Finance and administered by the South African Reserve Bank in cooperation with central banks of the other members.
- Member countries share a common pool of foreign exchange reserves, managed by South African Reserve Bank and increasingly also managed by South African authorized dealers (banks); central banks and authorized dealers of other member countries have free access to the foreign exchange market in South Africa. On

request, the South African Reserve Bank will make the foreign exchange of the common pool available to other member countries.

- Lesotho, Namibia, and Swaziland may hold additional foreign exchange by themselves for direct and immediate needs; up to 35% of this foreign exchange might be held in a currency other than the ZAR.

Since the South African Monetary Policy is guided by an inflation targeting monetary framework, the arrangement has impacted on the macroeconomic stability of the region and is thus generating a low inflation rate. Hence, it can be said that the SARB *de facto* determines monetary policy for the CMA although every member has its own central bank with formal competence for the design of monetary policy. It is also widely acknowledged that the process of inflation assimilation at the South African level, for Lesotho, Swaziland and Namibia, is due to CMA membership. Besides, a clear evidence of convergences of fiscal and monetary policies is attributable to this arrangement. The central banks of the three countries vary their interest rates to defend the nominal peg and thereby “import” price-level stability. This convergence has been empirically proved by Jenkins and Thomas (1997) in terms of real per capita income and Honohan (1992) for inflation and interest rates.

(c) Common Market for Eastern and Southern Africa (COMESA):

The COMESA was previously named the Preferential Trade Area, which was set up in December 1981. In the 1990's, it included 21 members. The slow progress of the PTA towards trade liberalization has resulted to the signature of a new treaty establishing COMESA in December 1994. COMESA included in addition to the PTA members

Madagascar and Mauritius. Lesotho and Mozambique withdraw from COMESA in 1996. COMESA's original objective was to establish a common market by 2000 and ultimately an economic union. Besides a common market, COMESA has the objective of establishing a monetary union and a common central bank by 2025.

Roughly speaking, COMESA is a large economic and trading unit capable of overcoming some of the barriers faced by individual states. COMESA's strategy is trade liberalization through market integration.

(d) Cross Border Initiative (CBI):

The CBI was jointly launched in 1992 with the support of the African Development Bank, the European Union, the IMF and the World Bank as a mechanism to foster continued trade liberalization, increased cross border trade, facilitate investment and payment in Eastern and Southern Africa and the Indian Ocean. Countries are expected to harmonize import tariff regimes and to reduce internal tariffs and non-tariffs barriers (NTBs) significantly. Fourteen countries are participating to the CBI. The original deadline for removing intra-CBI NTBs and tariffs (1996) has already passed.

Regional Integration Facilitation Forum (RIFF) has grown out of the Cross Border Initiative (CBI) program implemented in 1992. It was established primarily with the aim of creating conditions for a more beneficial integration of the countries of eastern and southern Africa into the regional and world economy. It aims to achieve this by facilitating the dismantling of barriers to the cross-border flow of goods, services, persons

and capital. It also seeks to ensure the consistency of national adjustment programs and regional integration measures²⁹.

(e). Southern African Development Community (SADC):

The SADC evolved out of the Southern African development Coordination Conference (SADCC). The latter was created in 1980 and was more intended to provide a bulwark against the Apartheid system prevailing in South Africa than to foster a regional trade arrangement. SADCC became SADC in 1992 and broadened its concerns to facilitating regional economic integration. The participation of South Africa in 1994 enhanced the viability of the SADC as an economic community. For now, SADC encompasses 14 members. One of the main features of the SADC is related to the sector coordination approach because each member country is responsible for coordinating a specific sector programs. The SADC-secretariat is located in Gaborone in Botswana.

SADC's main objective is to achieve the levels of policy harmonization and resource rationalization required for the complex task of regional economic integration. The main economic goals can be summarized as development and economic growth; poverty alleviation; improvement of living standards; harmonization of socio-economic policy; and the establishment of suitable institutions and mechanisms for the mobilization of resources to implement the programs of SADC (www.sadc.int). One important step is the creation of a SADC Free Trade Area, which was initiated in 2000 and will be fully implemented by 2008. In the process of the creation of a full-fledged FTA, intra-regional

²⁹ The CBI/RIFF was never meant to be a permanent structure nor is it a new kind of regional organization. It promotes a pragmatic approach of variable speed towards regional integration (so that progress is not determined by the slowest-moving member state).

trade and investment is expected to grow significantly as the issues of market access, rules of origin and non-tariff barriers are resolved.

SADC has allocated the co-ordination of specific sectoral responsibilities to member countries in order to achieve the Community's goals. In such co-ordination, member countries "... are supervised by Sectoral Committees of Ministers. The Minister representing the sector co-ordinating country, chairs the Sectoral Committees of Ministers. Sectoral Commissions may be established and ratified by member states. Commissions are regional institutions, supported by all member states..."(Background information on SADC, www.sadc.int).

As the Republic of South Africa accepted sectoral responsibility for finance and investment in SADC, it is responsible for the co-ordination and monitoring of progress with the convergence criteria set by SADC and the Governor of the South African Reserve Bank chairs the CCBG.

2.2. The Socio-Economic Situation in Southern Africa

Qualman (2000) argues that the integration process among SADC countries has become more demanding and more difficult following the accession of South Africa and the DR Congo, its enlargement to include fourteen member countries and its entry into the phase of creating a free-trade area. However, Henning et al. (2001) sustain that regional cooperation and integration are preconditions for accelerating economic and social development in southern Africa. They argue that major weaknesses for most SADC members are that these countries are small and agricultural based primary

commodity exporters, hence they will not be able to attract the necessary financial and technological transfers needed to support a sustained industrialization process.

The SADC is a regional organization which is characterized by a heterogeneity among its member states in terms of land size, population figures, size of their domestic markets, per capita incomes, resource base, development, and social and political situation. Table 2.2 presents some basic indicators for the countries of the region.

Among the 15 members of SADC, six of them are landlocked while three other countries are islands in the Indian Ocean³⁰. In terms of land size, the Democratic republic of Congo is the largest country, with 2 345 000 square kilometers, following by Angola and Republic of South africa, with 1,247,000 and 1,219,000 square kilometers, respectively. The two islands of Seychelles and Mauritius are the smallest countries with a land area of 456 and 2,000 square kilometers, respectively. Lesotho and Swaziland are also small countries with land size of less than 18,000 square kilometers. The remaining eight countries are large with a land area ranging from 118,000 square kilometers (Malawi) to 945,000 (Tanzania).

The combined population of SADC area is approximately 236 million in 2004. In terms of population, the most notable feature of SADC constituent members is that the smallest state, Seychelles, has a population of only 84,000, while the two largest, the DR Congo and South Africa, have 60 and 47 million, respectively. Almost two-third of the SADC population lives in three countries, namely South Africa, Tanzania, and the DR Congo, while the remaining countries unevenly share the other one-third of the population. The five smallest countries (Botswana, Lesotho, Mauritius, Namibia and the

³⁰ The landlocked countries include Botswana, Lesotho, Malawi, Swaziland, Zambia and Zimbabwe, while the islands are Madagascar, Mauritius and Seychelles.

Seychelles) account for only 3.4% of the population and six of 15 countries have a population of less than 10 million people.

In 2004, the combined Gross Domestic Product (GDP) for Southern Africa was approximately \$296 billion, and is more than double that of ECOWAS and equivalent to more than half (56%) of Sub-Saharan Africa (SSA)'s aggregate GDP. SADC's total volume of exports (estimated at US\$66 billion) is three times that of the CFA Zone and more than double that of ECOWAS (Kritzinger-van Niekerk et al., 2002). Hence, in terms of combined GDP and volume of exports, SADC forms the largest regional economic integration arrangement in Africa.

One of the main aspects of economic performance in Southern Africa sub-region is that it is dominated by the Republic of South Africa (RSA), the largest economy of the region. Indeed South Africa represents more than 70% of the combined regional GDP, 32% of its population and about two-thirds of SADC's total volume of exports in 2000.

South Africa, which has long been a middle-income developing country, also dominates CMA, comprising 96% of total CMA's GDP. South Africa dominance in terms of economic size is also associated with economic strengths such as its relatively sophisticated financial markets, its physical and social infrastructure, its business capacity, etc. This predominance is even more evident when comparing RSA's data to that of dominant countries in other Sub-Saharan Africa regional arrangements: In 2000, Nigeria represented 40.4% of ECOWAS' GDP and 45.4% of its exports. Similarly, Cote d'Ivoire accounted for 40% of the West African Economic and monetary Union (WAEMU) aggregate GDP and 53.1% of its volume of exports. For Cameroon in the

Central African Economic and Monetary Union (CAEMU), the percentages are 47.7% and 35.7%, respectively (Kritzinger-van Niekerk et al., 2002).

Table 2.2: Basic Indicators for SADC – 2004

	Area Sq (’000)	Km	Population (’000)	GDP US\$ (million)	GDP/Capita US\$	Imports US\$ (million)	Exports US\$ (million)
Angola	1,247		15,116.0	19,110.0	1,264	5,831.8	13,475.0
Botswana	582		1,711.0	8,485.3	4,959	4,778.5	3,530.1
Democratic Republic of Congo	2,345		59,554.0	6,600.0	111	1,580.0	1,440.0
Lesotho	30		2,333.8	1,396.0	598	1,120.0	568.0
Madagascar	587		16,900.0	5,840.0	346	1,310.0	2,133.0
Malawi	118		11,938.0	1,879.0	157	926.0	484.0
Mauritius	2		1,233.0	6,287.0	5,099	2,760.0	1,990.0
Mozambique	799		18,961.5	5,933.0	313	2,035.0	1,504.0
Namibia	824		2,001.0	5,500.0	2,749	2,107.0	1,829.0
South Africa	1,219		46,586.6	213,097.0	4,574	57,600.0	56,500.0
Swaziland	17		1,105.0	1,800.0	1,629	1,470.0	1,780.0
Tanzania	945		35,300.0	10,361.0	294	2,430.0	1,452.0
Zambia	753		10,987.5	5,408.0	492	2,013.0	1,457.0
Zimbabwe	391		11,892.0	3,050.0	256	2,600.0	1,900.0
Seychelles	0.456		84.0	703.0	8090	392.0	220.1

Source: SADC Website www.sadc.int

Another fundamental characteristic of the SADC region is that it is poor. The region’s average GDP per capita is \$984, and the per capita GDPs range with a low of \$111 in Democratic Republic of Congo to a high of \$8090 in Seychelles. In terms of per capita income Mauritius, Seychelles, and more recently, Botswana, have even surpassed South Africa, while Namibia is also relatively wealthy. Half of the SADC countries have

annual per capita incomes below \$500. Challenges of post-war disarmament and reconstruction (in Angola and DRC), and continuing internal strife (Zimbabwe) have adversely affected economic performance in these states. The Zimbabwean economy has experienced a sharp deterioration over the past five years, with real GDP contracting by about 30 percent during that period and inflation reaching 600 percent in 2003, before dropping to 124 percent in 2005. The economies of DRC and Angola have begun to experience GDP growth as peace agreements in both countries begin to take hold (IMF, 2003).

When we compare SADC to other regional economic integration schemes in Africa, we find that SADC has had the highest level of per capita income, even though the per capita income in southern Africa fell over the past two decades (US\$ 984 in 2004 compared with US\$1023 in 1980). The 2000 income per capita was US\$932, almost three times that of ECOWAS. In terms of growth rates of GDP, the average GDP growth rate for the region in 2003 was 2.3% which is almost similar to that of the period 1997-2001. In 2003, Tanzania and Mozambique experienced the largest growth, about 7.1%, and followed by DR Congo and Zambia. Finally, in Zimbabwe, the growth rate is negative at -9.3%. For the CMA countries, the growth of real GDP is quite stable for the period under consideration.

The member countries of the SADC are unequally endowed with natural resources. For example, South Africa, Namibia, Botswana, DR Congo, and to a lesser degree Zimbabwe and Zambia have significant and important strategic mineral reserves including copper, cobalt, diamonds and gold, Angola is heavily endowed with petroleum, while other member countries, e.g., Swaziland, Lesotho, and Tanzania have very little

such natural resources (Sparks, 2002). Angola, DR Congo, Lesotho and Lozambique are the countries with abundant water resources, while South Africa is the main water importer in the region (Qualman et al., 2001).

In table 2.3, we present some macroeconomic indicators for the member countries of SADC for the periods 1997-2001 and 2003. While a number of countries were able to limit inflation to one-digit levels, prices have been rising by 20% per year, and more in Angola, Zambia, and Zimbabwe. Compared to the average of 1997-2001, Angola and DR Congo have brought their inflation levels from three to two-digit numbers, while Zimbabwe is experienced a large increase in its inflation rate.

Most of the countries in the region are marked by heavy dependence on a limited number of export goods as well as on external transfers. Only South Africa, Mauritius, and Zimbabwe have a manufacturing sector of any significance and, correspondingly, a more markedly diversified external-trade sector. In most of the member countries, however, two or three primary commodities account for over 50% of exports. Hence, as (Qualmann, 2000) noted, this dependence on a limited number of export goods makes the region subject to the sharp, often asymmetrical price shocks typical for world-market cycles.

With the end of apartheid, South Africa's trade with its SADC partners is expected to increase over time and also by taking into consideration the establishment of the free trade area. Qualmann (2000) notes that the most dynamic development in the region is shown by the increase in the volume of trade between South Africa and the other SADC countries in the course of the last five years since the volume of trade has grown by a factor of 1.5. However, trade and capital flow linkages have until recently

been very low between South Africa and the rest of SADC, except for South Africa's partners in SACU. The intra-regional trade, with its volume of US\$ 5.2 billion according to SADC data, accounts for 20% of all exports, a figure that is relatively high for intra-regional trade among developing countries (Qualmann, 2000).

Overall, southern African economies are largely undiversified because the region has not transformed its productive base sufficiently with progressive industrialization. For example, in the period from 1970 to 1998, the share of agriculture in GDP increased in Zambia and Zimbabwe. However, the share of industry in GDP decreased for countries such as Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe. In South Africa and Zimbabwe, the share of manufacturing also declined. Finally, the lack of complementarity in production limits the scope for trade, except between South Africa and the rest of the region.

The economies in the region are reasonably open, and given that all countries in the region, including SA, are heavily dependent on exports of primary agricultural and mineral commodities, the regional economy remains excessively vulnerable to rainfall variations and to commodity market fluctuations (Kritzinger-van Niekerk et al., 2002).

2.3. Macro-Economic Convergence in SADC

When countries decide to pursue a full monetary unification (i.e. the adoption of a single currency), the question is whether the adoption of a common currency should be at one stroke (a shock approach) or it should be introduced after a long gradual process of preparation and economic convergence (gradual approach).

Table 2.3: Selected Macroeconomic Indicators for SADC

Country	Inflation rate		Broad Money Growth		Overall Fiscal Balance	
	1997-2001	2003	1997-2001	2003	1997-2001	2003
Angola	211.0	98.3	270.9	67.5	-14.1	-6.4
Botswana	7.8	4.7	25.4	25.9	4.9	1.6
Congo, D.R.	284.1	12.8	264.6	32.7	-5.0	-4.7
Lesotho	7.6	6.0	10.3	5.3	-3.8	0.7
Malawi	28.1	9.6	27.8	26.4	-5.8	-5.3
Mauritius	6.2	5.0	12.3	11.7	-4.8	-6.0
Mozambique	6.3	13.5	29.4	18.7	-3.8	-4.5
Namibia	8.4	7.2	10.7	20.7	-3.1	-3.6
Seychelles	4.4	7.0	16.9	0.4	-10.4	2.0
South Africa	6.4	5.8	13.3	12.3	-2.4	-2.1
Swaziland	7.7	7.3	10.4	14.1	-0.5	-6.3
Tanzania	9.8	4.5	10.7	23.4	-1.0	-1.4
Zambia	24.7	21.5	32.1	23.4	-4.4	-6.0
Zimbabwe	48.3	431.7	48.3	413.5	-9.4	-0.2
SADC Average	20.8	16.3	23.9	23.6	-3.2	-2.5
SACU Average	6.5	5.8	13.6	13.0	-2.2	-2.0

Source: IMF (2003)

The first strategy (gradual approach) is based on the idea that transition to a monetary union should be gradual and paced by convergence criteria³¹, especially if the participating economies are less homogenous. However, the process of gradual economic convergence may be risky due to the problem of sustainability during the transition period in the case where the formulated policies are overly rigid and unrealistic. The gradual approach has been used strategy by the European Union through the Maastricht Treaty.

The second strategy (the shock approach) assumes that it should be speedier and without accompanying convergence criteria. In this case, a strong political commitment could create the economic conditions to make the monetary unification work. The monetary unification of East and West Germany in early 1990s represents the “shock” approach, i.e. a monetary reform, where the East German mark was replaced by the West German mark, which began legal tender in the whole of Germany (Agbeygebe, 2003).

In SADC region, the gradual approach is followed, i.e., convergence of a set of macroeconomic variables is required for a monetary union, as it is presented in the recent “Memorandum of Understanding (MoU) on Macroeconomic Stability and Convergence” set by the SADC Ministers of Finance in 2002 (Masson and Pathillo, 2005; IMF, 2003). The MoU emphasizes the fundamental role that needs to be played by macroeconomic stability in bringing about successful integration and that convergence on stability-oriented economic policies should be the prime aim of national economic policy within SADC (Roussow, 2006).

³¹ The macroeconomic convergence which entails the setting of lower and/or upper limits for selected macroeconomic variables is usually underpinned by the desire to guide certain key aspects of future economic and financial policy and its management among the member countries concerned.

In this respect, the MoU calls for national convergence programs, containing rolling, country-specific targets for a set of indicators and for a regional surveillance procedure that will assess, annually, progress towards each country's targets. The focus of the regional surveillance over macroeconomic policies is to maintain a low rate of inflation; other indicators are the ratio of the budget deficit to the GDP, the ratio of public debt to GDP, and the balance and structure of the current account. The Committee of Central Bank Governors (CCBG)³² of the SADC is responsible for monitoring progress towards the achievement of macro-economic convergence criteria since satisfactory progress is necessary to achieve the goal of monetary union and a single central bank by 2016. The first of the macro-economic convergence criteria set by SADC should be achieved by 2008. Table 2.4 presents the specified reference values for these economic indicators.

We present in Table 2.5 the evolution of the inflation rate in SADC for the period 1999 to 2004, and compared it with the target set for 2008. An examination of Table 2.5 shows that among SADC countries, the SACU member states and Mauritius have been the most converging using the underlying inflation rate. Angola and democratic republic of Congo which are post-conflict economies have also demonstrated a rapid move towards lower

Macroeconomic convergence should serve as an eligibility test for membership to an economic grouping, i.e., only those countries that attain the convergence benchmarks would qualify (Roussow, 2006).

³² The CCBG was established in 1995 with the specific purpose of achieving closer cooperation and integration in the area of monetary policy among SADC central banks. The work of the CCBG has contributed to major developments towards regional monetary cooperation such as significant progress in the harmonization of the payment and clearing systems, the approval of Memoranda of Understanding on Cooperation, Coordination of Exchange Control Policies in SADC, and Cooperation in the area of Information and Communication Technology. The CCBG has also contributed to the coordination of training for central bank officials in SADC and the creation of a Training and Development Forum. The South African Reserve Bank has established a small specialized research unit in its Economics Department to assist the Committee of Governors in its pursuance of these objectives. The Reserve Bank also provides secretarial services to this Committee.

levels of inflation rates, although the 2004 levels still remained high for Angola. Zimbabwe, which is experiencing economic decline or stagnation has the highest level of inflation, and is therefore the least convergent using inflation trends. Democratic Republic of Congo and Tanzania having succeeded in reaching the regional inflation targets. Five countries, namely Angola, Malawi, Mozambique, Zambia, and Zimbabwe are yet to achieve the single digit inflation rates, but some could do so by 2008 if the current inflation reduction trends are maintained, Zimbabwe being the exception. SACU member states, Tanzania and Mauritius have already achieved the targets ahead of the 2008 schedule. For these countries, they only need to maintain these inflation rates at current levels.

Other indicators of convergence generally follow a similar pattern as described above for the targets set for 2008 (See, Roussow, 2006, for instance). Some countries were already within the macro-economic convergence targets while others are making satisfactory progress towards the achievement of such targets.

Table 2.4: Macro-economic convergence criteria for SADC

Criterion	2008	2012	2018
Inflation rate	Single digits	5%	3%
Budget deficit	5% or less of GDP	3% of GDP as anchor, with a range of 1%	3% of GDP as anchor, with a range of 1%
Government debt	Less than 60% of GDP	Less than 60% of GDP	Less than 60% of GDP
Foreign reserves	3 month's import cover	More than 6 month's import cover	More than 6 month's import cover

Table 2.5: Macroeconomic Convergence in SADC: Rate of Inflation (1999-2004)

Country	1999	2001	2003	2004
<u>Inflation rate (target: single digit by 2008)</u>				
Angola	329.0	152.6	98.3	43.6
Botswana	8.4	6.6	8.7	6.3
DRC	483.7	357.3	12.8	3.9
Lesotho	8.6	6.9	7.6	5.5
Malawi	44.7	27.2	9.6	11.6
Mauritius	6.9	4.8	5.2	4.4
Mozambique	6.2	9.0	13.4	12.6
Namibia	8.6	9.3	7.2	5.5
Seychelles	6.0	6.1	3.3	5.0
South Africa	5.2	5.7	5.8	1.4
Swaziland	5.9	7.5	7.4	3.5
Tanzania	7.9	5.2	4.5	4.6
Zambia	26.8	21.7	21.5	18.0
Zimbabwe	58.5	76.7	431.7	282.4

Source: IMF(2006) and Roussow(2006).

CHAPTER 3: MONETARY UNION IN SOUTHERN AFRICA: A BUILDING BLOC FOR TRADE INTEGRATION

3. 1. Introduction

Following the example of Western Europe, Southern African countries, members of the SADC, are planning to have a common currency by 2016. A rationale for countries to share a common currency or to adopt fixed exchange rates is the notion that exchange rate variability and uncertainty affect negatively the level of bilateral trade flows³³. However, recent developments in international monetary arrangement push many economists to assess the economic effects of currency unions. Recently, a set of empirical studies by Andrew Rose and his co-authors provide evidence of large positive effects of common currencies on the volume of trade. Rose (2000) finds that two countries sharing the same currency trade three times as much as they would with different currencies.

It has also been argued that belonging to a free trade area (FTA) has a large impact on intra-regional trade. In the case of African regional groupings, several authors have demonstrated that the level of intra-regional trade is quite low. However, membership in an African regional trade agreement (or an economic bloc) has a positive impact on bilateral trade (see, for instance, Agama, 2001; Carrere, 2004). From the empirical evidences that sharing a common currency and also belonging to the same regional economic integration scheme have positive effects on bilateral trade, one would expect that if the SADC member states have a successfully implemented FTA and share a single currency, the level of intra-regional trade will be increased.

In international trade, the gravity model has been used as an empirical tool for modeling bilateral trade flows. The predicted trade flows obtained from this model are considered as the “normal” trade flows. The aim of this paper is to estimate trade potentials for southern African countries using the gravity model approach. We use the gravity model to first analyze the bilateral trade flows and, more specifically the effect of a currency union and a FTA on bilateral trade. The coefficients obtained are then used to predict trade potentials for SADC countries (intra-SADC trade). This allows us to assess the relevance of a FTA as well as a single currency for this region in terms of trade flows.

The remainder of this paper is organized as follows. In the next section, an introduction to the gravity model of trade and its theoretical foundations are presented. Section three briefly reviews the existing literature on the theory of regional integration, including the empirical evidence for southern Africa, while section four discusses the empirical evidence on the effect of a common currency on trade. Section five presents the specification of the empirical model, the data and the econometric procedures used for the estimation of the gravity model. Empirical results are analyzed in section six. In section seven we discuss the trade potentials for SADC countries. The last section concludes.

3. 2. The gravity model

3.2.1. Basic concepts

Newton formulated his law of gravity in seventeenth century stating that the attraction between two bodies is directly proportional to the product of masses and inversely proportional to the distance between these bodies. In the context of international trade,

³³ See, for instance, Brada and Mendez, 1988; Frankel and Wei, 1993; Belanger et al. ,1992.

the physical bodies are the bilateral trade partners (the exporting and importing countries), and the size of their economies represents their masses.

In economics, the gravity model to study bilateral trade flows was first introduced by Jan Tinbergen (1962) and Poyhonen (1963) in their analysis of trade flows between European countries. The gravity model of international trade establishes that trade flows between two countries depend directly on the size of their economies as clearly reflected in their income levels, and negatively related to the geographic distance between the two partners. The distance variable reflects the degree of trade resistance between these countries as measured by the transportation costs.

The simple version of the gravity model has been augmented by many other explanatory variables facilitating or hampering trade among countries such as the level of development of the trading partners which should result in higher trade opportunities. This stems from the empirical observation that demand tends to be more diversified at higher levels of development. Other factors include the size of the population, sharing the same border, landlockness, historical links (language, colony,...), membership to a preferential trade area or customs union, exchange rate variability. In sum, the variables entering into the gravity model can be classified into one or more of the following categories (Brulhart and Kelly, 1999):

- i) variables describing the potential supply of the exporting country, i.e; income and per capita income, population of the exporting country;
- ii) variables describing the potential demand of the importing country, i.e; income and per capita income, population of the importing country;

- iii) variables describing the resistance to trade such as geographical distance, landlocked countries, policy and cultural barriers to trade, etc.

Mathematically the gravity model in its most basic form can be expressed by the following equation:

$$X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} D_{ij}^{\beta_3} \varepsilon_{ij} \quad (1)$$

where X_{ij} is the value of bilateral trade between country i and country j , Y_i and Y_j represent the national income of countries i and j , respectively, and D_{ij} is the geographic distance between the two countries³⁴. The exponents β_1 , β_2 , and β_3 in equation (1) indicate that there is not necessarily direct proportionality between the explanatory variables and the trade flows. However, in order to estimate equation (1) econometrically, the basic gravity model has to be expressed in its log-linear form

$$\ln X_{ij} = \ln \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \varepsilon_{ij} \quad (2)$$

The gravity model reflects the normal pattern of trade between two countries. Once this pattern of trade is established, dummy variables are introduced in equation (2) to reflect how some particular conditions affect bilateral trade. A positive and significant coefficient on a dummy variable means that this particular condition increases trade above what the “normal” trade would be in the absence of this condition while a negative and significant coefficient represents the opposite.

3.2.2. Theoretical foundations of the gravity model

Following the works of Tinbergen and Poyhonen, the theoretical foundations of gravity equations explaining international trade flows have been widely discussed and developed within the last four decades. In what follows I briefly review some of the main contributions to the micro-foundations of the gravity equation and at the end of this short review, I present the recently proposed theoretical derivation of the gravity model by Anderson and van Wincoop (2003).

Linneman (1966) was the first author who attempted to provide formal theoretical foundations to the gravity equation. He extended the basic model by including the population size of the countries which denotes the share of domestic demand in total national product. He showed how standard gravity equation can be derived from Walrasian general equilibrium model of export supply and import demand. Based on simplifying assumptions, the gravity equation turns out, according to Linneman, to be a reduced form of a four equation partial equilibrium model.

Leamer and Stern (1970) showed how a probability model of trade patterns could be used to derive the gravity equation. They assumed that world trade is generated by thousands of small independent transactions in which the probability that a transaction involves a particular country i is its share of world trade f_i . The probability of a trade flow between countries i and j , p_{ij} , is given by

$$p_{ij} = f_i f_j \quad (3)$$

The expected trade flow from country i to country j is

³⁴ Distance in the gravity model is measured using the great circle formula, that is, the shape of the earth is approximated as a sphere and the minimum distance between two economic centers along the surface is calculated.

$$X_{ij} = N\beta f_i f_j, \quad (4)$$

assuming that all transactions are of size β , and the number of transactions is equal to N . Due to the fact that there are resistance factors that alter the probability of a transaction involving countries i and j , R_{ij} , then the expected trade flows between two countries become

$$X_{ij} = N\beta f_i f_j g(R_{ij}) \quad (5).$$

Helpman (1979) and Helpman and Krugman (1985) provide the theoretical rationale for the idea that bilateral trade depends on the product of GDPs. The authors argued that the neo-classical Heckscher-Ohlin theory of competitive advantage does not have the property that bilateral trade depends on the product of incomes, as it does in the gravity model. In this theory, consumers seek variety in the products they consume, products that are differentiated by firm, not just by country, and firms are monopolistically competitive. In addition, Helpman and Krugman (1985) introduced the assumptions of increasing returns to scale in the gravity model to assess the sectoral pattern of trade (inter-industry or intra-industry trade volumes). They argue that economies of scale lead to more specialization and that the gravity equations tend to fit the trade pattern better, the more important are increasing returns.

An inconsistency between the Heckscher-Ohlin theory (with Cobb-Douglas utility and production functions) and the gravity equation have been found by Sanso et al. (1989) who examine the theoretical foundations of the gravity model provided by Anderson (1979) and Bergstrand (1985). They show that the inconsistency arises from the fact that income in the labor (capital) abundant country is negatively (positively)

related with trade; and population in the labor (capital) abundant country is positively (negatively) related to trade.

Deardoff (1998) derives the gravity model from two extreme cases of the Heckscher-Ohlin model. The first case shows that if trade is frictionless and producers and consumers are indifferent among trading partners, and if markets are settled randomly among all possibilities, gross trade flows will follow a gravity equation with distance and prices playing no role. In the second case, he proves that if trade is impeded and each good is produced by only one country, the Heckscher-Ohlin framework will result in the same bilateral trade pattern as the model with differentiated goods. It can be shown that, if there are transactions costs to trade, distance should also be included in the gravity equation. He suggested that countries with similar pattern of factor endowments would trade more with each other. High income countries are likely to be capital-intensive in their production and consume capital-intensive products due to their high income, which results in the higher volume of trade among high income countries.

Product differentiation is the basis of new approaches in the derivation of the gravity models where some authors, on the one hand, employs the Armington (1969) assumption that goods are differentiated symmetrically by country of origin, while others, on the other hand, use the Dixit-Stiglitz (1977)'s assumption that goods are differentiated symmetrically by monopolistic competitive firms.

Theoretical derivations using the Armington-differentiated goods assumption include Anderson (1979), Bergstrand (1985) and Anderson and van Wincoop (2003), among others. The gravity model as proposed by Anderson (1979) is based on an expenditure system with identical constant elasticity of substitution (CES) utility

function, goods differentiated by place of origin, and distance as proxy for transportation cost. In this work the gravity model constrains the pure expenditure system by specifying that the share of national expenditure on tradable goods is a stable unidentified reduced-form function of income and population.

Bergstrand (1985) propose a theoretical foundation of the gravity model using the assumption of CES preferences over Armington's assumptions that goods are differentiated by country of origin and that firms are monopolistically competitive. He derives a reduced-form equation of bilateral trade including price indexes and found that imported goods are close substitutes for each other than for domestic goods, which supports his assumption. Improving on his previous work, Bergstrand (1989) applies the microeconomic foundations of the gravity model to the factor endowment variables and also includes exporter and importer income and per capita incomes as exogenous variables, assuming perfect substitutability of products across countries.

Anderson and van Wincoop (2003) use a theoretical framework derived from Anderson (1979), in which building blocks are the same as in Anderson (1979). The authors argue that there is an omitted variable bias in the derivation of the standard gravity equation due to the fact that the variable distance does not capture the majority of the factors which negatively affect bilateral trade flows. In fact, they derive a theoretical gravity specification explicitly taking "multilateral resistance" terms into account which consist of country specific price indices. In their derivation of the gravity model, the authors demonstrate that bilateral trade flows between two trading partners are function of the ratio of specific bilateral trade barriers over the product of their multilateral resistance terms. Hence, they propose the simultaneous use of both importer and

exporter fixed effects to replace the resistance terms, the latter are not observable. The second approach (with Dixit-Stiglitz assumption) has been used by Helpman (1987), Bergstrand (1989), as well as Evenett and Keller (1998), among others. As an empirical test of the monopolistic competition model, Helpman (1987) derives a variant of the gravity model from product differentiation at the firm level, in which bilateral trade depends positively on the economic size (measured by their GDP's) of the trading partners. Bergstrand (1989) extends the micro-foundations of his previous work by explicitly linking the Heckscher-Ohlin model and the monopolistically competitive model. He derives a gravity equation, in a two-sector economy, in which each monopolistically competitive sector has different factor proportions. Evenett and Keller (1998) find empirical support for formulations of the gravity model based on both the Heckscher-Ohlin model and increasing returns to scale, which leads to the conclusion that both models explain different components of the volume of trade.

3.2.3. The Anderson and van Wincoop's Gravity Model

Based on the seminal work of Anderson (1979), Anderson and van Wincoop (2003) derive a theoretical gravity model from a framework that maintains the Armington assumption, i.e, goods are differentiated by place of origin, and where consumers exhibit a constant elasticity of substitution (CES) preferences across the differentiated goods. In addition, they also assume that, on the supply side of the economy, each region is specialized in the production of only one good with a fixed supply.

Let c_{ij} denote consumption of region j consumers of goods from region i , then the utility function to be maximized by consumers in region j is expressed as

$$\max U_j(c) = \left(\sum_i \beta_i^{(1-\sigma)/\sigma} c_{ij}^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)} \quad (6)$$

subject to the budget constraint

$$\sum_i p_{ij} c_{ij} = y_j \quad (7)$$

where

c_{ij} is consumption by region j consumers of goods from region i ; β_i is a positive distribution parameter³⁵; σ is the elasticity of substitution between goods from different countries; p_{ij} is the price of the good from country i in country j ³⁶, and y_j is nominal income in country j . Due to trade costs, prices vary across countries. Let p_{ij} be the exporter's supply price, net of trade costs, and let t_{ij} be the trade cost factor between i and j . Then $p_{ij} = p_i t_{ij}$. Anderson and van Wincoop (2003) assume that the trade costs are imputed to the exporter. Hence, the exporter incurs export costs equal to $t_{ij} - 1$ of country i goods for each good shipped from i to j , which are passed on to the importer.

The nominal value of exports from i to j is $x_{ij} = p_i c_{ij}$, the sum of the value of production at the origin, $p_i c_{ij}$ and the trade cost $(t_{ij} - 1)p_i c_{ij}$ that the exporter passes on to the importer.

Total income in region i is therefore $y_i = \sum_j x_{ij}$.

The solution to the optimization problem is

$$x_{ij} = \left(\frac{\beta_i p_i t_{ij}}{P_j} \right)^{(1-\sigma)} y_j \quad (8)$$

where P_j is a consumer price index of region j given by

³⁵ β can be interpreted as the number of goods within the bundle produced by country i (Soderling, 2005).

³⁶ Prices differ between locations due to trade costs that are not directly observable.

$$P_j = \left(\sum_i (\beta_i p_i t_{ij})^{(1-\sigma)} \right)^{1/(1-\sigma)} \quad (9)$$

Using a general equilibrium approach, i.e. imposing market clearance $y_i = \sum_j x_{ij}$,

Anderson and van Wincoop (2003) show that the sum of i's exports to all countries must equal i's GDP:

$$y_i = \sum_j x_{ij} = \sum_j \left(\frac{\beta_i t_{ij} p_i}{P_j} \right)^{1-\sigma} y_j = (\beta_i p_i)^{1-\sigma} \sum_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} y_j \quad (10)$$

Substituting (10) into (8) yields the following equation

$$x_{ij} = \frac{y_i y_j}{y^w} \frac{(t_{ij}/P_j)^{1-\sigma}}{\sum_j (t_{ij}/P_j)^{1-\sigma} \phi_j} \quad (11)$$

where $y^w \equiv \sum_j y_j$ (y^w being the world nominal income) and $y_j/y^w = \phi_j$ (ϕ_j : income

shares). Re-arranging equation (11) gives

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \quad (12)$$

where

$$\Pi_i \equiv \left[\sum_j (t_{ij}/P_j)^{1-\sigma} \phi_j \right]^{1/(1-\sigma)} \quad (13)$$

Substituting equation (13) into (9) yields

$$P_j = \left[\sum_i (t_{ij}/\Pi_i)^{1-\sigma} \phi_i \right]^{1/(1-\sigma)} \quad (14)$$

Equations (13) and (14) can be simultaneously solved for all Π_i 's and P_i 's in terms of income shares $\{\theta_i\}$, bilateral trade barriers $\{t_{ij}\}$ and σ . Under the assumption of symmetric trade barriers, i.e. $t_{ij} = t_{ji}$, the solution of equations (13) and (14) yields

$$P_i = \prod_i \quad (15)$$

with
$$P_j^{1-\sigma} = \sum_i P_i^{\sigma-1} \phi_i t_{ij}^{1-\sigma} \quad \forall j$$

The gravity equation is obtained by substituting (6) into (12)

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{P_i P_j} \right)^{1-\sigma} \quad (16).$$

This specification of the gravity model is not used in our estimation. To make comparison of our estimated coefficient with those of previous studies dealing with the effect of currency union on trade, we follow the trend in literature by using approximately the same specification as Rose (2000), Glick and Rose (2001) among others.

3. 3. Regional integration

In this section, we briefly review the theory of regional economic integration. We also include some empirical evidence concerning southern African countries.

3. 3.1. Regional economic integration: Theory and Evidence

3. 3.1.1. Theory

According to Balassa (1961), in his seminal study "*The Theory of Economic Integration*", economic integration is said to occur when a group of countries in the same region, ideally of equal size and at equal stages of development, join together to form an

economic union or a regional trading bloc. Any type of arrangement in which countries agree to coordinate their trade, fiscal, and/or monetary policies is referred to as economic integration. Obviously, there are many different degrees of integration.

(a) The stages of regional integration

The first stage is a *free trade area* (FTA), where a designated group of countries agree to eliminate tariffs, quotas and preferences on most (if not all) goods between them. In order to distinguish between foreign and partner products, customs authorities often use the share of value-added as a criterion to determine the origins of traded products. The second stage of integration is the *customs union* (CU), where members of a union set a common external tariff (CET) against non-members, and completely free trade of commodities within the union. The third stage is a *common market* (CM), which includes a customs union as well as the free movement of factors of production and services. *Economic union* (EU) is the fourth stage of integration where national economic policies are harmonized. The last stage is *complete economic integration* where almost all policies are unified. This stage includes monetary, fiscal and even social policies, and is to be governed by a supra-regional authority rather than by members individually. Each stage determines the degree of regional economic integration.

(b) The theory of customs union

In 1950, Jacob Viner introduced the theory of customs unions and elaborated on two important concepts that are widely used in trade literature, namely “trade creation” and “trade diversion”. The first, “trade creation”, involves the replacement of locally

produced products by imports produced by a partner in the union, where trade creation came about due to the elimination of tariffs among members of the union. The second, “trade diversion”, is the shift in the domestic consumption from the low-cost rest of the world imports to the higher cost imports from partners of the union. This change in the source of imports is attributed to the elimination of tariffs among members of the union. Viner argued that “trade creation” will make the union better off because the home country can use resources that were devoted to less efficient industries to more efficient industries that have a comparative advantage. Also, when a partner country increases its exports, it will gain from such trade. On the other hand, “trade diversion” could make the union worse-off because of the switch of the home country’s imports from low-cost sources to higher-cost partners, according to Viner, will make no gain because higher prices for production will be necessary to pay the higher costs. Therefore, the whole union could lose from such practices. Accordingly, whether or not a regional integration scheme produces a net welfare benefit to participating countries is an empirical issue.

The following diagram, drawing fully from Siggel (2005), illustrates the basic argument of Jacob Viner’s original approach. The typical situation of an importable product is shown in the familiar partial equilibrium setting of a country that faces the prospect of association with a regional neighbor through a free trade area (FTA) or customs union (CU). Its supply curve takes three alternative forms: Before association and with a tariff of t_m consumers face a supply curve shown by CC ’s, while under free trade they should face AA ’s. Under a FTA or CU with another country that has higher production costs than third countries, the supply curve would be BB ’s, which represents

the cost of production in the member country, when its products enter the home market without any restriction (neglecting transport cost). The domestic price would therefore fall from Pd' to Pd'' , when regional free trade is opened up. Imports would rise from formerly $(Q_3 - Q_2)$ to $(Q_4 - Q_1)$, which represents trade creation. It is trade diversion to the extent that the imports from third countries $(Q_3 - Q_2)$ are replaced by imports from member countries as long as the external tariff remains at its formal level. If, however, the external tariff is lowered as well, trade diversion diminishes. The price fall from Pd' to Pd'' following introduction of regional free trade implies a gain of consumer surplus shown by area $\{a + b + c + d\}$, but producers lose producers' surplus of area $\{a\}$ and the government loses tariff revenue of area $[c + h]$. On the whole, the introduction of regional free trade results in a welfare gain of $[b + d - h]$. Whether it is a net gain or loss depends on whether the efficiency gain from trade creation $[b + d]$ exceeds the net loss of tariff revenue $[h + c - c]$, that is, the revenue loss net of $[c]$, which is part of the consumers' gain. It also remains true that regional free trade implies a shortfall of welfare, relative to the situation of total free trade, which sums up to $[f + j]$ (Siggel, 2005).

In terms of successive stages in the integration process, the member countries of SADC are at the first stage, i.e. a free trade area, which was launched in 2001. Eleven of fourteen members of SADC have joined the free trade area. Angola, Seychelles and the DR Congo have not elected to join the FTA yet. The SADC Trade protocol, which is based on negotiations and offers by contracting parties, aims for liberalization of all trade by 2012. Member countries have agreed to liberalize 85 percent of intra-SADC trade by 2008 and liberalize sensitive products by 2012 (Khandelwal, 2004). More recently,

SADC has focused on macroeconomic stability and convergence in member countries in order to achieve the formation of a common market over the medium term. In this regard, SADC has announced a plan in March 2004 the goals of which include

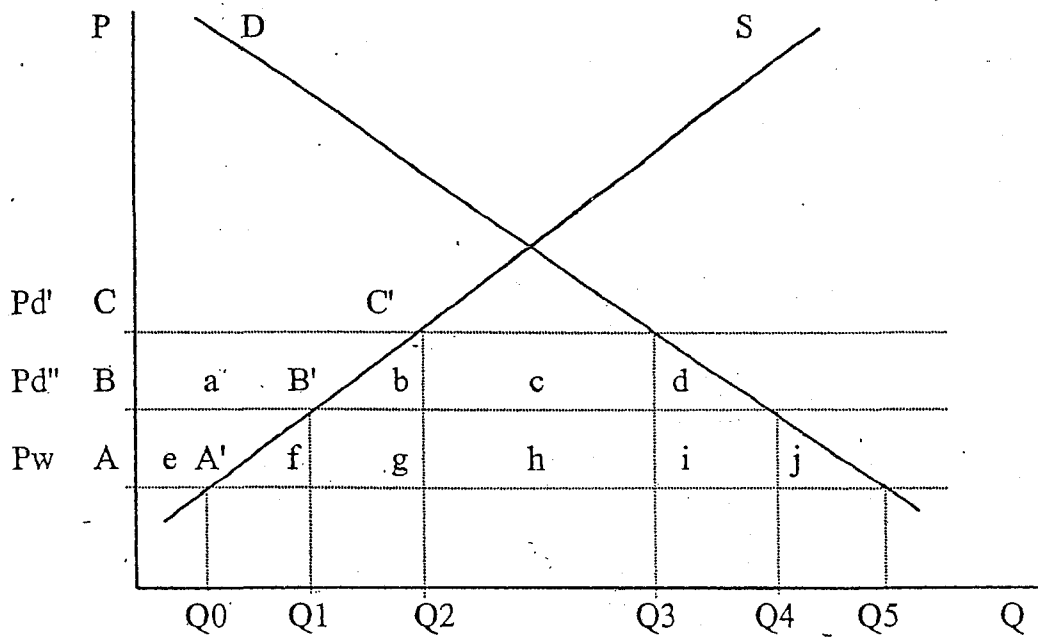


Figure 3.1: Welfare Effects of Regional Integration.
Source: Siggel (2005)

establishment of a SADC customs union and implementation of a common external tariff by 2010, a common market pact by 2012, and establishment of a SADC central bank and preparation for a single SADC currency by 2016 (Khandelwal, 2004).

3.3.1.2. A survey of empirical studies on regional integration in southern Africa

In this section, we briefly review empirical studies which dealt with the issue of regional integration in Africa with a particular emphasis on the southern Africa region.

(a) Potential of a free trade agreement in Southern Africa

Several studies have been conducted to assess the trade potential expected from a free trade agreement among member countries of the SADC. These studies have employed different approaches. For this survey, we focus most on the studies using the gravity model approach.

Using estimated coefficients by Frankel et al.³⁷ (1997), Mukherjee and Robinson (1996) predict the normal levels of gross trade (exports plus imports) between the eleven countries of the Southern African region. While it is certainly not clear that any of these arrangements are comparable to a proposed southern Africa free trade agreement, Mukherjee and Robinson (1996) find that the increase in bilateral trade arising from such membership range from 87 percent to 585 percent and that current intra-regional trade is somewhat above what would be expected, based on the experience of other countries.

³⁷ Frankel et al.'s results were published in 1997 while they were already available before that period. Frankel et al. (1997) use a gravity model, based on a sample of 63 countries, to estimate the impact of bilateral trade when one or both partners being members of a trade bloc or free trade area. The following trade blocs were considered: the European union, Nafta, Mercosur, the Adecan Pact, and Asean.

They conclude that economic integration through the establishment of a free trade area or customs union with South Africa could greatly increase intra-regional trade.

Lyakurwa (1997) explores the potential for increased intra-SADC trade using a gravity model approach to investigate the extent to which trade patterns have been influenced by natural economic factors and the respective regional policy initiatives thus far undertaken within SADC. The gravity model was estimated for three discrete time periods, 1981, 1985 and 1990. The three periods represent the pre-SADC (1981) period, the formative stage (1985), and the period when South Africa was being considered as a potential member state (1990). In all the three periods, the results showed that all the parameters have the right sign³⁸. For 1981 and 1985 the variables (distance) and (SACU) are significant at 10 per cent. This indicates that while the BNLS countries' trade flows are highly in the direction of South Africa as members of SACU, there is higher trade potential between South Africa and the rest of the SADC members than within the customs union.

Using a gravity model, Subramanian *et al.* (2001) estimate a model of bilateral trade flows for African countries for three points in time - 1980, 1990 and 1997- to test for the typicality of Africa's overall trade and to check also whether Africa's trade is uniform. They disaggregate Africa's trade into that of Central and Western Africa, and of Eastern and Southern Africa³⁹. They find that Africa appears to be disintegrating from the world economy, a result that is especially strong for Francophone Africa and weakly present for Anglophone Africa. The disintegration pattern is particularly evident in

³⁸ The signs are positive for GDP, GDP per capita and border, and negative for distance and membership in COMESA and SACU) except membership in COMESA for the periods 1981 and 1990.

³⁹ In this study, the authors use the term francophone Africa for Central and Western Africa countries while Eastern and Southern Africa countries are referred to as Anglophone Africa.

Africa's trade with the technologically advanced countries of the North. The only source of dynamism in Africa's trade – trade growing faster than predicted by the underlying determinants – is in Anglophone Africa's trade with itself⁴⁰.

(b) Bloc Effects

Several studies have tested the impacts of regional integration initiatives (or bloc effects) on bilateral trade of southern African countries by adding a dummy variable for all pairs of countries within a bloc and testing for the significance of the dummy. A positive and significant coefficient implies the existence of a bloc effect, namely that trade within the bloc, or the regional grouping, is larger than that for the average set of countries in the sample, after controlling for the familiar set of variables.

Holden (1996) conducts a quantitative analysis in which he attempted to assess whether regional schemes in Southern Africa and the lifting of sanctions in the early 1990s had an impact on the direction of trade for South Africa. Based on a panel data set covering the 1989-1993 sample period, the results of the gravity model show that the direction of trade for South Africa is influenced by the GDP and population variables of trading partners, but there is no evidence that regional groupings have any effect on the South Africa direction of trade. The results also show that the lifting of sanctions has only a marginal effect on the South Africa exports.

Using data for the 1990-1997 time period, Agama (2001) find that two major regional integration schemes in southern Africa, namely SADC and COMESA, enhanced bilateral trade in the region. The lifting of sanctions in 1992 had a statistically significant

⁴⁰ The intra-Anglophone African trade dummy, which is negative and insignificant in 1980 became markedly positive and significant in 1997.

effect on trade flows in the region. South Africa joining the SADC in 1994 also had a positive impact on bilateral trade in southern Africa. The COMESA also had a positive impact on bilateral trade in Southern Africa. However, COMESA had a smaller impact on Southern Africa trade than the SADC.

Explaining the dynamism of Anglophone Africa's trade with itself, Subramanian et al. (2001) focused on the role of various regional agreements in the region. Their results show that, in the so-called "Anglophone Africa", the CBI and SADC exhibit bloc effects both in the early and late 1990s, while COMESA is the only grouping for which a negative bloc effect is found, meaning that countries within COMESA trade significantly less with each other than the average pair of countries.

(c) Trade creation and trade diversion

The issue of trade creation versus trade diversion in different regional integration schemes in Sub-Saharan Africa has been examined by several authors. Different approaches have been used such as: (i) use of dummy variables into the gravity equation in order to capture the effects of trade creation and trade diversion, or (ii) a multi-country computable general equilibrium model.

Musila (2005) investigates the intensity of trade creation and trade diversion effects of COMESA, ECCAS⁴¹ and ECOWAS, the three largest regional integration arrangements in Sub-Saharan Africa using the approach developed by Endoh (1999)⁴² and annual data for the period 1991-98. The empirical results reveal that ECOWAS and COMESA have trade creation effects and no evidence for trade diversion effects is found

⁴¹ ECCAS: Economic Community of Central African States; ECOWAS: Economic Community Of West African States; and COMESA: Common Market for Eastern and Southern Africa.

in the case of these two regional organizations. Accordingly, based on the estimated elasticities, ECOWAS and COMESA have net welfare gains. In the case of the ECCAS, no trade creation effect was found.

Considering the period 1962-96, Carrere (2004) assesses the average impact of each regional agreement on their implementation period and shows how these impacts have evolved. During their implementation, the African regional trade agreements have generated a significant increase in trade between members, although initially often through trade diversion. In the two agreements of the CFA franc zone, the currency unions have largely reinforced the positive effect of the corresponding preferential trade agreements on intra-regional trade, while dampening their trade diversion effect. Following Endoh (1999), she introduces the three dummies needed to evaluate trade creation and trade diversion in imports and exports for each regional agreement (CEMAC, WAEMU, ECOWAS, COMESA, and SADC) and their precursors.

Based on the evolution of the regional dummy coefficients, a more detailed analysis reveals that, firstly the Sub Saharan African regional agreements generated a significant increase in intra-regional trade, but mainly through trade diversion during the first five years of their inceptions. Afterwards, the WAEMU and the SADC succeeded in generating net trade creation with an increase in the propensity to import from the rest of the world. However, in the CEMAC and the COMESA, trade diversion continued over the whole period.

Using a computable general equilibrium (CGE) model, based on 12 SADC countries and 37 productive sectors for each country, Evans (2002) evaluates three

⁴² Endoh (1999) proposes an approach of estimating the effects of regional organizations on the flow of trade by introducing dummy variables into the gravity equation to account for trade creation and trade

different options for regional integration for the SADC countries, namely a FTA⁴³, a customs union, and open regionalism (free trade), by which SADC countries extend tariff reductions to all countries on a most favored nation (MFN) basis. His results, shown in Appendix 3.1, demonstrates that trade creation dominates trade diversion in a FTA as intra-SADC trade increases by 9 percent while trade with the rest of the world hardly changes. With free trade, there is also trade creation as SADC trade expands by nearly 7 percent, but there are potential terms of trade costs. Evans (2002) also provides an examination of trade creation and trade diversion for the SADC as a whole by using the seven-sector disaggregation of the changes in employment over the base levels. The results for the SADC FTA suggest that there is trade creation in the aggregate manufacturing sectors. On the other hand, there is trade diversion for agriculture and services.

Lewis et al. (2003) employ a computable general equilibrium (CGE) model to analyze the impact of various trade liberalization initiatives in southern Africa, and find that, under all FTA arrangements, the increased total imports from FTA partners exceeds the reduction in imports from non-FTA partners – the FTAs examined are all net trade creating.

diversion.

⁴³ The following trade liberalization initiatives are under way:

- a. The European Union (EU) – South Africa Free Trade Agreement (FTA),

3. 4. Effect of currency union on trade

Recent developments in international monetary arrangement⁴⁴ push many economists to assess the economic effects of currency unions. Started with the seminal paper by Andrew Rose (2000), the potential trade-creating effect of a common currency has recently gained wide attention in the literature, reinforcing the trade argument for monetary integration. In his study, Rose incorporates a currency union dummy variable⁴⁵ into the gravity equation and his results reveal that the impact of monetary union on trade was much larger, i.e. bilateral trade between two countries that use the same currency is over 200% larger than bilateral trade between countries that use different currencies. According to Alesina et al. (2002), this finding the currency union effect was expected to be small by many economists due to the fact that currency conversion costs are low and the estimates of the effect of exchange rate volatility on trade are small. While there has been a lot of controversy about the actual magnitude of the trade-creating effect of monetary union (i.e; Rose's finding), a broad agreement has emerged that a currency union has a significant positive effect on trade. Despite the heterogeneity in the empirical results, Alesina et al. (2002) support Rose's finding and they argue that the currency union coefficient is usually statistically significant, and the median estimate of the trade effect is 100%.

Alesina et al. (2002) and Rose (2002) summarize the finding of empirical studies dealing with this issue (see Table 3.1). Studies whose results support Rose's findings

-
- b. The EU's 'Everything but Arms'(EBA) initiative to eliminate trade barriers against imports from the least developed countries;
 - c. The SADC FTA (the FTA among SADC countries).

⁴⁴ The launch of a single currency in Western Europe, the dollarization of some Latin American countries, the prospect for new EU members to unilaterally adopt the euro, for instance.

include Lopez-Cordoza and Meissner (2003) who using trade data from 1870 to 1910 find similar quantitative effects. Moreover, Rose and van Wincoop (2001) introduce country-specific trade resistance measures into their gravity model; the currency union effect on trade is smaller than in Rose (2000), but still substantial. Rose (2002) conducted a meta-analysis covering 19 studies and find that the average effect of currency union is to more than double trade among the members, and this is robust to variations in sample composition, time period, estimation techniques (i.e; fixed or random effects) , and also excluding the six studies where Rose has been involved.

A major criticism of Rose's (2000) findings has been addressed by several authors including Kenen, (2001), Nitsch (2004) and Persson (2001). These authors have shown that the currency union members (used in Rose, 2000) are smaller and more open than their natural competitors⁴⁶, and that history matters⁴⁷. When the currency union members are matched with similar countries that are not in a currency union, the differential impact on trade is much smaller than when the currency union members are part of a global dataset. However, Rose and Engel (2002) show that members of currency unions are different, but their case is that currency union members are more integrated with one another than similar pairs of countries with independent currencies.

⁴⁵ The gravity equation is then augmented with a dummy variable indicating whether or not the country-pair shares the same currency. The estimate of the coefficient on this dummy is interpreted as the currency-union effect.

⁴⁶ i.e; countries with similar economic size and characteristics.

Table 3.1: Empirical studies of the effect of currency union on trade

Authors	Significance ^a	Point estimate of increased trade from Currency union
Rose (2000)	s	≈ 240%
Frankel and Rose (1998)	s	≈ 290%
Engel and Rose (2002)	s	≈ 240%
Persson (2001)	ns	≈ 40%
Tenyero (2001)	ns	≈ 60%
Pakko and Wall (2001)	ns	≈ - 55%
Glick and Rose (2002)	s	≈ 100%
Rose and van Wincoop (2001)	s	≈ 140%
Rose (2002)	ns, s	- 68% to + 708%
Lopez-Cordova and Meissner (2001)	s	≈ 100%
Levy (2001)	s	≈ 50%
Nitsch (2002)	s	≈ 85%
Flandreau and Maurel (2001)	s	≈ 220%
Klein (2002)	s	≈ 50%

^a s = statistically significantly different from zero, ns = not significant.

Source: Alesina et al. (2002)

Several authors investigated the trade effects of episodes of currency union formation and dissolution. Glick and Rose (2002)⁴⁸ use a time series approach to empirically assess the impact of currency union formation or dissolution on bilateral trade. While their results show a large and positive effect of currency union formation (using different time-series variations), they also find that dissolution of a currency union halves bilateral trade. In contrast to Glick and Rose results, Thom and Walsh (2002) find that breaking the currency union did not have an adverse impact on Ireland-UK trade. On his research

⁴⁷ The CFA members are mostly former French colonies and the East Caribbean Currency Union members are former British colonies.

on the Belgium-Luxembourg currency union, Nitsch (2004) does not find a measurable change in bilateral trade. Nitsch (2004) analyzes the trade effects of currency union on the three countries which entered the CFA franc zone in the 1980s and 1990s and find mixed results: a decrease in the volume of trade for Mali with its CFA partners, countries while the opposite outcome has been experienced by Equatorial Guinea. However, Guinea Bissau's trade was largely unchanged⁴⁹. In the case of the implementation of the euro in Western Europe, Rose and van Wincoop (2001) using coefficients from their gravity model with country-specific trade resistance measures, estimate that the adoption of the euro will boost trade among Euroland countries by 59 percent⁵⁰.

Finally, Rose (2002)⁵¹ provides new estimates of the effect of currency unions on trade and finds that the trade effects of currency union range from -68% to a 708%.

3. 5. Model Specification, Data and Estimation Procedure

3.5.1. Model Specification

This study employs the gravity model of trade to investigate the effects of currency union on the level of bilateral trade and we use the estimated coefficients to predict the trade potentials for SADC countries in the light of the upcoming monetary unification of the region. It addresses the issue of whether trade would increase among the member countries if they share a common currency.

⁴⁸ Analyzing time series data for correlations between changing currency union status and bilateral trade flows, Glick and Rose (2002) use an expanded panel dataset that includes more episodes of regime switching.

⁴⁹ Guinea-Bissau enters the CFA zone in 1997 (as opposed to 1984 for the other two countries) and this may affect the outcome.

⁵⁰ Such an estimate is only as good as the underlying model, which, like any gravity model, may be confounding other determinants of bilateral trade flows in the currency union coefficient. The authors observe that in a simpler gravity model the predicted increase in trade due to the euro is 250-400%.

The gravity equation specified in this study is different from the one used in other studies in the sense that, in addition to several variables used in previous works related to the effects of currency union on trade, this study applies the Linder hypothesis⁵² to explain trade patterns in the developed and developing countries respectively, since our sample includes both types of countries.

As previously stated, in line with previous studies used to estimate the effect of a currency union on trade (see, Rose (2000) and Glick and Rose (2002), for instance), we estimate the following augmented gravity model.

$$\begin{aligned} \ln(X_{ijt}) = & \beta_0 + \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(Y_i Y_j / \text{Pop}_i \text{Pop}_j)_t + \beta_3 \ln D_{ij} + \beta_4 \text{Linder}_{ij} \\ & \beta_5 V_{ij} + \beta_6 \text{Lang}_{ij} + \beta_7 \text{Cont}_{ij} + \beta_8 \text{FTA}_{ijt} + \beta_9 \text{Landl}_{ij} + \beta_{10} \text{Island}_{ij} + \beta_{11} \\ & \text{ComCol}_{ij} + \beta_{12} \text{CurCol}_{ijt} + \beta_{13} \text{Colony}_{ij} + \gamma \text{CU}_{ijt} + \varepsilon_{ijt} \end{aligned} \quad (17)$$

where i and j denotes countries, t denotes time, and the variables are defined as:

- X_{ijt} denotes the average value of real bilateral trade between i and j at time t ,
- Y_i or Y_j is real GDP of country i or j ,
- Pop_i or Pop_j is population of country i or j ,
- D_{ij} is the distance between i and j ,
- V_{ij} is the nominal bilateral exchange rate volatility,
- Linder is the log of per capita income differential,
- Lang_{ij} is a binary variable which is unity if i and j have a common language,
- Cont_{ij} is a binary variable which is unity if i and j share a land border,
- FTA_{ij} is a binary variable which is unity if i and j belong to the same regional trade

⁵¹ Rose (2002) makes use of the time-series as well as cross-sectional variation in the data using different samples and techniques.

agreement,

- $Landl_{ij}$ is the number of landlocked countries in the country-pair (0,1, or 2),
- $Island_{ij}$ is the number of island nations in the country-pair (0,1, or 2),
- $ComCol_{ij}$ is a binary variable which is unity if i and j were ever colonized after 1945 with the same colonizer,
- $Colony_{ij}$ is a binary variable which is unity if i ever colonized j or vice versa,
- CU_{ij} is a binary variable which is unity if i and j use the same currency at time t ,
- β is a vector of nuisance coefficients, and
- ε represent the myriad of other influences on bilateral exports, and the error term is assumed not to be correlated with any of the right-hand side variables.

The dependent variable in this study is the average bilateral trade (average of exports and imports from country i to j). Several studies use as dependent variable of the gravity model for international trade either exports (imports) or total trade (sum of exports and imports), but the studies which deal with the issue of currency union on trade mostly use the average of exports and imports as dependent variable.

The first three independent variables in the model are the conventional variables in the gravity model. The basic gravity model specifies that trade between two countries is proportionate to the product of their GDPs and inversely related to the distance between them. We add the exchange rate volatility (V_{ij}) as an explanatory variable to assess the effect of exchange rate fluctuation on trade. We expect a negative relationship between the exchange rate volatility and bilateral trade since according to the traditional trade theory that high exchange rate volatility would reduce trade by increasing the profit

⁵² Linder (1961) posed a hypothesis that the closer the preference structure between two countries is, the bigger the trade volume becomes. This would explain the preponderance of trade between high-income

uncertainty among export-oriented firms. We also include a variable to test the Linder hypothesis which states that countries with similar levels of per capita income would have similar preferences and similar but differentiated products, and thus would trade more with each other. Thus, the Linder hypothesis is associated with the prediction that the absolute value of the difference of the per capita income of the two trade partners will be negatively related to bilateral trade.

To the baseline gravity equation and the additional variables described above, we also introduce a set of dummy variables to capture the impact of geographical factors and historical ties between countries on bilateral trade flows. These are explained as follows:

- (i) *Contiguity* (or adjacency): A dummy variable to identify a pair of countries that are adjacent or share a common border⁵³. The dummy variable is unity if countries i and j share a common border and zero when they do not.
- (ii) *Common language* is expected to reduce transaction costs as speaking the same language helps facilitate trade negotiations. Hence, speaking the same language has a positive effect on trade.
- (iii) Shared history is expected to reduce transaction costs caused by cultural differences. We include two dummy variables to capture colonial links. *Comcol* is equal to one if both trade partners were colonies after 1945 with the same colonizer while *Col* is equal to one if country i colonized country j or vice versa. We expect a positive trade effects for colonial links.

countries, much of which is of the intra-industry variety.

⁵³ This dummy is in addition to the inclusion of the distance variable to account for the possibility of center-to-center distance overstating the effective distance between neighboring countries that may often engage in large volumes of border trade.

- (iv) Countries often enter into regional trading arrangements with the intention of facilitating bilateral trade. The estimated coefficient on the dummy variable representing FTA will then tell how much of the trade can be attributed to a special regional effect. On average, it has been found that FTAs has a positive impact on trade (Frankel and Wei, 1997), and thus, we expect a positive sign for this variable. In this paper, we treat all FTA equally, as in Rose (2000) and Glick and Rose (2002).

3.5.2. Data

The empirical analysis should be based on a maximum geographical coverage of world trade flows. Unfortunately, for a variety of reasons, we cannot include all the countries of the world and have been obliged to omit some countries in this study. The equation is estimated for a reference sample of 70 countries. Nineteen of these countries are members of the OECD and the remaining countries are classified as developing countries. By basing our estimates on a sample of countries which includes developed countries, the model avoids producing results which are characteristic solely of trade flows between developing countries. Since we are also interested on the impact of currency union as well as free trade agreements on bilateral trade, we include in our sample the members of the existing currency unions⁵⁴ and also the countries which belong to some FTAs.⁵⁵ The countries considered in this study are presented in Appendix 3.2.

⁵⁴ Existing currency unions: the CFA zone, the East Caribbean Currency Union and the Euro area (for year 2002 data).

⁵⁵ The list of FTA are obtained from the WTO website and includes NAFTA, CARICOM, EU15, ECOWAS, ASEAN.

The gravity model estimated in this study is based on panel data for the period 1992 to 2002 at five years intervals, i.e., data are for 1992, 1997 and 2002. The year 1992 marks the establishment of the Southern African Development Community (SADC) as well as the lifting of international sanctions against the Republic of South Africa, the dominant economy of the region. Since data are not available for the bilateral trade among the BNLS⁵⁶ countries, they are not included in the analysis. With 70 countries in the sample⁵⁷, we should expect $(70*69)/2= 2415$ country-pair observations for each single year. But due to missing values, the number of country-pair observations is smaller than this. We have in the estimated model an unbalanced panel of 1956 country-pair groups with a total of 5163 observations.

The bilateral trade data, in current US dollars, were taken from the Direction of Trade Statistics (DoTS) produced by the International Monetary Fund (various issues). Trade flows recorded as zero were omitted. These trade values were deflated by US GDP deflators. Distance is measured as the great circle distance between the economic centers (mostly capital cities) of the exporting and importing countries. The great circle distance is computed as follows⁵⁸:

$$D_{ij} = z * Arc \cos[\sin \varphi_i \sin \varphi_j + \cos \varphi_i \cos \varphi_j \cos \Delta_{ij}] \quad (18)$$

where z is the earth radius of 3956 miles or 6367 for kilometres, φ_i and φ_j are radian measures of the parallel of latitude of the two countries' capitals, and $\Delta_{ij} = (\lambda_j - \lambda_i)$ is the radian measure of the difference in meridians of the two countries' capitals. The

⁵⁶ BNLS: Botswana, Namibia, Lesotho and Swaziland. These four countries are SADC and SACU members.

⁵⁷ The list of countries used in the estimation is present in Appendix 3.2.

⁵⁸ See Helmers and Pasteels (2005).

measures for the great circle distance between two countries were taken from the USDA's web site⁵⁹.

Real GDP and population data for countries used in this analysis were taken from the World Bank's World Development Indicators CD-ROM with 1995 as base year. The nominal bilateral exchange rate series were obtained from the IMF's International Financial Statistics CD-ROM. The exchange rate volatility was calculated as the standard deviation of the first difference of log of monthly bilateral exchange rates for the five years preceding the period under consideration. For year 1992, for example, the data include observations from January 1987 to December 1991. The adjacency and the common language variable were constructed using Central Intelligence Agency's World Factbook (2005).

3. 5.3. Estimation techniques

Following previous studies which use the gravity model, we apply different estimation methodologies. We firstly estimate our gravity model using ordinary least square (OLS) techniques on pooled cross-section and time-series data. Since we are dealing with panel data, we then use different techniques which are more appropriate with this type of data. As Greene (1997) shows, the use of panel data methodology has several advantages over cross-section analysis. First, panels make it possible to capture the relevant relationships among variables over time. Second, a major advantage of using panel data is the ability to monitor the possible unobservable trading partner-pairs individual effects. When individual effects are omitted, OLS estimates will be biased if individual effects are correlated with the regressors. There are two types of "effects"

⁵⁹ <http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm>

models, the fixed-effects model (FEM) and the random-effects (REM) model. In the current study, we use the random-effects model.

The basic framework for this discussion is a regression model of the form

$$y_{it} = \alpha_i + \beta'x_{it} + \varepsilon_{it}, \quad (19)$$

There are K regressors in x_{it} , not including the constant term. The individual effects is α_i , which is taken to be constant over time t and specific to the individual cross-sectional unit i . As it stands, this is a classical regression model. If we take the α_i 's to be the same across all units, ordinary least squares provide consistent and efficient estimates of α and β . There are two basic frameworks used to generalize this model. The fixed effects approach takes α_i to be a group specific constant term in the regression model. The random effects approach specifies that α_i is a group specific disturbance, similar to ε_{it} except that for each group, with the exception that for each group, there is a single draw that enters the regression identically in each period (Greene, 1997)

3. 6. Empirical results

We follow the norm in the literature by using ordinary least squares, with robust standard errors (White's heteroskedasticity corrected standard errors). We also employ a number of panel data estimation techniques. The results of our benchmark regression are presented in table 3.2. The typical empirical success of the gravity specification is manifested in a good fit, with a R-squared value of 0.79, which denotes that almost 80 percent of the variation in trade flows is explained by the variables used in the model.

On the basis of the estimated results, it is possible to conclude that the conventional variables in the gravity equation (economic size and distance) are important

in explaining bilateral trade flows among the countries considered in this study. All the corresponding parameter estimates show the expected sign and they are statistically significant.

The pooled OLS model confirms that economic size has a highly significant and less-than-proportional impact on bilateral trade. The magnitude of the coefficient on the product of real GDP suggests that a one percent increase in economic activity at home or abroad raise bilateral trade by about 0.80 percent. The coefficient on the product of per capita income is statistically significant and positive. This indicates that richer countries trade more than poor ones. Hence, a 1 percent increase in per capita income raises trade by almost 0.1 percent. As expected, a longer distance between trading partners has a negative impact on trade. The estimated coefficient shows that the elasticity of trade with respect to distance is close to unity (in absolute value). On average, a 1 percent increase in transportation costs will reduce trade by about 0.4 percent. The coefficient on the bilateral exchange rate volatility is correctly signed but it is not statistically significant.

Our results support the Linder hypothesis which states that similar countries trade more than dissimilar ones. The estimated coefficient of the log difference of per capita income appears to be negative and significant for the model. This implies that a 1 percent reduction in per capita income differential will increase bilateral trade by about 0.076 percent.

Let's now turn to the interpretations of our dummy variables⁶⁰. The results show that having a common border and speaking the same language increase trade by 300

Table 3.2: Gravity Model Coefficient Estimates (Pooled OLS)

VARIABLES	Model 1	Model 2	Model 3
Real GDP	0.785(62.82)*	0.789(66.84)*	0.797(67.99)*
Real GDP/capita	0.182(10.27)*	0.125(7.75)*	0.120(7.45)*
Distance	-0.510(-8.02)*	-0.398(-6.41)*	-0.399(-6.48)*
Linder effect	-0.126(-7.33)*	-0.076(-4.62)*	-0.076(-4.67)*
Exch. rate volatility	-0.102(-0.86)	-0.062(-0.52)	-0.075(-0.63)
Adjacency	1.524(9.79)*	1.409(9.86)*	1.399(9.83)*
Common language	0.231(3.31)*	0.261(3.79)*	0.232(3.44)*
Islands	-0.615(-11.50)*	-0.583(-10.94)*	-0.583(-10.91)*
Landlocked	-0.156(-2.00)**	-0.096(-1.31)	-0.114(-1.60)
FTA		1.028(8.40)*	0.832(6.67)*
Currency union			0.741(4.93)*
Ever colonized (or by) partner	1.599(15.89)*	1.606(16.23)*	1.625(16.44)*
Common colonizer	0.655(5.19)*	0.607(4.98)*	0.487(3.90)*
Constant	-33.302(-59.80)*	-34.057(-61.25)*	-20.5148(-36.92)*
Dummy 1997	-0.227(-4.41)*	-0.218(-4.29)*	-0.218(-4.32)*
Dummy 2002	0.038(0.64)	0.034(0.59)	0.015(0.25)
No. of observations	5163	5163	5163
R-squared	0.777	0.782	0.783
F(13,5149)	1506*		
F(14,5148)		1432.53*	
F(15,5147)			1334.65*

Notes:

Model 1 is estimated without FTA and Currency union dummies. Model 2 includes the FTA dummy while model 3 includes both FTA and currency union dummies in the estimation.

All variables except dummies are expressed in natural logarithms.

Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.

t-statistics are in parentheses.

(*), (**) and (***) denote significance at the 1%, 5% and 10%, respectively.

⁶⁰ The marginal effect of the dummy variables can be calculated by taking the exponential of the estimated coefficient minus one. Thus, for the common currency and the FTA dummies, we get $e^{0.742} - 1 = 1.1$ and $e^{0.832} - 1 = 1.3$, respectively. See Bussiere, M., J. Fidrmuc, and B. Schnatz (2005)

percent and 26 percent, respectively, while the fact that, when at least one of the two trading countries is landlocked, reduces bilateral trade by about 80 percent. We also find that, in terms of bilateral trade flows, colonial links matter. The two dummy variables introduced in the model to ascertain the impact of colonial ties on trade are positive and statistically significant. Moreover, it shows that trade between a given country and its former colonizer is 4 times more than with another trading partner. Similarly, two countries which had the same colonizer trade on average 63 percent more than with each other.

In this study, we are mostly interested on the combined effect of a common currency and a free trade agreement in explaining bilateral trade. We then introduce two dummy variables to account for these effects. The pooled OLS model shows that the estimated coefficients for both dummy variables are positive and statistically significant. The estimated coefficient for the common currency dummy is 0.74, and this estimate is close to that the FTA dummy, 0.832. This means that pairs of country sharing the same currency trade on average 110 percent more than those with separate currencies, while the impact of a FTA is equivalent to an increase on trade of about 130 percent.

The impact of a common currency on trade, estimated in this study, is comparable to the values found in the literature and the effect found in this study is close to the median value of 100 percent as presented by Alesina et al. (2002). (see Table 3.1 or different values estimated by Glick and Rose (2002), for instance).

In Appendix 3.3, we present the estimated results for the three different years taken individually. However, the estimated results from the gravity model using panel estimation techniques are shown in Table 3.3.

Having estimated the gravity model, we now turn to our next step which consists of using the estimated coefficients to calculate the trade potentials for SADC countries in the case where these countries decide to share a common currency.

3. 7. Trade potentials

In most analyses where the gravity model is estimated, the results have been used for the prediction of additional bilateral trade that might be expected if integration between two countries (or more than two countries) is fostered. In this type of exercise, two main strategies have been developed in order to calculate trade potentials:

(i) The first strategy involves the derivation of *out-of-sample* trade potential estimates. This strategy was used by Wang and Winters (1992), Hamilton and Winters (1992), for example, in the case of the Central and Eastern European Countries (CEEC). Referring to the EU-CEEC case, for instance, De Benedictis and Vicarelli (2004) mentioned that the parameters for EU or OECD countries are estimated by a gravity model and then the same coefficients are applied to project “natural” trade relations between EU countries and CEECs. By using this strategy, it is assumed that that the intra-OECD or the intra-EU trade relations should reflect a kind of steady-state that East-West and also East-East (within CEEC) trade relations should approach in the medium

Table 3.3: Gravity Model Coefficient Estimates (Results from Panel estimation techniques)

Variables	Between Regression OLS on group means	Random Effects (GLS regression)	Random Effects (Max. Likelihood Regression)
Real GDP	0.784(50.18)*	0.801(52.32)*	0.802(54.45)*
Real GDP/capita	0.132(5.44)*	0.050(2.31)*	0.058(2.73)*
Distance	-0.389(-10.26)*	-0.343(-8.66)*	-0.347(-9.13)*
Linder effect	-0.067(-2.66)*	-0.073(-3.76)*	-0.073(-3.78)*
Exch. Rate volatility	-0.723(-2.42)**	0.131(1.84)***	0.127(1.75)***
Adjacency	1.503(8.17)*	1.501(7.86)*	1.502(8.22)*
Common language	0.213(1.99)**	0.314(2.80)*	0.310(2.90)*
Islands	-0.554(-7.65)*	-0.714(-9.45)*	-0.699(-9.64)*
Landlocked	-0.238(-2.50)**	-0.138(-1.41)	-0.138(-1.46)
FTA	0.804(5.02)*	1.162(7.69)*	1.135(7.79)*
Currency union	0.812(3.44)*	0.579(4.80)*	0.595(4.90)*
Ever colonized (or by) partner	1.631(6.15)*	1.694(6.12)*	1.687(6.38)*
Common Colonizer	0.401(2.53)*	0.211(1.31)	0.240(1.55)
Constant	-32.493(-46.81)*	-34.086(-53.76)*	-34.254(-56.02)*
Dummy 1997	-2.549(-9.89)*		
Dummy 2002	-2.083(-9.55)*		
No. of Observations	5163	5163	5163
No. of country-pairs	1956	1956	1956
R-squared			
-within	0.0027	0.0264	
-between	0.8213	0.8054	
-overall	0.6944	0.7799	
F(15,1940)	594.31		
Wald chi2(13)		7582.08*	3122.00*

term. It has to be noted that, in this approach, the data for CEECs are not included in the estimation of the gravity equation. Thus, as noted by Egger (2002), the difference between the observed and predicted trade flows is then interpreted as the un-exhausted trade potential.

(ii) In the second strategy, employed Baldwin (1994) and Nilsson (2000), for instance, the CEECs are already included in the regression analysis, and the trade potentials are the residuals obtained by taking the difference between predicted and observed (actual) trade flows (Egger, 2002). The second strategy is called *in-sample* trade potential estimates.

Egger (2002) provides a criticism of the strategies outlined above and proposes a new way of calculating trade potentials. Since in our analysis and model specification, we follow the model of Rose (2000) and other researchers who investigate the effect of currency union on trade, we use in this section the second strategy outlined above.

The trade potentials for each individual SADC member to the rest of SADC is calculated in Table 3.4 as a ratio between the potential and the observed (actual) trades, while Table 3.5 presents the trade potentials for these individual SADC countries with South Africa, the largest economy of the region. They may be greater or lower than one. A ratio higher than one represents a potential trade flow higher than the observed trade flow. Since we are interested in the effect of a common currency, combined with a FTA, on the level of bilateral trade, we first use the benchmark model (Table 3.2, column 4). We calculated trade potentials using data for the year 2002⁶¹.

⁶¹ Regarding the interpretation of the potential trade in general, we should bear in mind that these values are based on 2002 observed data and on expected trade flows predicted from a model estimated with year 2002 data. They should therefore not be viewed as forecasts. If we wish to adapt the potentials to future years,

Overall, for each SADC country, the predicted trade flows to the rest of the region are lower compared to the actual trade flows. Thus SADC countries trade more than the predictions of the gravity model. For five countries in the region, namely Malawi, Mauritius, Seychelles, Zambia and Zimbabwe, their actual trade flows to the rest of SADC are at least five times greater than the predicted values from the gravity model. Whereas, for Angola and South Africa, their predicted trade flows represent approximately 48% and 26% of their observed trade flows, respectively. DR Congo and Mozambique have predicted trade flows of over 50% of the observed ones. Tanzania is the only country in the region which under-trades with its SADC partners.

While our finding seems to be contrary to our expectations, following the results of Rose (2000), similar results have been obtained by Masson and Pattillo (2005) in the case of WAEMU and CMA, but not for the CEMAC, using the same model specification. For the case of SADC, this can be justified by the share of trade between each SADC country and South Africa. An examination of the actual trade flows in the two panels of Table 3.4. provides an explanation for the dominant share of South Africa in internal trade⁶², mainly imports from South Africa. In addition to this, the low level of predicted trade flows can also be explained by large distance between capital cities in the region, since this variable is negatively related to trade flows, and also low levels of the economic size (GDP and GDP per capita).

we should note firstly that the GDP levels of all the countries will change, and secondly, that the parameters of the model may change as well.

Table 3.4: Intra-SADC trade potentials

Country	Actual Trade Flows (X_{ij})	Predicted Trade Flows (Z_{ij})	P/A Z_{ij}/X_{ij}
<i>Panel A</i> : : Intra-SADC trade potentials (including South Africa)			
Angola	443.1	214.4	0.48
DR Congo	238.5	139.8	0.52
Malawi	392.8	36.5	0.09
Mauritius	327.4	73.2	0.22
Mozambique	519.5	333.2	0.64
Seychelles	82.3	17.1	0.20
South Africa	3256.2	839.2	0.26
Tanzania	238.3	270.5	1.14
Zambia	808.7	148.2	0.18
Zimbabwe	1040.9	202.6	0.19
<i>Panel B</i> : : Intra-SADC trade potentials (excluding South Africa)			
Angola	2.9	112.2	38.55
DR Congo	96.6	133.8	1.39
Malawi	59.8	18.8	0.31
Mauritius	69.9	24	0.34
Mozambique	72.9	63.2	0.88
Seychelles	4.4	7.4	1.68
Tanzania	113.1	69.2	0.61
Zambia	89.7	166.8	1.86
Zimbabwe	72.4	236.9	3.27

Notes: Trade (actual or predicted) = exports + imports, in millions of US dollars)

⁶² In 2002, the share of South Africa in total trade for Angola, for instance, has been more than 50 percent.

Due to the large dollar values of bilateral trade between individual SADC country and South Africa, we also estimate, in panel B of Table 3.4, the trade potentials of these countries to the rest of the region, excluding South Africa. With exception of Angola and, in a lesser extent Tanzania, whose predicted trade exceeds largely the observed ones, the situation depicted above prevails for the other SADC countries. This means that Angola and Tanzania may significantly gain from the implementation of a FTA and a common currency with the rest of the region in terms of bilateral trade flows. Even though the two countries have their actual trade with South Africa greater than the predicted ones (see table 3.4.), there are still room for increase in their trade with the rest of the region.

The bilateral trade flows in southern Africa is largely dominated by trade between each single SADC country and South Africa. Results in Table 3.5 show that, for most of the SADC countries, their predicted trade with South Africa are less than 20% of the observed trade flows in 2002, the exception being Mozambique and Tanzania with a ratio of 0.50 and 0.65, respectively. Here again, the numbers demonstrate that South Africa over-trade with its SADC partners compared to the predictions of the gravity model.

In the light of the above results, we find that each country in southern Africa over-trades with the rest of its SADC partners. There is a tremendous gap between the predicted and actual trade flows for these countries. Therefore, on the basis of bilateral trade flows, the implementation of a free trade areas as well as a common currency may not have a large impact as expected in the level of intra-SADC trade in general.

The results obtained in this paper are in line with the conclusions reached by Yeats (1998) and Chauvin and Gaullier (2002). Yeats finds that African countries tend to

have exports concentrated in a few commodities, reducing their possibilities of intra-regional trade while for the case of SADC, Chauvin and Gaullier (2002) find that SADC countries have similar disadvantages in manufactured goods (except South Africa) while having similar advantages in primary goods. South Africa appears to be the only source of manufactured goods, and even here, the range of products is limited. They argue that the potential to expand trade within SADC is small and existing opportunities may already have been exploited.

Table 3.5: SADC trade potentials with South Africa

Country	Actual Trade Flows (X_{ij})	Predicted Trade Flows (Z_{ij})	P/A
Angola	440.1	103.2	0.23
DR Congo	134.7	43.2	0.32
Malawi	332.3	17.6	0.05
Mauritius	257.4	49.4	0.19
Mozambique	447.5	271.1	0.60
Seychelles	40.3	9.6	0.24
Tanzania	167.1	157.4	0.94
Zambia	641.9	58.5	0.09
Zimbabwe	793.9	130.2	0.16

Notes: see Table 3.4.

3. 8. Conclusion

In the light of the European integration experience, southern African countries are placing a remarkable emphasis on the regional integration process. The issue of a regional free trade agreement has been elaborated and almost completed, while that of a monetary union is still on the debate. Several studies have already investigated the impact of a FTA on the regional trade. However, the effect of a regional single currency on the intra-SADC trade has not been examined empirically. In this paper, we provide an empirical contribution to this issue.

In this paper, the gravity model of international trade was used to analyze the determinants of bilateral trade flows for the period 1992-2002, and the study used a large dataset comprised of 70 countries. The effect of a currency union and that of a FTA on trade have been discussed. The main result shows that the currency union impact on trade found in this study is comparable to those obtained in other studies (see Table 3.1).

The estimated coefficients allowed us to calculate trade potentials of SADC countries and analyze whether these countries would significantly gain, in terms of trade flows among them, when they will share the same currency. Our results demonstrate that the observed trade flows among SADC countries are largely greater than the ones predicted by the empirical model. Hence, there are no unexploited trade potentials in the region. However, sharing the same currency as well as a FTA would certainly have an impact on the economy of the region for other reasons. Honohan and Lane (2000) show that, in the case of Africa, a common currency would increase economic stability, provide greater insulation for central banks from pressures to provide monetary financing, and lower transactions costs. Thus, the argument that common currency would increase the

intra-regional trade in Southern Africa is not supported by the evidence found in this study.

CHAPTER 4: OPTIMAL PEG FOR SOUTHERN AFRICAN CURRENCIES

4. 1. Introduction

Following the emergence of the euro as the single currency of the twelve western European countries, there has been a renewed and a growing interest in the monetary integration around the world. The experience of Europe has raised the question as to whether countries in other regions of the world should follow a similar path towards adopting a common currency. One special case is the monetary union project in the Southern African Development Community (SADC) which is a regional group of 14 countries. The SADC has monetary union in the cards, with a project of a SADC common currency by 2016.

The main justification for promoting monetary cooperation in southern Africa is to promote closer regional trade integration as a way to speed up economic growth in the region. It has been argued that monetary agreement reduces real exchange rate instability and prevents rough and repeated monetary adjustments. The stabilization of the macroeconomic environment is an important condition to the expansion of intra-regional trade. Hence, for countries seeking to increase their intra-regional trade, a monetary coordination mechanism is necessary. In this line of reasoning, Volz (2006) shows that there are numerous problems faced by countries what are close partners but follow different exchange rate regimes:

- (i) Exchange rate disagreements could lead to reduced exports from the country that loses competitiveness to its partners. This could evoke increased protectionism and even a scaling back or elimination of trade agreements.*
- (ii) Investments may be relocated because of severe exchange rate disagreements.*

(iii) A change of the exchange regime in one of the partner countries may cause an exchange rate crisis in the other. Exchange rate depreciation in one country may reduce the credibility of the partner's commitment to a fixed parity and can generate speculative attacks on its currency. (Volz, 2006)

It has been argued that exchange rate cooperation is necessary for countries which compete against one another in third markets, as is the case for SADC members, in order to avoid competitive depreciation under the floating exchange rate mechanism for seeking competitive advantage both within the region as well as in third markets (Volz, 2006; Corsetti et al., 2000).

In terms of strategies to achieve full monetary unification in the African regions, Cobham and Dobson (1994) suggest that the strategy depends upon whether the countries are committed to monetary union or governments are attracted to monetary integration but are unwilling to commit themselves. Two stages are required in the case where countries are committed to the goal of achieving a monetary union: a preparatory period during which fiscal policy in each country is stabilized, the existing currencies are made convertible, the union-level central bank is established and the transformation of the existing national central banks into subordinate agencies is prepared; and a subsequent transitional period during which the old currencies would be phased out and the new one phased in, with monetary responsibility being transferred to the new union-level central bank. However, when countries are not committed to the goal of monetary integration, but are interested in moving at least some way towards it, Cobham and Dobson (1994) suggest two policies⁶⁴: first, they should peg their currencies to the same anchor; and secondly they should make current and capital account transactions convertible.

⁶⁴ Such policies can be expected to bring about a considerable convergence in terms of macroeconomic policies and inflation rates, and place the countries concerned in a position from which they could decide, if they so wished, to embark on the basic strategy outlined above. (Cobham and Dobson, 1994).

In many situations at least it would be useful for the preparatory period to involve a process of convergence of inflation rates and stabilization of exchange rates. Under the SADC's Memorandum of Understanding⁶⁵, the question of the convergence of inflation rates has been addressed and a timetable has been proposed. However, the issue of exchange rate coordination has not been addressed yet, to our knowledge. Hence, we suggest that the next step towards monetary unification in Southern Africa must be the issue of exchange rate coordination, for which we provide some rationale below.

Wyplosz (2001) argues that while optimum currency area arguments have not been prominent in the European debate, exchange rate stability has been the paramount objective among countries seeking to achieve and maintain a high degree of trade integration. Fear of competitive devaluation and of protectionist reactions that they create has always been a key concern and the incentive for a cooperative approach to interdependence. He also argues that some degree of exchange rate stability may be desirable for countries that trade heavily – or wish to expand trade links – among themselves. He then recommends that, for countries which have good reasons to pursue a regional strategy, currency pegs (in form of a soft peg) remain an appealing option.

Although common currency pegs have been suggested for many emerging countries, several economists, including Eichengreen (2004), have expressed some reservations on the issue of exchange rate coordination as a way of promoting trade and growth in regions with an objective of regional economic integration. Using the examples of MERCUSOR in Latin America and NAFTA in North America, as well as the case of East Asia, he questioned the relevance of macroeconomic stability and exchange rate

⁶⁵ The Memorandum of Understanding is a document designed by the SADC Central Bank Governors in 2002.

stability, in particular, in generating support for regional trade integration. He, thus, suggests as alternative to exchange rate coordination an harmonized inflation targeting which provides an anchor for inflation expectations and hence for exchange rate expectations as well. Where inflation targeting has been adopted, floating rates have worked to limit macroeconomic pressures without allowing currency volatility to undermine support for a FTA (Eichengreen, 2004).

However, while inflation targeting seems to be advisable for countries with deeper financial markets, less short-term debt, and greater transparency, those countries with more volatile exchange rates may find it more difficult to inflation target because, for instance, the domestic price level will be more difficult to forecast and exchange rate fluctuations will have disruptive effects (Eichengreen, 2004). Eichengreen (2004) added that harmonized inflation targeting will not succeed to reconcile national policy autonomy with regional integration since many developing countries have chronic fiscal and financial imbalances, making central banks unable to commit to low inflation, therefore inflation targeting will lack credibility. On the other hand, Jadresic et al. (2001) argue that, for many developing countries with less linkage to global capital markets, traditional exchange rate pegs and intermediate regimes are more viable and retain important advantages. Exchange rate pegs can provide a useful and credible nominal anchor for monetary policy and avoid many complexities and institutional requirements for establishing an alternative anchor (such as a credible inflation target backed by an operationally independent central bank). In addition to the absence of sophisticated financial systems, many of these countries lack a deep and broad market for exchange rate, which can provide reasonable exchange rate stability in the absence of

official guidance. Moreover, the few developing countries that still confront the problem of stabilizing from very high inflation may also find virtue in exchange-rate-based stabilization plans, while giving due attention to timely implementation of an exit strategy. This is the case for many SADC (non-CMA) countries with a long track record of double digit inflation rates.

The obvious choice for exchange rate coordination would be the adoption of a common peg for the countries of the regional grouping. Thus, the peg must be supported by adequate institutions as well as procedures to enforce and verify the arrangement. In the case of pegging SADC currencies, an important issue concerns the choice of the nominal anchor. Mundell (2003) explores different choices of nominal anchors for Asian countries, and we find that this applies as well for southern African countries. Henceforth, the countries could commonly peg their currencies either to an internal anchor as is the case for the CMA countries⁶⁶ or to an external anchor (a major currency: the US dollar or the euro, for example).

This chapter is concerned with the optimality of the pegging strategies of the SADC countries. In this paper, we consider the optimal pegging strategies in the light of the optimum currency areas (OCA) theory. Hence, this study will try to provide answer to the following two questions. (1) What is the appropriate nominal anchor currency for southern African countries? and, (2) What are the country-pairs which are suitable for currency union, on the basis of the OCA index? This chapter deals mainly with the calculation of OCA indices for Southern African countries in an effort to estimate the

⁶⁶ CMA: Common Monetary Area which includes South Africa, Lesotho, Namibia and Swaziland. The latter three countries peg their currencies to the South African rand.

cost-benefit ratio of adopting a common currency peg, as well as a single common currency.

Recent studies of common currency pegs have focused on Asian countries and the transition economies in Central and Eastern Europe. To our knowledge, there are no such studies for African countries in general and Southern African countries, in particular. Note, however, that currency pegs are not new in Africa since the 15 CFA countries peg their currency to the euro, an external anchor, and the CMA countries have their currencies pegged to South African rand, an internal anchor. This paper will attempt to fill the gap since there is a clear indication that the SADC will probably move, in the next decades, towards a monetary union, and a common currency peg could be an option prior to adoption of a common currency as it was the case for European countries.

The rest of this paper is organized as follows. In the next section, we provide a short review of the optimum currency area theory. Section 3 discusses the present exchange rate regimes in the region. Data and methodology used in this paper are presented in section 4. Empirical results and their interpretations are discussed in section 5. Section 6 concludes.

4. 2. Review of the optimum currency areas (OCA) theory

The aim of this section is to give a short review of the Optimum Currency Area theory. Originated from the seminal work of Mundell (1961), who defines the appropriate geographical domain of a currency area as a domain within which exchange rates are fixed against each other although flexible vis-à-vis the outside world, the OCA theory serves as an approach for thinking about monetary integration. In other words, the OCA

theory provides properties or criteria for determining whether countries or groups of countries are best suited to form a monetary union, and also discusses benefits and costs which may arise from creating such an area.

The OCA theory arose from debates among exchange rate regimes and adjustment under balance of payments disequilibria. Mundell (1961) challenged Friedman's (1953) view on the floating exchange rate regime as means of adjustment under balance of payments disequilibria due to exogenous shocks. In his model of an asymmetric shift in demand between two countries, Mundell (1961) offered some non-exchange rate means of adjustment, such as mobility of factors of production and nominal price and wage flexibility. Later, McKinnon (1963) and Kenen (1969), among others, extended the list of non-exchange rate means of adjustment by considering economic openness and national product diversification.

Based on the OCA literature, there were two essential approaches that have been formulated to evaluate the merits and the readiness of countries to form monetary unions. The first approach consists of identifying sets of criteria which assess the viability of a monetary union while the second approach deals with the costs and benefits of a monetary union. This section elaborates on both of these approaches.

4.2.1. Overview of some OCA criteria

In his seminal work on the theory of OCAs, Mundell (1961) argued that the key to forming a currency union is a higher degree of factor mobility (capital and labor) between regions in a given nation or between nations, and nominal wage and price flexibility. To demonstrate his argument, Mundell (1961) presents a simple model consisting of two

entities (countries or regions) A and B with fixed exchange rates. He assumes that the two entities are initially in full-employment and balance of payments equilibrium, and that each country maintains its own national currency.

Mundell considers an “asymmetric shock”⁶⁷ that shifts demand from B to A, and this causes unemployment in country B and inflationary pressure in country A. For this purpose, Mundell presents two alternative cases depending on whether the two entities are countries with separate national currencies or regions of the same country with the same currency:

(1) Assume, in the first scenario, that the two countries are tied by a fixed exchange rate regime and that wages and prices are sticky. In the absence of exchange rate adjustment, the demand shift from B to A would necessitate a drop in employment in country B and inflationary pressures in country A. Moreover, if these pressures are restrained by restrictive monetary policies in A, all the burden of adjustment falls completely on country B which has to go through a severe recession. Therefore, in the absence of factor movement the two countries and also with domestic wages and prices being sticky (rigid), an adjustment mechanism which would correct the external balance and also relieve unemployment in country B and restrain inflation in country A will require either a depreciation by country B or an appreciation by country A. In the case where factors of production are mobile across countries, a system of flexible exchange rate is not necessary since the high unemployment in country B is offset by the movement of labor and capital from deficit country B to the surplus country A until equilibrium is restored in both countries. Another way of adjusting to the disequilibrium

⁶⁷ Asymmetric shock can be referred to an unexpected disturbance in the national output that affects one country differently from another (Jurek, 2004)

without using exchange rates is the flexibility of nominal prices and wages between and within countries A and B because wage claims in country B would be reduced cushioning the economy from unemployment while the opposite would be valid for country A.

(2) In the second scenario, Mundell assume that the two entities are regions of the same country, unemployment in B will trigger money expansion which will magnify inflation pressures in A. Consequently, a full-employment policy of the central bank will raise prices in region A and turn the terms of trade in favor of B which will complete the adjustment process.

From the two cases mentioned above, it has been shown that a currency area whether comprising countries or regions will always imply a trade-off between willingness of countries/regions to inflate or thrusting the burden of adjustment on the real sector and provoking recessions in deficit countries/regions. From this analysis, Mundell suggests that the domain of the currency areas should correspond to the homogeneous regions rather than heterogeneous nations or states. He also adds that regions should be entities with high internal and low external mobility of factors of production.

McKinnon (1963) argues that the effectiveness of exchange rate adjustments to restore balance of payment equilibrium is lower in small and highly open economies⁶⁸. McKinnon demonstrates that in small highly open economies, the tradable sector is relatively larger than the non-tradable sectors, and in this case nominal exchange rate variations cannot have significant effects on the terms of trade and real wages. In sum,

⁶⁸ Economic openness has a range of dimensions that include the degree of trade integration (ratio of reciprocal exports plus imports over GDP) with member countries; the share of tradables versus non-tradables goods and services in production and consumption; the marginal propensity to import and international capital mobility (Mongelli, 2002).

we should note that the smaller the size of the economy, the more open it is likely to be, and thus, the more inclined to join in a currency area.

According to Kenen (1969), emphasis should be placed on economic diversification in both production and consumption as another non-exchange rate adjustment process to deal with the effects of an asymmetric disturbance on the economy of a country⁶⁹. Economic diversification is supposed to insulate countries against a variety of shocks, i.e, countries with more diversified economies are more likely to endure small costs from forsaking nominal exchange rate changes. Therefore, countries that are highly diversified economically are good candidates for forming a currency union as compared to those whose economies are less diversified because shocks focused on one or more sectors of the economy would offset each other in the aggregate.

Another criterion for forming an optimal currency area is the flexibility of nominal prices and wages. According to Fleming (1971), flexible adjustment of prices and wages to excess demand and excess supply would bring automatic adjustment in the event of an asymmetric shock (Horvarth, 2003). In this instance, the need for nominal exchange rate adjustment becomes negligible. However, Mongelli (2002) points out that nominal price and wage flexibility may be more effective in the very short run in smoothing the adjustment process following a disturbance. When a shock is permanent, changes in real prices and wages may be required.

Ingram (1962) shows that a high degree of financial integration among a group of countries can reduce the need for exchange rate adjustments, in the face of temporary adverse disturbances through capital inflows. This can be done, for example, by

borrowing from surplus areas or de-cumulating net foreign assets than can be reverted when the shock is over (Mongelli, 2002). Greater financial integration also implies fewer opportunities of arbitrage and smaller interest differentials, hence, fostering a more efficient allocation of resources. Moreover, similarity in financial institutions and markets would also make it less costly to transition to a single currency area since they would be easily governed by similar rules and regulation, hence, minimizing possibilities of financial crises.

When countries experienced similar rates of inflation over time, this could be an indication that the countries have similarities in economic structures, economic policies, and social preferences. According to Fleming (1971), when inflation rates among countries are low and similar over an extended period of time, terms of trade will also remain somewhat stable. In turn, this stability is expected to foster a more equilibrated current account transactions and trade, therefore minimizing the need for nominal exchange rate adjustment (Mongelli, 2002).

OCA theory also suggests that a higher level of fiscal integration between two areas increases their ability to smooth out diverse shocks through endogenous fiscal transfers. This transfer mechanism is supposed to lessen the need for nominal exchange rate adjustments in dealing with shocks. Mongelli (2002) explains that countries that share a supra-national fiscal transfer system that allows for a redistribution of funds to a member country impacted by a negative asymmetric shock would smooth the adjustment to such a shock, hence they would need less nominal exchange rate adjustment.

⁶⁹ In the same line of reasoning, Mongelli (2002) explains that highly diversified production and consumption, and similarity in imports and exports between countries, dilutes the effect of specific sectoral shocks.

While many authors focused on the economic criteria for forming a monetary union, political integration appears to be one of the most important OCA properties. Mundell (1961) referred to currencies as being an “expression of national sovereignty” and that changes would necessitate “profound” political changes. Likewise, Mintz (1970) argued that “the major, and perhaps only, real condition for institution of monetary integration is the political will to integrate on the part of the prospective members”. In sum, political will fosters cooperation on various economic policies and encourages institutional development, thus forming a real currency area is (and has to be) a political process (Jurek, 2004).

Vaubel (1976) introduced the variability of the real exchange rates as another criterion for currency area and argues that a stable real exchange rate between two countries gives evidence that in the past there were not too many shocks which required exchange rate adjustment (Jurek, 2004). Under the assumption that the situation of a stable real exchange rate would prevail in the future, there would be less need for the nominal exchange rate adjustment, and the cost of giving up an exchange rate tool would be negligible (Jurek, 2004).

Eichengreen and Bayoumi (1994) introduce the “similarity of shocks” property which covers interactions among several other OCA properties. From this OCA criterion, net benefits from establishing a currency area are higher when the supply and demand shocks and the speed with which the economy adjusts are similar within a group of countries (Eichengreen and Bayoumi, 1994, and Jurek, 2004). Thus, if the impact of an economic shock is symmetric on all possible members of a union, the exchange rate changes needed for adjustment would be the same for all and there would be no need for

separate currencies. However, the case for a separate currency is especially strong if the impact of a shock is asymmetric between countries because the economic costs of altering the exchange rate is lower than those of adjustment through changes in wage and price levels, or through factor mobility (labour and capital).

4.2.1.2. Costs and benefits approach to OCA theory

An interesting aspect of the OCA literature is that it attempts to identify and quantify the potential benefits and costs of participation in a currency area. It has to be noticed that the relevant benefits are usually at microeconomic level, while costs at macroeconomic level.

A single currency confers benefits of reducing volatility in the real exchange rate, thus reducing uncertainties and contributing to better allocations of resources initially used for foreign exchange reserves and to hedge against the risk of sharp exchange rate adjustments⁷⁰, and the welfare gains due to increased volume of trade in goods, services and financial assets. It also helps to save on transactions costs associated with multiple exchanges, further fostering trade, investment and cross-area foreign direct investment (Mongelli, 2002). Further, if the same currency circulates in a greater area, the usefulness of money is enhanced due to economies of scale (Fleming, 1971; Grubel, 1970; Tavlas, 1993).

For countries experiencing severe macroeconomic disequilibrium and where domestic policy formulation may be lacking discipline, as evidenced by high or rising

⁷⁰ The union member countries pool their reserves together and give the role of reserve management to a supranational monetary authority. Pooling of reserves help to reduce the amount of reserves each country would have help independently.

inflation rates, currency union membership may be one option for importing a stable monetary policy. This benefit stems from the credibility of the exchange rate as a nominal anchor for monetary policy. A credible fixed exchange rate will provide a clear commitment that can be monitored by private agents consequently eliminating speculative attacks that have been blamed to cause currency and financial crisis.

The most important cost normally associated with the creation of a common currency area is the loss of monetary and exchange rate policy instruments that could be used to restore equilibrium in the economy, in the event of asymmetric disturbances. Another cost of joining a currency area is the loss of seigniorage revenue, which is also frequently called the “inflation tax”. Seigniorage represents a benefit to the central bank that comes from its authority to create money and can be used as an alternative source of revenue for the government outside what can be raised via taxation or borrowing from financial markets, to finance expected emergencies (Cohen, 2003)⁷¹. Other identified costs include the loss of a national symbol, as indicative of some level of sovereignty or national pride.

Figure 4.1 illustrates the costs and benefits of an OCA and follows Krugman (1990) and De Grauwe (2000). Using the traditional OCA criteria, these authors show that the costs and benefits for a country of joining a monetary union are both functions of the degree of dependence on intra-union trade. The benefits are positively related to the degree of dependence on intra-union trade while the costs are known to be inversely related to the degree of dependence on intra-union trade. A plausible justification for this is that in terms of costs, the need to pursue an effective independent exchange rate policy would be small if the country concerned is heavily dependent on other members of the

monetary union for trade. The positive slope of the benefits curve can be explained by the effects of the reduction in transaction costs and exchange rate risks. Thus, the net benefits of joining a monetary union increase with the size of intra-union trade relative to GDP, and a country should join when the net benefits are positive⁷².

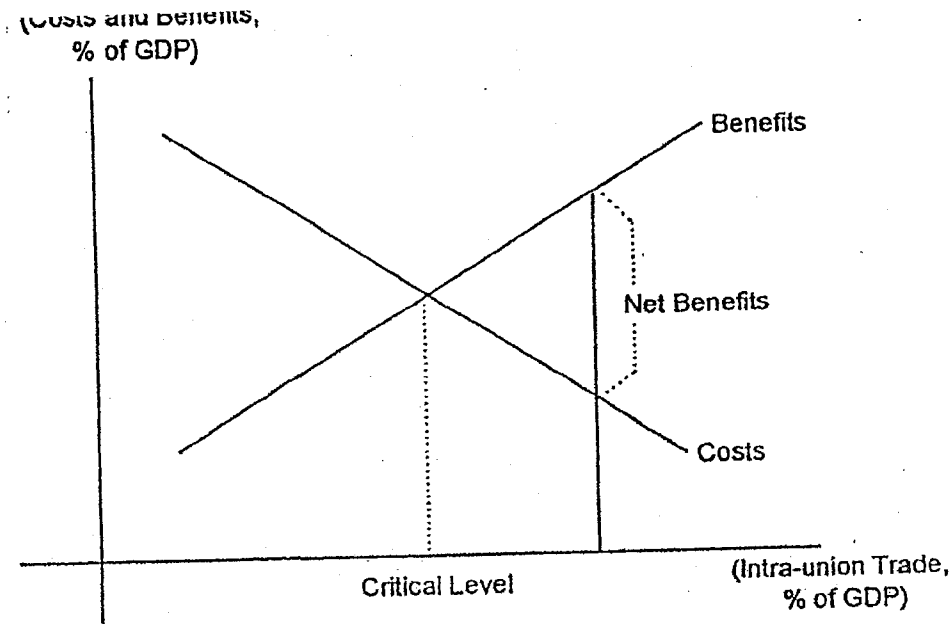


FIGURE 3.1: Costs and Benefits of a Monetary Union.

Source: Krugman (1990)

⁷¹ It is largely a policy question how seigniorage would be distributed in the case of monetary union.

4.2.2. The 'new' theory of Optimum Currency Areas

The theory of optimum currency areas lay dormant through most of the 1970s until the mid-1980s due to problems of inconclusiveness and inconsistency and the lack of strong empirical support (Jurek, 2004). In the mid-1980s, the revival of interest in the OCA theory is primarily due to the process towards the European monetary integration. According to Tavlas (1993), two broad sets of factors have been responsible for this interest on OCA theory. The first reflects developments on the international monetary scene, particularly the reinvigoration during the late 1980s and early 1990s of the process toward European monetary integration and the subsequent emergence of intense pressures with the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS) in late 1992, and in 1993. The second set of factors contributing to the theory's rejuvenation involves developments in macro-theory (Tavlas, 1993). These developments have allowed the reconsideration of the original OCA theory and also a reexamination of the assumption about stability of OCA properties in time.

4.2.2.1. Costs and Benefits of OCA revisited

One of the recent developments in macroeconomic theory involves the credibility issue, which is based on expectations theory and the debate between discretionary and fixed policy rules⁷³. According to this theory, monetary integration may be more beneficial when there is divergence of inflation rates among the group of countries under the assumption that the regional (newly created) central bank adopts a credible policy stance of optimal inflation. This can be explained by the fact that the high inflation

⁷² In this case, the size of intra-union trade relative to GDP lies to the right of the intersection of the two curves.

country can achieve a low inflation reputation by surrendering itself to the control of the low inflation central bank. This is possible when there exists in the region a hegemon country with a strong track record of low and stable inflation rate and the fact that this country could guarantee that it is not going to change its monetary discipline once monetary union is established.

In Southern Africa, the South African Reserve Bank pursues an inflation targeting policy framework and has succeeded in keeping low inflation for several years, and this is also translated in low inflation rates for its CMA partners. The governor of the SARB also chaired the CCGB of SADC. Therefore, the credibility of SARB may play a crucial role in the formation of a monetary union in the region.

The “monetarists’ critique” of the Phillips curve, provided by economists such as Friedman (1968) and Lucas (1972), demonstrates that in the long-run monetary policies are ineffective in balancing unemployment and inflation. In the long-run, the Phillips curve becomes vertical implying that a perfectly foreseen change in monetary policy has no effect on real variables like real GDP or unemployment (Jurek, 2004). The long run ineffectiveness of monetary policies reduces the assumed costs of monetary integration, i.e. the loss of monetary policy independence to achieve the desired tradeoff between inflation and unemployment (Adams, 2005).

The role of exchange rate as a stabilization tool has also been challenged. The major criticism is that the exchange rate changes operate with longer lags due to the slow adjustment of financial asset prices (Tavlas, 1993; Jurek, 2004) and this reduces their effectiveness. From this outcome, it seems that the cost of losing exchange rate control would be lower than it has been expected in the traditional OCA theory.

⁷³ This work was developed by Kydland and Prescott (1997) and subsequently by Barro and Gordon (1983)

In sum, the credibility issue provides an additional benefit for countries to form a currency area. On the cost side, the long-run ineffectiveness of monetary policies as well as the long lags in the operation of exchange rate adjustment show that the costs of losing monetary policy instruments are lower than it was originally expected.

4.2.2.2. Specialization versus Endogeneity of OCA

The exogeneity of the criteria discussed in subsection 4.2.1 has been contested by Frankel and Rose (1998). They argue that though some countries may fail to comply with OCA criteria *ex ante* they may do so *ex post* once the currency zone is established. However, there is disagreement, among economists, whether forming a currency area induces a rise or a fall in the correlation of shocks among members of that area. Two opposite hypotheses with different implications were formulated on whether entry into a currency union may raise international trade linkages, which could result in either tighter or looser correlations of national business cycles.

Endogenous OCA theory was introduced by Frankel and Rose (1998) and the basis of their argument is that there may be no pre-requisite for a country to meet OCA criteria for entry into a currency union or adopting a common peg *ex ante*; that trade intensity and macroeconomic convergence can significantly increase *ex post*. Frankel and Rose (1998) build an argument that the international trade pattern and international business cycle correlation is endogenous, i.e., countries with closer trade links tend to have more tightly correlated business cycles. In their opinion, joining a currency union moves countries closer to meeting the optimum currency area criteria. Hence, entering a monetary union increases the symmetry in the business cycle of the prospective member-

country due to common monetary policy and closer international trade ties. Empirical evidences from Frankel and Rose (1998a, 1998b) demonstrate that the higher trade integration the higher the correlation of business cycles among countries. Finally, the authors conclude that a mere analysis of historical data does not provide an accurate picture of a country's suitability to join a currency union since the OCA criteria are endogenous in the first place⁷⁴ and that they evolved over time.

The economic specialization by member states that could follow the adoption of a common currency constitutes a major challenge to the endogeneity property of OCA theory. Specialization occurs when individual countries capitalize on their comparative advantage after joining a monetary union and this may lead to dissimilarity in production structures among members of a monetary union and as such hinders, rather than promotes economic policy coordination. Krugman (1993) argues that higher trade integration leads to a higher specialization. The Krugman argument is based in trade theory and increasing returns to scale in the sense that sharing a common currency removes obstacles to trade and promotes economies of scale. Because of the economies of scale, higher integration leads to a regional concentration of industrial activity. As a result, countries will become less diversified and more exposed to asymmetric shocks, as correlation of shocks among their economies will tend to lower (De Grauwe 2000, Mongelli 2002, Jurek, 2004).

4.3. Present exchange rate regimes in southern Africa

In this section, we first briefly review the evolution of "reported" exchange rate arrangements of SADC member states. However, official exchange rate arrangements

⁷⁴ Using 30 years of data for twenty industrialized countries, they also found that countries with closer trade links tend to have closely correlated business cycles.

registered with the IMF may not accurately describe the exchange rate policies in Southern African countries. Several economists, including Ghosh, Gulde, Ostry, and Wolf (1997); Bubula and Otker-Robe, (2002); Levy-Yeyati and Sturzenegger, (2003); Benassy-Quere and Coeure (2004), and Reinhart and Rogoff, (2004) have highlighted the fact that the exchange rate regime a country claims to follow often differs from the regime actually in place. Hence, they have developed different *de facto* exchange rate regime classifications as an alternative to the IMF's *de jure* classification. We present in Appendix 4.1. the IMF's exchange rate classifications.

4. 3.1. Reported Exchange Rate Arrangements

It is essential to first have a clear picture of the various exchange rate regimes currently employed by nations in the region. The present state of exchange regimes adopted in Southern Africa is much varied and diverse, ranging from hard pegs to independent floats. The IMF classification suggests a range of arrangements⁷⁵. Table 4.1 summarizes the present exchange rate arrangements in Southern Africa. Three of the SADC members, namely Lesotho, Swaziland and Namibia, have their currencies pegged at par to the South African rand while Botswana has a peg to a basket of currencies with a large weight for the rand. In December 2004, more than half of the Southern African countries have a floating exchange rates (managed or independent) for their currencies.

⁷⁵ The IMF uses a *de facto* classification that combines quantitative and qualitative information, including the authorities' stated exchange rate policy (IMF, Annual Report on Exchange Arrangements and Exchange restrictions, various years). Although the IMF changed from a *de jure* to a *de facto* classification in 1999,

4.3.2. Observed Exchange Rate arrangements

In this sub-section, we employed two different approaches for investigating *de facto* exchange rate regimes for SADC countries. The first approach deals with the exchange rate volatility for SADC currencies. In this approach, a currency is a good candidate to serve as a nominal anchor if a country's exchange rate vis-à-vis this particular currency exhibits the lowest volatility among the currencies studied as potential nominal currency anchors (Kawai and Akiyama (1998)). The second approach, initiated by Frankel and Wei (1993, 1994) assumes an implicit basket of currencies and therefore the weights assigned to different currencies (in the basket) are obtained from a regression of exchange rates. The second approach assumes that the monetary authorities are pegging their national currency to a basket of currencies without explicitly announcing it.

4.3.2.1. Exchange Rate Volatility

We calculate the exchange rate volatility of the SADC currencies to that of the U.S. dollar, the Japanese yen, the euro (ecu⁷⁶ for data prior to 1999), the UK pound and the South African rand. These five potential currency anchors are widely regarded as freely floating. We then compare the magnitude of the volatility of each SADC currency vis-à-vis the five potential currency anchors mentioned above.

the data for previous years were obtained from Bubula and Otker-Robe (2002), who constructed the back series using the same *de facto* methodology used since 1999.

Table 4.1: SADC Currencies and Exchange Rate Arrangements

Country	Currency	Exchange rate arrangements					
		1990	1993	1996	1999	2001	2004
Angola	New Kwanza	4	4	4	13	12	12
Botswana	Pula	5	5	5	5	5	5
Congo, D.R..	Franc Congolais	12	12	13	4	12	13
Lesotho	Loti	4	4	4	4	4	4
Malawi	Kwacha	5	5	4	12	13	13
Mauritius	Mauritian rupee	5	5	12	12	12	12
Mozambique	Metical	9	13	13	13	13	12
Namibia	Namibian dollar	1	4	4	4	4	4
Seychelles	Seychelles rupee	5	5	5	5	5	4
South Africa	Rand	12	12	12	13	13	13
Swaziland	Lilangeni	4	4	4	4	4	4
Tanzania	Tanzanian Shilling	11	13	13	13	13	13
Zambia	Kwacha	9	13	12	13	12	12
Zimbabwe	Zimbabwe dollar	5	5	10	4	4	12

Notes: The Bubula and Okter-Robe *de facto* classification (2002):

1 = Another currency as legal tender; 2 = currency union; 3 = currency board; 4 = conventional fixed peg to single currency; 5 = conventional fixed peg to a basket; 6 = pegged within a horizontal band; 7 = forward-looking crawling peg; 8 = forward-looking crawling band; 9 = backward-looking crawling peg; 10 = backward-looking crawling band; 11 = tightly managed floating; 12 = other managed floating; and 13 = independently floating.

⁷⁶ ECU: European Currency Unit.

Since we do not have data on observed exchange rates from country i to country j , we use the IMF or World Bank exchange rate data which are expressed as number of units of currency i or j for one unit of US dollar or SDR⁷⁷. Hence, the nominal bilateral exchange rate between countries i and j is calculated as follows:

$$E_{ij} = \frac{\text{Currency}_i / \text{US\$}}{\text{Currency}_j / \text{US\$}} \quad (1)$$

The percentage change in nominal exchange rates is then computed as

$$\Delta e_t = e_t - e_{t-1} = \ln(E_t) - \ln(E_{t-1}) \quad (2)$$

where E_t is the level of the nominal exchange rate for currency j vis-à-vis currency i ⁷⁸.

The exchange rate volatility is obtained by the standard deviation of the change in nominal exchange rates between each individual SADC country and a potential nominal anchor. In order to obtain reasonable estimates of exchange rate volatility, we follow Kawai and Akiyama (1998) by removing data observations with values of log of first differences greater than 0.1⁷⁹.

The results are shown in table 4.2. Except for Botswana and the CMA countries whose currencies are less volatile to the South African rand compared to other major currencies, the majority of SADC currencies exhibit a lower volatility vis-à-vis the US dollar than the other potential currency anchors. This volatility ranges from a low 1.45 percent for Seychelles to a high 5.45 percent for Congo on a monthly basis. In the case of Congo, as

⁷⁷ SDR: Special drawing Rights.

⁷⁸ In this case, currency i is the potential nominal anchor.

⁷⁹ These authors have done so because countries often devalue their currencies to accommodate persistent differences in inflation rates vis-à-vis their nominal anchor-currency country. Without the effects of such discrete currency devaluations (or revaluations) being eliminated, the estimated volatilities would become too large in order to conclude the presence or absence of a nominal anchor currency.

Beaugrand (1997) showed, the roots of hyperinflation in Congo in the 1990s and, hence higher exchange rate volatility, were essentially political, as the collapse of the traditional form of government was accompanied by an explosion in government spending and dwindling revenue collections⁸⁰.

4.3.2.2. Regression analysis

Using an econometric technique proposed by Frankel and Wei (1993,1994)⁸¹, we estimate the relative weights of the five potential currency anchors in the composition of their implicit currency baskets for each SADC member state⁸². The goal is to see whether countries try to stabilize their currencies in terms of a particular major currency. For this purpose, we use monthly exchange rate data spanning the period from January 1993 to December 2005. We follow Frankel and Wei (1993, 1994) by using the Swiss franc as a numeraire for measuring exchange rate volatility. We present in Appendix 4.1 the methodology we used for estimating implicit basket weights in the line of Frankel and Wei (1993, 1994).

⁸⁰ During 1991-92, opposition forces derailed the gradual liberalization process laid out by the President, and by 1993 Congo (then Zaire) political system had all but disintegrated. A measure of control over monetary and fiscal policies were restored in 1995, but in late 1996, political conditions further deteriorated and inflationary pressures reemerged. (Beaugrand, 1997)

⁸¹ Frankel and Wei (1993, 1994) examine the influence which the most important international currencies have on the determination of the values of currencies of smaller countries located around the world. They use the Swiss franc, and the purchasing power over local goods as numeraire, in addition to the SDR. Any other outside currency could serve equally well as numeraire. Under the basket-peg null hypothesis, the choice of numeraire makes no difference in the estimation of the weights.

⁸² Even though, the pound sterling is no longer considered as a world major currency⁸², we also include it in our estimation since a large number of countries in Southern African region are former British colonies.

Table 4.2: The volatility of the SADC currencies against the reference currencies^a

	Standard deviation of monthly log variations of the exchange rate				
	USD	Euro ^b	Yen	UK pound	rand
Angola	0.0364	0.0410	0.0417	0.0391	0.0422
Botswana	0.0223	0.0249	0.0298	0.0330	0.0162
Congo, DR	0.0545	0.0578	0.0577	0.0591	0.0643
Lesotho	0.0288	0.0301	0.0351	0.0384	0
Malawi	0.0247	0.0310	0.0327	0.0312	0.0397
Mauritius	0.0157	0.0200	0.0261	0.0287	0.0343
Mozambique	0.0281	0.0337	0.0337	0.0344	0.0402
Namibia	0.0288	0.0301	0.0351	0.0384	0
Seychelles	0.0145	0.0226	0.0246	0.0275	0.0340
South Africa	0.0288	0.0301	0.0351	0.0384	0
Swaziland	0.0288	0.0301	0.0351	0.0384	0
Tanzania	0.0179	0.0273	0.0330	0.0267	0.0369
Zambia	0.0442	0.0499	0.0543	0.0496	0.0533
Zimbabwe	0.0240	0.0293	0.0318	0.0286	0.0383

Source: Author's calculations based on IMF's *International Financial Statistics* (line rf)

Notes: a: sample period 1993:02 to 2005:12.

b: prior to 1999, we use ecu (European currency unit) as proxy for euro.

We also include the South African rand, a regional nominal anchor, due to the dominant position (in economic terms) that South Africa⁸² has in the region.

The results in Table 4.3 show the implicit weights assigned to the different currencies in the basket for individual SADC countries. Due to the fact that we used a constrained regression in our estimation, the weight for the pound is obtained by the difference between one and the sum of the estimated four coefficients. The SADC countries, as shown in Table 4.3, give heavy weights to the U.S. dollar in their implicit basket, with the exception of Botswana and Angola which show a strong linkage to the South African rand. However, in the case of Congo, none of these currencies is statistically different from zero and the estimated equation does not explain the change in its exchange rate, i.e. a R^2 close to zero.

In the majority of the estimated regressions, the coefficient for the US dollar is large and statistically significant. This means that monetary authorities in Southern African countries are more concerned about the changes in US dollar in their exchange rate management. This also confirms the finding in the previous subsection which shows that the US dollar is the major currency with lower volatility for the SADC currencies. In addition to Botswana, only two others countries, namely Mozambique and Zambia, show some sign of a small weight on the South African rand ranging from 15 to 18 percent for the full sample period.

When we look at the weights of the euro in the estimated regressions, the coefficient is significant for Botswana, Mauritius and Tanzania, with a weight of 15, 29 and 13 percent respectively. However, Mauritius, Seychelles, Tanzania and Zambia give significant weight to the Japanese yen.

Table 4.3: The linkages of SADC currencies with the potential nominal currency anchors,
(constrained estimation).

Countries	Sample	US dollar	Euro	Jap. Yen	SA rand	R ²
Angola	95:12-05:12	0.894	-0.046	-0.681	1.052***	0.53
Botswana	93:02-05:12	0.181	0.145****	0.030	0.616***	0.94
Congo	95:01-05:12	0.070	-0.159	0.026	-0.06	0.00
Malawi	93:02-05:12	1.300***	0.005	0.075	-0.030	0.87
Mauritius	93:02-05:12	0.706***	0.289***	0.076***	-0.016	0.78
Mozambique	93:02-05:12	0.918***	0.080	-0.064	0.147**	0.39
Seychelles	93:02-05:12	1.014***	0.019	0.137***	0.026	0.77
South Africa	93:02-05:12	0.426*	0.095	0.219**		0.13
Tanzania	93:02-05:12	0.873***	0.131**	-0.082*	0.040	0.55
Zambia	93:02-05:12	0.917**	0.172	-0.273*	0.169*	0.17
Zimbabwe	93:02-05:12	1.348***	-0.050	0.031	0.028	0.52

Notes: a: Since Lesotho, Namibia and Swaziland currencies are pegged at par to the South African currency, the results for South Africa apply to these countries as well.

b: As in the previous exercise, we have removed data observations with values of log first differences greater than 0.1.

In sum, we used in this section two different approaches for investigating *de facto* exchange rate regimes for SADC countries. In the majority of cases, both approaches yield the same results, that is, the US dollar is the dominant currency in the exchange rates of SADC countries.

4. 4. Methodology, data and estimation procedures

In this study, we first apply the methodology developed by Bayoumi and Eichengreen (1997a, 1997b) in order to derive OCA indices for Southern African countries vis-à-vis potential nominal currency anchors and then use the calculated indices to find the appropriate currency peg for SADC countries. Then, we derive OCA indices for pairs of SADC countries and use it to ascertain the suitability of different country-pairs to enter a currency union.

4.4.1. Brief review of OCA index

In their seminal paper, and using economic characteristics outlined in the literature on the OCA theory for suitability of countries to form a monetary union, Bayoumi and Eichengreen (1997a, b) show that the variability of the bilateral exchange rates for each pair of countries is explained by the asymmetry of their business cycles, the share of their bilateral trade and the relative size of each country pair. Through cross-section estimations, they derive the OCA index which relates nominal bilateral exchange rate variability with output movements, trade linkages and economic size.

Benassy-Quere and Lahreche-Revil (1998) provide the following justification for the choice of the factors in the calculation of the OCA index: (i) asymmetric business cycles should come from either asymmetric shocks or asymmetric structures that justify frequent exchange rate adjustment, (ii) industry-specific shocks have relatively symmetric effects in two countries whose bilateral trade is mostly intra-industry, reducing

the needs for exchange rate variations. In terms of economic size, Bayoumi and Eichengreen (1997a, b) argue that the costs of a common currency, in terms of macroeconomic policy independence forgone, should be balanced against the benefits, which will be greatest for small economies where there is least scope for utilizing a separate national currency in transactions. That is, small countries should benefit the most from the unit of account, means of payment, and store of value services provided by a common currency.

Roughly speaking, where the index is relatively low, OCA characteristics predict a low level of bilateral exchange rate variability and therefore a high suitability for monetary integration (Bayoumi and Eichengreen, 1997a, b). The variability of nominal exchange rates between those two countries is expected to be low where bilateral trade is high and where output movements between countries are similar.

4. 4. 2. Model specification

Following Bayoumi and Eichengreen (1997a, 1997b, 1999) and other economists who use this methodology, we use cross-country estimations in order to derive the OCA indices for southern African countries. Because we are mainly interested in currency pegs, we consider the behavior of exchange rates against five potential international anchors: the US dollar, the euro, the Japanese yen, the UK pound and the South African rand.

The basic model, as specified by Bayoumi and Eichengreen (1997a, 1997b), is as follows:

$$SD(e_{ij}) = \alpha_0 + \alpha_1 SD(\Delta y_i - \Delta y_j) + \alpha_2 DISSIM_{ij} + \alpha_3 TRADE_{ij} + \alpha_4 SIZE_{ij} + \epsilon_{ij} \quad (3)$$

where subscripts i and j denote the two countries in the pair. $SD(e_{ij})$ measures the volatility of bilateral exchange rates, $SD(\Delta y_i - \Delta y_j)$ captures the asymmetric shocks at national level, $DISSIM_{ij}$ is the sum of the absolute differences in the shares of agricultural, mineral, and manufacturing trade in total merchandize trade⁸³, $TRADE_{ij}$ is the proxy for the intensity of trade linkages, and $SIZE_{ij}$ measures the size of the economy.

However, taking into account the fact that SADC members are developing countries, and major commodities producers, we use in the model the variability of the terms of trade as an explanatory variable. Another variable used in the regression is the variability of inflation differentials. These two variables have been suggested by Kim and Papi (2005) since it takes into consideration specific characteristics of emerging and developing countries, and these authors argue that the variability of bilateral exchange rates of developing countries is determined to a large extent by monetary phenomena.

We also take into consideration the particular situation for the southern African countries by adding to the above model a set of dummy variables. It has been argued, in the literature, that there are strong colonial ties between African countries and their former colonial power, thus it is possible that these African countries would prefer to peg their currencies to that of their former colonial power. Moreover, in the gravity model of trade used by Rose (2000) and many other researchers who investigated the effects of currency union on trade, the dummy variable associated with 'colony' used to be statistically significant. Hence, we employed one dummy variable to ascertain colonial ties in the conduct of monetary policy. There is also a fact that many countries would

⁸³ We did not use the DISSIM variable in our study since there is a lack of of disaggregated trade for most African countries and whenever data are available, there is no a long time series of observations (i.e., data

prefer to peg their currencies to that of their main trading partners. Hence, a set of dummy variables have been included for the different currency zones under consideration.

Hence, our estimated equation is as follows:

$$SD(\epsilon_{ij}) = \alpha_0 + \alpha_1 SD(\Delta y_i - \Delta y_j) + \alpha_2 SD(TOT_{ij}) + \alpha_3 TRADE_{ij} + \alpha_4 SIZE_{ij} + \alpha_5 SD(P_{ij}) + \alpha_6 COL_{ij} + \sum_{i=1}^4 \alpha_{7i} D_{ij} + \epsilon_{ij} \quad (4)$$

The proxies are computed as follows:

$SD(\epsilon_{ij})$ is the standard deviation of the change in the logarithm of the year-end bilateral (nominal or real) exchange rates between countries i and j . (see equation 2 for calculation of the bilateral exchange rates).

$SD(\Delta y_i - \Delta y_j)$ is the standard deviation of the difference in the logarithm of real output between the country-pair.

$SD(TOT_{ij})$ is the standard deviation in relative changes in the terms of trade.

$TRADE_{ij}$ is the average value of bilateral trade, weighted by GDP between the two countries i and j ⁸⁴.

$SIZE_{ij}$ is the mean of the logarithm of the real GDPs of the country pair.

$SD(P_{ij})$ is the standard deviation in relative inflation differentials.

COL_{ij} is a dummy variable taking value of 1 if country i is a former colony of j and 0 otherwise.

covering our sample period).

⁸⁴ Since Bayoumi and Eichengreen (1997a, 1997b) give very few details on how their trade variable was constructed, and in order to overcome the relative shortage of trade statistics reported by some African nations, we have chosen to measure total trade (the average of imports and exports) rather than exports alone.

D_{ij} is a dummy variable taking value of 1 if country i is the main trading partner for country j in 2002 (in millions of dollars). We use for this purpose four dummy variables: for USA, European Union, United Kingdom and South Africa.

The expected signs of the explanatory variables are as follows: the exchange rate volatility is expected to depend positively on the business cycle, and negatively on the trade linkages. The estimated regression is used to predict bilateral values for the dependent variable, and the predicted values are called "OCA indices".

4. 4. 2. Data

In this paper, we use annual data for a set of 63 countries⁸⁵ which includes both developed and developing countries. We selected fourteen members of the SADC, the four countries whose currencies are considered as potential nominal anchors in addition to the South African rand. We finally add other 45 largest trading partners of South Africa⁸⁶.

Exchange rate data⁸⁷ are obtained through the IMF International Financial Statistics CD-ROM (2005). Real GDP in constant U.S. dollars (2000, base year), terms of trade and inflation rate data are from the World Bank's World Development Indicators CD-ROM (2005) using real GDP (in constant US dollars, base year 2000). The bilateral trade data are from the IMF Direction of Trade Statistics (DoTS) in current US dollars. We convert it in real figures by deflating it using the US consumer price index.

⁸⁵ The list of countries used in this paper is presented in Appendix 2. Most of the data used in the estimation were only available at annual basis.

⁸⁶ We choose the largest trading partners for South Africa using 2002's trade data (IMF DoTS).

⁸⁷ National Currency Units per US dollar .

The standard deviations and the means are calculated for a panel of 63 countries over the sample period 1993 to 2002. With 63 countries, there are 1953 pairs of observations and hence potentially 1953 observations in the regression. In practice, the regressions include 1843 observations as a result of missing values in the data. We also exclude in the estimation, pairs of countries with no trade data for the entire period.

4.5. Empirical results

4.5.1. A preliminary look at the exchange rate volatility

In this subsection, we focus on the variability of nominal and real exchange rates for SADC countries using annual data. Tables 4.4 and 4.5 display the variability of nominal bilateral exchange rates⁸⁸ for SADC countries for the sample period 1993 to 2002. While table 4.4 presents exchange rate variability between each individual SADC members and a potential nominal anchor, table 4.5 displays the exchange rate variability for each pair of SADC countries.

An examination of table 4.4 shows that there are three groups of countries in terms of the variability of their exchange rates vis-à-vis the potential nominal anchors for the period under consideration.

- (i) Angola and Congo are the only two SADC members which experienced a highly unstable exchange rates for their currencies. The variation in their exchange rates is well above 100 percent. A possible explanation is that these two countries experienced a period of hyperinflation in the 1990s.

⁸⁸ We present in Appendix 4.3 the results for real exchange rate variability.

- (ii) Malawi, Mozambique and Zimbabwe form the second group of countries with an exchange rate variability ranging from 16 to 33 percent during the sample period. Tanzania and Zambia may also be included in this group.
- (iii) The last group is comprised of Botswana, Mauritius, Seychelles and the CMA countries. These countries have a lower volatility for their exchange rates and it ranges from 4 to 10 percent.

Looking at table 4.5, we find the same pattern as the one exhibited in the previous table. Three groups of countries emerge and correspond to the one described in the previous paragraph.

4.5.2. Regression results

Table 4.6 reports the results of estimating the coefficients on these OCA variables for our sample period. We focus on the results for nominal exchange rate variability⁸⁹. In almost all cases, the OCA coefficients are statistically significant at standard significance levels, the exception being the variable explaining colonial ties. They also are all jointly significantly different from zero, suggesting that the OCA criteria do explain some of the variability of exchange rates. We also estimate equation (4) using only data for the five potential nominal anchors and find results which are quite similar to those reported below⁹⁰.

⁸⁹ A series of papers, including Bayoumi and Eichengreen (1997, 1998) and Benassy-Quere (1997) find similar results when using real exchange rate variability. We also estimate the above regressions using real exchange rate variability and the results are shown in Appendix 4.

⁹⁰ These results are shown in Appendix 5.

Table 4.4: The Variability of Nominal Exchange Rates for SADC Countries

vis-à-vis Potential Nominal Anchors (Annual data: 1993-2002)⁹⁰

	US dollar	Japanese yen	Euro	British Pound	SA rand
South Africa	0.067	0.085	0.102	0.065	
Angola	1.398	1.435	1.438	1.401	1.432
Botswana	0.043	0.083	0.079	0.047	0.050
Congo, DR	1.766	1.799	1.782	1.765	1.785
Lesotho	0.067	0.085	0.102	0.065	0
Malawi	0.260	0.331	0.305	0.266	0.292
Mauritius	0.061	0.089	0.067	0.073	0.074
Mozambique	0.156	0.211	0.215	0.159	0.185
Namibia	0.067	0.085	0.102	0.065	0
Seychelles	0.047	0.101	0.057	0.035	0.069
Swaziland	0.067	0.085	0.102	0.065	0
Tanzania	0.060	0.152	0.125	0.079	0.104
Zambia	0.098	0.164	0.148	0.103	0.120
Zimbabwe	0.210	0.240	0.212	0.208	0.212

Table 4.5: The Volatility of Nominal Exchange Rates among SADC Countries

	RSA	ANG	BOT	CON	LES	MAL	MAU	MOZ	NAM	SEY	SWA	TAN	ZAM	ZIM
RSA														
ANG	1.432													
BOT	0.050	1.402												
CON	1.785	1.611	1.766											
LES	0	1.432	0.050	1.785										
MAL	0.292	1.363	0.274	1.678	0.292									
MAU	0.074	1.445	0.058	1.789	0.074	0.280								
MOZ	0.185	1.299	0.170	1.646	0.185	0.248	0.202							
NAM	0	1.432	0.050	1.785	0	0.292	0.074	0.185						
SEY	0.069	1.410	0.036	1.774	0.069	0.269	0.055	0.180	0.069					
SWA	0	1.432	0.050	1.785	0	0.292	0.074	0.185	0	0.069				
TAN	0.104	1.388	0.088	1.724	0.104	0.220	0.100	0.131	0.104	0.092	0.104			
ZAM	0.120	1.347	0.095	1.724	0.120	0.214	0.137	0.153	0.120	0.104	0.120	0.095		
ZIM	0.212	1.472	0.199	1.821	0.212	0.245	0.188	0.315	0.212	0.192	0.212	0.216	0	

Note: ANG = Angola, BOT= Botswana, CON = Congo, LES = Lesotho, MAL = Malawi, MAU = Mauritius, MOZ = Mozambique, NAM = Namibia, SEY = Seychelles, SWA = Swaziland, TAN = Tanzania, ZAM = Zambia, ZIM = Zimbabwe.

⁹¹ The entries in this table differs from those in table 4.2 since the former are computed on annual basis (sample period:1993-2002) while the latter are calculated on monthly basis from a sample running from

In regressions 1 and 2, the OCA variables enter with their anticipated signs, and they are hence consistent with our theoretical expectations; increased output variability and size increased the level of bilateral exchange rate variability whilst increased bilateral trade reduced the bilateral exchange rate variability. However, the strength of these two regressions in terms of their predictive power (14%) compares poorly with the results found by Bayoumi and Eichengreen (1997a, 1997b) for developed countries for the period post-1980 (almost 50%), but they are quite close to that of Bayoumi and Eichengreen (1997a) for the developed countries for the period 1960s (15%) and that of Benassy-Quere (1997,1998) for the sample including developed and developing countries.

The variability of terms of trade and of inflation differentials are expected to be positively related to bilateral exchange rate variability. In regressions 3 and 4, the results show that these two variables are statistically different from zero at 1 percent confidence level and they enter the regressions with their expected signs. Their inclusion improved the goodness of fit of the model, since the OCA variables now explain almost half of cross-section differences in bilateral exchange rate variability, up from about 14 percent in the previous specifications. In the estimated regressions, the variable COL_{ij} is not statistically significant, so we drop it.

In regression 5, we added four dummy variables for assessing whether major trading partners may have an effect on the variability of exchange rates, but only one dummy variable appears to be significant. Surprisingly, the inclusion of these additional variables (in regressions 3 through 5) affects the anticipated signs of the variability of

Table 4.6: Optimum Currency Area Regression for Nominal Exchange Rate Variability

Variables	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
	Coefficient	Coefficient	Coefficient	coefficient	coefficient
Variability of output	1.61(0.10) ^a	1.61(0.22) ^a	-0.44(0.19) ^a	-0.44(0.19) ^a	-0.4(0.21) ^b
Trade ratio	-13.3(3.059) ^a	-13.33(4.36) ^a	-3.13(1.367) ^b	-3.07(1.36) ^b	-3.14(1.39) ^b
Size of economy	0.009(0.002) ^a	0.009(0.001) ^a	-0.004(0.002) ^a	-0.004(0.001) ^b	-0.004(0.01) ^a
Terms of trade			1.707(0.112) ^a	1.705(0.112) ^a	1.71(0.11) ^a
Price differentials			0.348(0.020) ^a	0.348(0.020) ^a	0.35(0.02) ^a
Colony		-0.023(0.083)		0.039(0.059)	
Dummy USA					0.06(0.05)
Dummy EU					-0.003(0.03)
Dummy UK					0.11(0.01) ^a
Dummy RSA					0.004(0.04)
Constant	-0.040(0.044)	-0.040(0.044)	-0.11(0.025) ^a	-0.11(0.025) ^a	-0.12(0.03) ^a
No. Obs.	1834	1834	1834	1834	1834
R-square	0.14	0.13	0.48	0.48	0.48

Notes: Heteroskedasticity-corrected standard-errors in parentheses.

^a significant at the 1% level; ^b at the 5% level; ^c at the 10% level.

The dependent variable is the variability of nominal bilateral exchange rates.

output and size of the economies, and this is inconsistent with the theoretical expectations. Moreover, by using the estimated coefficients of regressions 3, 4 or 5, we have obtained several negative values for the predicted exchange rate variability (OCA

index). With respect to this fact, we use our results from the regression 1 (second column of table 4.6.) in the next step.

4.5.3. OCA indices

We consider in this exercise the regression 1 as our standard OCA estimated equation since its coefficients are consistent with our theoretical expectations, i.e. the significance and correct signs of the estimated coefficients for the OCA variables. From this regression, we calculate the OCA indices which measure the variability of the exchange rates that would fit the OCA theory (Bayoumi and Eichengreen (1997a, 1997b)). These indices are the predicted value of exchange rate variability from the estimated equation. The lower is the OCA index, the higher is the benefit-cost ratio for monetary integration for the country pair.

The OCA index for each case is the predicted value of the following equation:

$$SD(e_{ij}) = -0.04 + 1.61 * SD(\Delta y_i - \Delta y_j) - 13.30 * TRADE_{ij} + 0.009 * SIZE_{ij} \quad (5)$$

We first construct OCA indices for Southern African countries with respect to the five potential nominal anchors, namely USA, Germany (a proxy for Eurozone), Japan, United Kingdom and South Africa. As mentioned earlier, the currencies of the first four countries are considered as external nominal anchor while the South African rand is an internal (regional) nominal anchor. The estimated OCA indices are shown in the Table 4.7 below.

A first look at these indices demonstrates that they exhibit a wide variation from 0.165 to 0.506. We also find that more than half of the SADC countries have a lower OCA indices vis-à-vis South Africa while four of them exhibit a lower OCA index vis-à-

vis the USA. Democratic Republic of Congo is the only country which has a lower OCA index vis-à-vis Japan while Swaziland, on the other hand, exhibits a lower OCA index with United Kingdom. When we consider South Africa⁹², we find that it presents a lower OCA index vis-à-vis the United Kingdom, followed by the euro and the USA.

We expected to see the CMA countries with a lower OCA index vis-à-vis South Africa since their currencies are pegged at par to the South African rand. There is only Lesotho which fulfills our expectations, while Namibia and Swaziland have lower OCA indices with USA and United Kingdom, respectively.

Table 4.7: OCA Indices for Southern Africa vis-à-vis Anchor Country

SADC Countries	Anchor Countries				
	U.S.A.	EURO	JAPAN	U.K.	SOUTH AFRICA
Angola	0.235	0.423	0.447	0.359	0.335
Botswana	0.287	0.368	0.396	0.299	0.307
Congo, D.R.	0.498	0.403	0.383	0.464	0.417
Lesotho	0.247	0.264	0.271	0.232	0.213
Malawi	0.263	0.291	0.303	0.262	0.222
Mauritius	0.262	0.342	0.371	0.272	0.255
Mozambique	0.396	0.478	0.506	0.413	0.361
Namibia	0.201	0.268	0.295	0.203	0.209
Seychelles	0.235	0.302	0.327	0.251	0.254
South Africa	0.235	0.204	0.256	0.165	---
Swaziland	0.197	0.246	0.273	0.185	0.188
Tanzania	0.241	0.304	0.332	0.243	0.228
Zambia	0.296	0.245	0.256	0.267	0.198
Zimbabwe	0.364	0.316	0.304	0.341	0.217

Note: The OCA index represents the predicted value obtained from estimating equation (5)

⁹²Since South Africa is a SADC member states, we only compute OCA indices vis-à-vis the other four anchor countries.

In sum, the OCA index is the predicted volatility of exchange rates being function of output movements, changes in trade, and other variables. Based on OCA criteria, the predicted volatility is higher for SADC countries vis-à-vis potential anchors in this study in comparison to the OCA indices obtained by Bayoumi and Eichengreen (1997) for developed countries vis-à-vis to Germany. Hence, suitability for monetary integration is not high for SADC countries.

4.5.4. Excess Volatility

Like Benassy-Quere et al. (1998), we use the OCA indices obtained in the previous table and compare them to observed volatilities to assess whether the estimated volatility over-or-under-predicts the observed volatility of nominal exchange rates. In this exercise, we eliminate the Japanese yen since, in the majority of cases, the OCA indices vis-à-vis Japan are higher than the others. We compute the excess volatility, i.e. the ratio of observed volatility over OCA index⁹².

The entries in table 4.8 show that, for the majority of SADC countries, the predicted variability of the exchange rates (OCA indices) are greater than the observed nominal exchange rate volatility. Similar results have been obtained by several authors who estimated OCA indices, including Bayoumi and Eichengreen (1997), Benassy-Quere et al. (1998), and Kim and Papi(2005)⁹³. Angola, Congo and Malawi⁹⁴ are the only countries where the observed volatility is greater than the predicted one, hence their excess volatility is greater than 1. For the remaining SADC members, their excess

⁹² Instead of using the ratio of the two volatilities as did Benassy-Quere et al. (1998), Bayoumi and Eichengreen (1997b) take the difference of predicted and observed volatilities (residuals) to assess the prediction of the estimated model.

⁹³ Bayoumi and eichengreen (1997) estimated OCA indices for 21 developed countries while Benassy Quere et al. (1998) and Kim and Papi (2005) included both developed and developing countries in their samples.

volatility is less than 1. From this analysis, we observe that, in most cases, our estimated model over-predicts the variability of nominal exchange rates of most SADC members against the major currencies considered in our study.

4.5.5. Choice of a nominal anchor currency

After obtaining the OCA indices, we can now use them in order to select the appropriate peg in each SADC country and find the currency which empirically is the most appropriate nominal anchor for a common peg in the case of Southern African countries. In order to do so, we follow Benassy-Quere and Lahreche-Revil (1998) who

Table 4.8: Excess Volatility for SADC countries⁹⁵

SADC Countries	Excess Volatility against			
	US\$	Euro	U.K. pound	SA rand
ANGOLA	4.1153	3.399	3.9073	4.2811
BOTSWANA	0.15	0.2147	0.1588	0.1625
CONGO, D.R	3.5438	4.4256	3.8026	4.278
LESOTHO	0.2693	0.3865	0.2789	0
MALAWI	0.9862	1.0498	1.016	1.3159
MAURITIUS	0.2316	0.1972	0.2696	0.2919
MOZAMBIQUE	0.3938	0.451	0.3843	0.5128
NAMIBIA	0.3308	0.3803	0.3193	0
SEYCHELLES	0.1998	0.1889	0.1388	0.2705
SOUTH AFRICA	0.2833	0.4991	0.3919	---
SWAZILAND	0.339	0.4138	0.3507	0
TANZANIA	0.2484	0.4131	0.3228	0.4566
ZAMBIA	0.3315	0.6058	0.3852	0.6062
ZIMBABWE	0.5776	0.672	0.3116	0.9763

Note: Excess volatility is the ratio of observed volatility over estimated OCA index.

⁹⁴ Except when the US dollar is considered.

⁹⁵ The currencies of the CMA countries are pegged at par to the rand, so the observed volatility is zero.

use a normative approach. They make use of the excess volatility in order to calculate relative excess volatility indices, i.e. the ratio of excess volatility. In other words, we compute the ratio of the excess volatility against currency i over the corresponding index against currency j . Thus, currency i should be preferred to currency j if this ratio is lower than one.

Table 4.9 presents the calculated ratios of excess volatility. We made six different combinations using our four nominal currency anchors.

Table 4.9: Relative Excess Volatility Indices

	usa/euro	usa/uk	usa/rsa	euro/uk	euro/rsa	uk/rsa
ANGOLA	1.211	1.053	0.961	0.870	0.794	0.913
BOTSWANA	0.699	0.945	0.923	1.352	1.321	0.977
CONGO, D.R.	0.801	0.932	0.828	1.164	1.035	0.889
LESOTHO	0.697	0.966		1.386		
MALAWI	0.939	0.971	0.749	1.033	0.798	0.772
MAURITIUS	1.174	0.859	0.793	0.731	0.676	0.924
MOZAMBIQUE	0.873	1.025	0.768	1.174	0.879	0.749
NAMIBIA	0.870	1.036		1.191		
SEYCHELLES	1.058	1.439	0.739	1.361	0.698	0.513
SOUTH AFRICA	0.568	0.723		1.274		
SWAZILAND	0.819	0.967		1.180		
TANZANIA	0.601	0.770	0.544	1.280	0.905	0.707
ZAMBIA	0.547	0.861	0.547	1.573	0.999	0.635
ZIMBABWE	0.860	1.854	0.592	2.157	0.688	0.319

In the light of the relative excess volatility indices presented in table 4.9, we get the following insights:

- When we compare the US dollar to the euro, as shown in column 2, we find that the former is preferred to the latter in most Southern Africa countries with exception of Angola, Mauritius and Seychelles. In column 3, we observe that the US dollar is preferred to the British pound for nine SADC countries. Finally, as shown in column 4, all SADC countries, with the exception of the CMA members⁹⁶, would peg to the US dollar when it is compared to the South African rand. The results for South Africa also demonstrate that this country would prefer to peg to the US dollar when compared to both the euro and pound.

- When we look at the ratio of euro over British pound, only two countries, namely Angola and Mauritius, would prefer to peg to euro rather than pound. In the other side, the euro is preferred to the rand in most of the SADC countries.

- With respect to the British pound, this currency is preferred to the South African rand for all SADC countries in terms of relative OCA index.

We also computed relative excess volatility indices using the estimated model with the five potential anchors only. The results are quite similar to those presented in table 4.9.

This analysis presented above demonstrates that for the SADC countries the obvious choice in terms of nominal currency anchor for a common peg is the US dollar. Hence, in the light of the optimum currency area, the South African currencies need to be pegged to a major international currency, the US dollar. Due to the dominant position of South Africa in the region, one would expect the South African rand to be the preferred currency peg since it is the case for three of the SADC members, namely Lesotho, Namibia and Swaziland, which have their currencies pegged to the rand. While

⁹⁶ We do not compute relative excess volatility for the CMA countries with respect to South African rand since their currencies are pegged at par to the rand, hence their observed volatility is zero.

Botswana has a peg to a basket of currencies, the weight of the rand is more than 60 percent, that is why Botswana used to be considered as a *de facto* CMA member. However, we find that this is not the case.

Several economists have discussed the possibility for African countries, in general, to peg their national currencies to an external currency anchor. Using trade weights, Honohan and Lane (2000) suggest that the euro could be an appropriate anchor for African currencies. Alesina et al. (2002) find similar results for the African countries included in their sample using the criteria of trade weights, price and output co-movements⁹⁷.

When we look at the entries in table 4.9, we also observe that several values of the relative excess volatility indices are close to unity. According to Benassy-Quere et al. (1998), this may suggest the possibility of pegging the national currency to a basket of currencies. Cohen et al (1999), quoted by Honohan and Lane (2000), suggest a weight of 50 percent for the euro and 50 percent for the US dollar. This is an issue we will explore in the future as an extension to the present study, i.e., to estimate the relative weights of different major currencies in a common currency basket for southern African countries.

4.5.6. Intra-SADC OCA indices

As a second objective of this study, we intend to use our estimated OCA indices for each pair of SADC countries in order to assess their suitability for a common currency. The estimated OCA indices are shown in table 4.10. Recall that when the index is relatively low, OCA characteristics predict a low level of bilateral exchange rate variability and therefore a high suitability for monetary integration.

⁹⁷ DR Congo and Mauritius are the only two SADC members which are included in their sample.

The indices presented in this table show that there are two groups of pairs of countries in Southern Africa: (1) the pairs of countries which exhibit a relatively high level of nominal exchange rate volatility and (2) pairs of countries with relatively low level of volatility. However, these OCA indices are similar to those obtained by Bayoumi and Eichengreen (1997b) for European countries using data on industrial countries. But our indices are quite similar to those obtained by Kim and Papi (2005) for Central America countries using a panel of 53 countries including both industrial and developing countries.

As we mentioned earlier, in Southern Africa, there exists a long standing monetary union⁹⁸ which includes South Africa, Lesotho, Namibia and Swaziland. If we take the OCA indices for these countries as indicative for suitability for a currency union among pairs of countries, we consider a benchmark for OCA indices of 0.22 . Therefore, those country-pairs with an OCA index of less than 0.22 may be considered as suitable for a currency union. We find 20 country-pairs which satisfy this condition. For the remaining countries, we find different combinations of country-pairs which may enter a currency union, such is the case for Zimbabwe-Malawi, Zimbabwe-South Africa, and Zimbabwe-Zambia.

Angola, Congo and Mozambique are the countries whose OCA indices with their SADC partners are higher than 0.22. Hence, these countries cannot, for the moment, enter the currency union with any of the SADC countries.

⁹⁸ The CMA is more close to a currency board than a real monetary union (Grandes, 2003).

Table 4.10: Intra-SADC OCA indices

	AN	BOT	CON	LES	MAL	MAU	MOZ	NA	SEY	RSA	SWA	TAN	ZAM	ZIM
ANG														
BOT	0.233													
CON	0.615	0.569												
LES	0.325	0.292	0.435											
MAL	0.327	0.279	0.453	0.222										
MAU	0.243	0.176	0.543	0.268	0.275									
MOZ	0.242	0.263	0.676	0.393	0.391	0.279								
NA	0.305	0.252	0.468	0.207	0.236	0.227	0.358							
SEY	0.292	0.234	0.494	0.244	0.233	0.202	0.334	0.217						
RSA	0.335	0.307	0.417	0.215	0.222	0.255	0.361	0.209	0.254					
SWA	0.316	0.25	0.445	0.196	0.215	0.229	0.349	0.166	0.212	0.188				
TAN	0.288	0.105	0.493	0.245	0.259	0.202	0.332	0.207	0.232	0.223	0.197			
ZAM	0.404	0.333	0.357	0.261	0.217	0.319	0.449	0.266	0.286	0.198	0.233	0.26		
ZIM	0.455	0.428	0.337	0.294	0.206	0.391	0.434	0.303	0.343	0.217	0.299	0.372	0.22	

4.6. Conclusion

Southern African countries, which are members of the SADC, are planning to have a monetary union in the next ten years. Following the experience of Western European countries, this involves a long period of transition. Since these countries have different exchange rate regimes and to avoid a high volatility of their nominal exchange rate, we suggest that these countries should start exchange rate coordination just like the exchange rate mechanism (ERM) for the European countries. For this, the SADC countries have to find a common nominal anchor for which they have to peg their currencies.

In this paper, we use the optimum currency area theory in order to find the optimum currency peg for Southern African countries. We follow the model developed by Bayoumi and Eichengreen (1997a, 1997b) who operationalise the OCA theory to obtain OCA indices. Using a panel of 63 countries which include both industrial and developing countries, we obtained OCA indices for SADC countries vis-à-vis five potential nominal anchor currencies. Using a methodology developed by Benassy-Quere et al. (1998), we find that the optimal nominal currency anchor for these countries is the US dollar, which is a major international currency anchor. This study suggests that SADC countries should commonly peg their currencies to the US dollar. Since most of the Southern African countries are primary commodity producers and that Western World being the main destination for their exports, pegging their currencies to a major currency anchor such as the US dollar would be preferable than pegging to an regional anchor.

We also find that several pairs of SADC countries are suitable for a common currency when we use the OCA indices. However, for countries such as Angola, Congo and Mozambique, the evidence found so far does not favor their membership to a monetary union with their SADC partners.

One would expect that the SADC countries might be willing to use the rand as the anchor currency such is the case for their CMA partners. However, Khamfula and Huizinga (2004) argued that if the rand is used as the anchor currency, then fluctuations of the rand against other currencies outside the union will have a major impact on the export revenues of SADC countries. Since South Africa, on the one hand, mainly exports industrial products and the other countries, on the other hand, primary goods, the fluctuations of the rand may, in fact, hurt export revenues of commodity exports. This is because movements of the rand will be driven by fluctuations of prices of industrial goods and will therefore not synchronize with commodity price movements. From this argument, we conclude that pegging the SADC currencies to the rand is not a better way for the stability of SADC exchange rates. The results obtained in this paper, i.e. pegging the SADC currencies to the US dollar, are also consistent with the views expressed by the SADC Ministers of Finance to have a single currency in the region or adopt the dollar (IMF, 2003).

CHAPTER 5: CONVERGENCE OF MONETARY POLICY IN SOUTHERN AFRICA

5.1. Introduction

In Africa, there has recently been a proposal for the creation of a single currency following the gains made in Europe after the implementation of the Euro. The African Union's plan for an African monetary union relies on the earlier creation of monetary unions in five existing regional economic communities which could be strengthened, and ultimately merged to a common African monetary union with a single central bank and currency⁹⁹. However, Masson and Pattillo (2005) argue that a straightward move to a single African currency may not be feasible, and they suggest a selective expansion of existing monetary unions in order to induce countries to improve their fiscal and monetary policies, stimulating growth and fostering good governance in Africa.

The Southern African Development Community (SADC) has an ambitious program for economic integration, including completion of negotiations on a customs union by 2010, a common market by 2015 and the launch of a regional currency in 2016 (IMF, 2003). The region has a long-lasting monetary union, the Common Monetary Area (hereafter, CMA), which is led by South Africa, and has proven to be credible, especially from the inflation targeting monetary framework of the South African Reserve Bank (SARB)¹⁰⁰. Monetary cooperation in the SADC could eventually entail an entirely different framework or it could come about by the extension of the CMA arrangements to include more SADC countries when they are willing and able to join. In the second case, the other SADC members can take advantage of the credibility of the CMA if they could

⁹⁹ Notice that there already exist two functioning monetary unions in Africa.

¹⁰⁰ SARB is *de facto* responsible for monetary policy in the CMA zone

join it. However, an expanded monetary zone could involve shared monetary policy responsibility by South Africa's Reserve Bank with neighboring central banks. But, as Van Zyl (2003) shows, expanding the membership of the CMA would be complicated because new members would not share the history of the South African currency being legal tender. However, the CMA arrangements have in the past proved to be very flexible and this could be a big advantage.

While several scholars have looked at Southern Africa regional integration, there has been little research on the specific issue of expanding CMA. Jenkins and Thomas (1998) use the convergence hypothesis to investigate the possibility of monetary integration in the region. Sparks (2002) uses annual data covering mostly the 1995-1998 period and focuses on six potential criteria that are essential for the feasibility of a monetary union. Agbeyegbe (2003) has sought to investigate the feasibility of monetary union in SADC by looking at evidence of nominal exchange rate and inflation convergence. Masson and Patillo (2005) simulate and calibrate a model for the existing asymmetric monetary union, the CMA, assuming that monetary policy is set by South Africa. They also consider whether adding other SADC countries individually to the CMA is incentive compatible, both for the new member and for the countries that form the CMA, and assuming that the current asymmetric arrangement would continue. While the first three studies which use the concept of convergence fail to find evidence of convergence of macroeconomic variables in Southern Africa and, henceforth, a low probability for monetary union at this stage, the study presented by Masson and Patillo (2004) finds evidence of monetary integration in the region and that the expansion of the current arrangement will be in the interest of both the current members of the CMA and

the new entrants. However, Sparks (2002) suggests that if the CMA has to be expanded, it would be one new member at a time.

The purpose of this chapter is to empirically assess the expandability of the CMA within the SADC. Following the recommendations made by Sparks (2002) and Masson and Pattillo (2005), the possibility for individual SADC countries to join the existing regional monetary arrangement in Southern Africa is analyzed. We use as criterion for joining the monetary union the convergence¹⁰¹ of monetary policies of the potential member candidates to that of South Africa, used here as proxy for the CMA¹⁰². We assume that a country is suitable to join the monetary arrangement if there is a long-run relationship between its monetary base growth rates¹⁰³ and that of South Africa. The logic behind it is that a country, whose monetary base growth rates are cointegrated with that of South Africa in the past, would be able to follow the leadership of the South African Reserve Bank (SARB) in setting its monetary policies. While some authors, (Sparks, 2002; and Agbeyegbe, 2003, for instance) have investigated the convergence in SADC, to our knowledge, the issue of convergence in monetary base growth rates has not yet been conducted. This paper tries to fill this gap.

This paper follows the methodology used by several authors (Brada and Kutan, 2003; Hafer and Kutan, 1994, for instance) which investigate the so-called German dominance hypothesis (or 'leadership' hypothesis) in the European Monetary System (EMS), the precursor of the EMU. The German dominance hypothesis meant that other

¹⁰¹ See section 5.2. for the definitions of convergence used in economics.

¹⁰² A good proxy would be the weighted average of the CMA countries. However, the size of South Africa is almost 96 percent in the CMA.

¹⁰³ Interest rates and inflation rates could also be used in this type of analysis. But in the SADC region, the financial system is less developed for many countries while some countries have experienced high inflation

members of the EMS closely aligned their monetary policies to those of Germany in order to benefit from the reputation of the Bundesbank and the credibility of its policies. And in a recent paper, Brada and Kutan (2003) investigate the convergence with German monetary policy, a proxy for the European Monetary Union (EMU), of the Balkan and Mediterranean country candidates for EU membership in order to assess their suitability to join the EMU in the near future. In the case of accession countries, they argue that a necessary, if not sufficient, condition for the long-term viability of such an exchange rate regime is that the potential members be able to follow the lead of the ECB, proxy by the Bundesbank, in setting their monetary policy. Therefore, in our analysis, we import the logic behind the German dominance hypothesis and apply it to an economic community in developing world, namely the SADC.

The rest of this paper is organized as follows. The next section briefly reviews the convergence theory. In section three, we present the theoretical and methodological frameworks while section four discusses data and estimation procedure. The empirical results are presented in section 5. Section 6 concludes.

5.2. Review of the economic convergence theory

This section explains the concepts and definitions of convergence and the econometric approaches that have been used to investigate convergence among economies.

Neoclassical theory of growth, built on the pioneering work of Solow (1956), predicted that due to diminishing returns to physical capital the growth rate of a country

rates for the past three decades. Hence, the money supply growth rates seem to be the most appropriate indicator of monetary policy.

is likely to be inversely proportional to its initial level of income, as in the long run countries with low initial stocks of capital would tend to grow faster while those with high initial capital would tend to slow down. This implies a tendency on the part of countries to eventually converge to a single steady state level of growth. This prediction of neoclassical growth theory has led to much theoretical and empirical debate.

As an alternative to the neoclassical growth theory, Romer (1986, 1990), Lucas (1988), and Aghion and Howitt (1992) developed the endogenous growth model which argues that positive externalities associated with inputs such as technology and education can lead to increasing returns to scale and, in turn, prevent any tendency towards convergence.

5.2.1. Definitions

Ever since the Solow model predicted the convergence of economic growth, the concept of convergence has been defined in a variety of ways though they are closely linked to one another. The definition of convergence depends on what the study focuses on and how it is operationalized. Several definitions of economic convergence have been proposed in the literature: (i) Convergence could be defined as the reduction in dispersion of per capita income among a group of countries or the catching up of relatively low-income countries with relatively high-income countries as in Baumol (1986) and Barro and Sala-i-Martin (1991); (ii) Anderton, et al. (1992) defined convergence as the long-run reduction of international differences in the development of certain economic variables; (iii) Convergence of macroeconomic variables for a group of countries is defined as each country having identical long-run stochastic or deterministic trends, and this definition of

the convergence hypothesis is based on time-series techniques (Bernard and Durlauf, 1995). These authors gave definitions to both convergence and common trends, and defined convergence as “countries i and j converge if the long-term forecast of output for both countries are equal at a fixed time t ”. If countries do not converge in this sense, they may still respond to the same long-term driving process. Therefore, they defined the common trends as “countries i and j contain a common trend if the long-run forecast of output are proportional at a fixed time t ”.

5.2.2. Concepts and empirical measurements of convergence

Using cross-sectional data, there are two major concepts of convergence. The first concept, called σ (*sigma*) *convergence*, means the decline of the dispersion in the level of per capita income among countries while the other concept, β (*beta*) *convergence*, is the convergence of growth rates (Barro and Sala-i-Martin, 1991).

σ -convergence involves looking at the dispersion of levels of some economic variables (mainly, the real per capita income levels) across countries and its change over time. If the cross-sectional dispersion, measured by the standard deviation of the logarithm of per capita income across a group of countries, declines over time, there is a process of σ -convergence. The sample variance of log of income at time t , σ_t^2 , is used to measure the cross-sectional dispersion of income.

$$\sigma_t^2 = \left(\frac{1}{N}\right) \sum_{i=1}^N [\log(y_{i,t}) - \mu_t]^2, \quad (5.1)$$

where μ_t is the sample mean of $\log(y_{i,t})$ and $\log(y_{i,t})$ is the logarithm of the i^{th} economy's GDP per capita at time t .

The β -convergence concept involves examining the relationship between the growth rate of per capita output over some time period and its initial level. The presence of β -convergence is indicated by a negative correlation between the rates of growth and initial income levels, and it implies that poor economies tend to grow faster than rich ones in the level of per capita income. Depending on the assumption about the steady-state level, we distinguish two sub-concepts of β -convergence: absolute and conditional convergences (Barro and Sala-i-Martin, 1995). Absolute convergence¹⁰⁴ requires that per capita income levels be equalized across economies in their steady-states under the assumption that economies have identical preferences and technologies. Because economies converge to the same steady-state which guarantees the same per capita income, poor economies should grow faster than richer ones without conditioning on any other characteristics of the economies, such as technology and preferences. In testing absolute convergence, the cross-section approach runs a cross-country growth regression with the growth rate as the dependent variable and the initial income level as the explanatory variable:

$$\frac{1}{T} \log \left(\frac{y_{i,T}}{y_{i,0}} \right) = \alpha + \beta \log(y_{i,0}) + \varepsilon_i, \quad i=1,2,\dots,N \quad (5.2)$$

where $y_{i,T}$ is real per capita income of economy i at time T , $y_{i,0}$ denotes economy i 's initial income, and ε_i is an error term. It should be noted that the left hand side of the equation depicts the average growth rate of per capita income for economy i between periods 0 and T . Then, equation (5.2) is used to test for the null hypothesis of no convergence, $\beta \geq 0$, against the alternative of convergence, $\beta < 0$.

¹⁰⁴ Absolute β -convergence used also to be called unconditional β -convergence.

The concept of conditional convergence relaxes the strict assumption of absolute convergence by taking into account the differences of characteristics of economies that determine the respective steady-states of the economies. This concept implies that per capita income in a given economy converges to its own steady-state which can differ permanently from steady-state income levels of other countries and the speed of this convergence has an inverse relationship with the distance from the steady-state. Therefore, an economy which starts out proportionately further below its own steady-state position tends to grow faster. Because a lower starting value per capita income tends to generate a higher per capita growth rate to the extent that the determinants of the steady-state are controlled for, convergence is conditional on the determinants of the countries' steady-state levels per capita output.

To test conditional convergence, we need to hold the steady state constant by estimating a regression which includes a vector of variables that proxy the steady state. The following equation is estimated to test conditional convergence.

$$\left(\frac{1}{T}\right) \log\left(\frac{y_{i,T}}{y_{i,0}}\right) = \alpha + \beta \log(y_{i,0}) + \gamma X_i + \varepsilon_i, \quad i=1,2,3,\dots,N, \quad (5.3)$$

where X_i is a vector of observations on exogenous variables which are designed to control for the cross-sectional heterogeneity in levels and growth rates of per capita income. α and β are parameters, γ is a parameter vector, and ε is an error term with mean zero and finite variance. According to the above equation, growth rates can vary from country to country either due to differences in the parameters determining their steady states captured in the term X_i or due to differences in initial positions captured in the term $\log(y_{i,0})$. Therefore, convergence is conditional on the determinants of the economy's

steady state level of per capita output. A significantly coefficient of β is taken as evidence for conditional convergence. If $\beta < 0$, economies that are initially rich grow more slowly than economies that are initially poor, after controlling for the mean differences associated with their X s and any economy-specific fixed effects embedded in the ε_s .

In general, the process of β -convergence tends to generate σ -convergence but the former does not necessarily imply the latter because the dispersion can be invariant or increasing even if a country is converging towards the sample mean. Hence, β -convergence is a necessary condition but not a sufficient condition for σ -convergence Barro and Sala-i-Martin (1991)¹⁰⁵. Sala-i-Martin (1996) argues that the two concepts examine different phenomena: σ -convergence studies how the distribution of an economic variable, per capita income for instance, evolves over time while β -convergence studies the mobility of the same variable within the same distribution.

In addition to the two concepts stated above, another concept of convergence is called *stochastic convergence* and it exploits time series properties of macroeconomic data by placing the convergence hypothesis in a dynamic and stochastic environment (Carlino and Mills, 1993; Bernard and Durlauf (1995). Bernard and Durlauf (1995) introduce two related definitions of convergence. The first definition (convergence as catching up) considers the behavior of output difference between two economies over a fixed time interval by equating convergence with the tendency of the difference to narrow. Bernard and Durlauf (1995) test for convergence by examining if $(x_{i,t} - x_{j,t})$ is a zero mean stationary process. The test of convergence thus amounts to testing for a

¹⁰⁵ β -convergence works toward σ -convergence but may be offset by new disturbances that tend to increase cross-sectional dispersion.

unit-root in the process $(x_{i,t} - x_{j,t})$. The rejection of the null hypothesis of a unit root implies a form of convergence in expectation between the two series x_i and x_j .

The second definition of convergence (convergence as equality of long-term forecasts at a fixed time) is based on whether the long run forecasts of output differences tend to zero as the forecasting horizon increases. This notion holds that two series converge when they share a common stochastic trend (cointegrated) and hence that there are $p-1$ co-integrating equations, where p is the number of series (that is, countries) included in the co-integration analysis. A finding of less than $p-1$, but at least one, co-integration vectors would imply that some of the countries are converging and some others are not, at least in the long-run¹⁰⁶.

5.2.3. Macroeconomic Convergence and Monetary Integration

Monetary integration in a region should involve some form of convergence of macroeconomic policies across countries. Several authors have used the concept of economic convergence to empirically assess the suitability of countries to form or to join a monetary union. Kocenda et al. (2006) distinguished two strands of convergence literature which deal with this issue. One strand of convergence literature is based on the concept of the optimal currency area (OCA) and used the methodological approach developed by Bayoumi and Eichengreen (1993) which test whether potential members of a monetary union displayed a significant correlation of their supply (real) and demand (nominal) shocks. They applied this approach for the case of European Union as well as for other regions in the world. In the case of African countries, several studies have used

this methodological approach, including Bayoumi and Ostry (1997), and Howarth (1997). A second strand of literature focuses on the nominal and real convergence¹⁰⁷ of the potential members of a monetary union as well as of candidate countries with the existing members of a monetary union. A set of studies applied this approach to assess whether new EU members could join the Eurozone, and this includes Brada and Kutan (2003), Kutan and Yigit (2004, 2005). In Southern Africa, Jenkins and Thomas (1998), Honohan (1992) and Agbedgebe (2003), among others, applied the concept of convergence to investigate the possibility of forming a monetary union among the SADC members.

Following Hafer and Kutan (1994), the notion of convergence generally used in the studies of European Union's economic convergence is that: complete convergence is achieved when there exist "n-1" cointegrating vectors or one common trend; and partial convergence is claimed when there exists one to "n-2" cointegrating vectors or multiple common trends among "n" countries. Complete convergence implies that economic variables in different countries converge to a single common long-run path, dominated perhaps by policy preferences of one country {e.g., that of Germany, which motivates the test of the German Dominance (or Leadership) Hypothesis in several studies} or a combination of countries (i.e. a common policy shared by several countries). On the other hand, partial convergence implies that countries set their policies independently in the long-run.

¹⁰⁶ Hafer and Kutan (1994) refer to the case of less than $p-1$ co-integrating vectors as to a situation of "partial" convergence.

¹⁰⁷ Convergence of economic variables can be broadly categorized into two areas: nominal and real economic convergence. Separation into two categories is based on representative variables and their degree of involvement with policy coordination. Nominal economic convergence is measured by convergence of monetary bases, inflation rates, interest rates, government deficit/GDP ratios and government debt/GDP ratios. Real convergence, on the other hand, is measured by convergence of real GDPs and industrial production.

5.3. The model of “Leadership hypothesis”

Several economists, including De Grauwe (2000), Camarero and Ordonez (2006) among others, argue that in an exchange rate arrangement, i.e. an incomplete monetary union¹⁰⁸, the so-called $n-1$ problem faced by fixed exchange rate systems may ultimately arise. This is due to the fact that there are only $n-1$ exchange rates among the n countries participating in an exchange rate arrangement and just one degree of freedom in order to set the monetary policy in the system. Therefore, only one common authority (a common central bank, for instance) or just a single country can set its monetary policy independently and the other countries following it. This policy, through the exchange rates commitment, will be the one for the whole system. However, in this situation, the question, as asked by De Grauwe (2000), is to decide who is going to use this degree of freedom.

Prior to the implementation of the European Economic and Monetary Union (EMU), the Exchange Rate Mechanism (ERM) was established through the European Monetary System (EMS), 1979 to 1998, with the original intention of maintaining a system of fixed-but-adjustable exchange rates within Europe. In the ERM, Each participating country was to exhibit symmetric behavior in maintaining the exchange rate arrangement. However, it is frequently argued that the EMS had worked in an asymmetric way, with Germany being the center country and the remaining countries passively adjusting to German monetary policy actions. In turn, these countries would have benefited from behaving in such a way, since they would have taken advantage of the firmly established anti-inflation credibility of the Bundesbank (Kirchgassner and Wolters, 1993). This leads to the so-called German Dominance Hypothesis (GDH).

According to the German Dominance Hypothesis (GDH), Germany was the EMS leader and sets its monetary policy quite independently, using therefore the degree of freedom, while the rest of the member countries follow that policy. This implies that other EMS countries only respond to German monetary policy but not the reverse. Kutan (1991) derives a simple theoretical model explaining the German dominance in the EMS.

In this chapter, we use the name of "leadership hypothesis" instead of German dominance hypothesis, and the discussion below follows Fratianni and Von Hagen (1990), Kutan (1991), Hafer and Kutan (1994), and MacDonald and Taylor (1991) among many others.

Fratianni and Von Hagen (1990) proposed a useful framework for the analysis of monetary policy convergence in terms of interest rate linkages or monetary base in the context of EMS. They argued that "*German dominance could be established if: i) monetary policy in the rest of the world did not Granger-cause the policies of the other EMS members; ii) no two-way Granger-causality existed between the policies of EMS countries; and iii) German monetary policy Granger-caused policies in the other EMS countries*". Furthermore, MacDonald and Taylor (1991) distinguish between short-run (or high-frequency) and long-run (or low-frequency) policy convergence. The short-run policy convergence implies that the growth of narrow money stock in each of the countries under investigation show a tendency to converge toward one another during the sample period while long-run policy convergence assesses whether or not monetary policy variables show a tendency to move together over long periods of time. In this study, we will follow previous studies by examining the long-run policy convergence.

¹⁰⁸ as the CMA and the European Monetary System (EMS).

The empirical analysis investigates policy convergence among countries under consideration within a long-run framework by using cointegration procedures which determine the number of shared common stochastic trends among their monetary policies and test whether a complete convergence of policies has been achieved in these countries. Rejection of the complete convergence – a finding of two or more shared common stochastic trends – indicates that some countries' policies are set independently at least in the long-run. If this is true, then the notion that the bank in the leading country dominated monetary policy in the other countries is rejected. Such a result also suggests that any credibility gain from tying policy to that of the leading country is probably outweighed by other considerations, such as domestic growth or international competitiveness.

The method used to test for cointegration in this study is the Johansen maximum likelihood procedure introduced in Johansen (1988) and extended in Johansen and Juselius (1990). If there are $p-1$ cointegrating vectors among p policy measures, then there is only one common policy shared by all countries and so there is complete long-run convergence of policies. If, however, the number of cointegrating vectors is less than $p-1$, but greater than one, then this implies that there is some partial convergence of policies. Finally, if the number of cointegrating vectors is zero, then this means that there are several (p) common trends and so no long-run convergence of policies. A lack of cointegration should not necessarily imply that convergence did not take place at the end of the period. In other words, if monetary policies become closely linked at the end of the sample period, rather than during the period, our cointegration tests will not capture

such a change and hence policy convergence will be rejected. As can be seen from the above procedure, cointegration does not automatically imply convergence.

In assessing the leadership hypothesis, it is also interesting to investigate the short-run connection among policy measures used by different countries. For this purpose, causality test can be employed to detect whether short-run changes in the leading country's policy alone are transmitted to the other countries, which is evident from the unidirectional causation from the leading country to the other countries, or whether there is general feedback among policy actions. If the "leadership hypothesis" is correct, then the Granger-causality should run from the leading country to the other countries but not vice versa.

5.4. Data and Methodology

5.4.1. Data

The empirical analysis below employs a monetary base measure for each country. It must be noted, however, that for the sample of countries under investigation, there is lack of large dataset for other monetary instruments for most countries, like M1 and M2, as well as market interest rates. However, concerning the choice of monetary base as the preferred measure, Hafer and Kutan (1994) argued that "*...the monetary base is the preferred measure to gauge changes in the direction of monetary policy since using broader measures to represent central bank policy actions may confuse policy-induced changes with unforeseen movements in the money multiplier or money demand. Hence, changes in the monetary base generally reflect actions taken by the central bank in their attempt to alter reserves of the banking system and, hence, some financial market rate or some monetary aggregate*".

The data used in this paper are on monthly basis and are taken from the International Financial Statistics (IFS) CD-ROM of the International Monetary Fund (IMF). Monthly data on base money are in national currency units. Like many other authors (e.g. Hafer and Kutan (1994), Brada and Kutan (2003), etc...) we use "reserve money" which is obtained from line 14 of the IFS's CD-ROM. The data were deseasonalized using the seasonally adjusted moving average (SAMA) command in TSP. Due to data availability, our sample consists of monthly monetary base spanning the period from January 1980 to December 2003¹⁰⁹ for Botswana, Malawi, Mauritius, Seychelles, South Africa, Tanzania, and Zimbabwe. The focus of this chapter is the investigation of the South African leadership hypothesis within the SADC in a strict sense, hence in this analysis we do not take into account the effects of other major countries's monetary base¹¹⁰, such as U.S.A, EU, UK or Japan.

Three other SADC members are not considered in this analysis and that the other CMA countries (Lesotho, Namibia and Swaziland) are not included. There are not enough observations for Angola, Mozambique and Zambia. However, since 1998, DR Congo has changed its national currency, from the New Zaire to *Franc Congolais*. Moreover, the exclusion of Angola and DR Congo is also due to the fact that both countries experienced a period of hyperinflation in the 1990s.

5.4.2. Econometric Methodology

The testing procedure involves three steps. The first step is to test for the order of integration of the natural logarithm of monetary base. This would be done by computing

¹⁰⁹in order to coincide with the beginning of the SADCC, the precursor of SADC.

the augmented Dickey-Fuller (ADF) test statistics (Dickey and Fuller, 1979) which tests for the presence of unit root under the alternative that the monetary bases are stationary around a fixed time trend and by another unit root test, the KPSS test (Kwiatowski et al, 1992). Conditional upon the outcome, the second step is to test for cointegration of the money supplies using the Johansen and Juselius (1990) maximum likelihood approach. If cointegration exists, then either uni-directional or bi-directional Granger-causality must exist in at least the $I(0)$ variables. The third step is to carry out a standard Granger-causality test augmented with an appropriate error-correction term derived from the long-run cointegrating relationship.

5.4.2.1. Unit Root Tests

The investigation of time series properties, checking for the presence of a unit root for instance, usually precedes the use of several econometric tests. A time series variable has the property of stationarity when it possesses a finite mean, variance and autocovariance function that are all independent of time. This implies that shocks to the series are necessarily transitory, and the effect of the shock will vanish over time and the series will tend to revert to its long-run equilibrium value. On the other hand, a non-stationary series possesses a time dependent mean or autocovariance function. However, if the series is not stationary, shocks to the series will be permanent and the series will have no tendency to revert to its long run equilibrium value (Hamilton, 1995). Moreover, a stochastic time series is said to be integrated of order d if the series requires differencing d times in order to achieve stationarity (Engle and Granger, 1987). Thus the

¹¹⁰ Including major countries' monetary base in the model would have produced an impact on all countries' money supply.

time series X_t is said to be integrated of order one, denoted $X_t \sim I(1)$, if its level series X_t is nonstationary but its first-differenced series ΔX_t is stationary, that is, $\Delta X_t \sim I(0)$.

Determining the order of integration of a time series variable involves testing for the number of autoregressive unit roots that the time series contains. Different testing procedures have been proposed, and this includes, among other, the ones developed by Dickey and Fuller (1979, 1981), Phillips and Perron (1988) and Kwiatkowski et al. (1992). In our analysis, unit root is tested using Augmented Dickey-Fuller (ADF) and Kwiatkowski et al. (1992) (KPSS) tests. Since the ADF test is known to be a low power test that is biased toward not rejecting the null hypothesis, we run both the ADF and the KPSS tests in order to get the optimum advantage of both tests. These two tests make a good combination, as the null hypothesis in one test is the alternative hypothesis in the other one. However, non-rejecting the null hypothesis of one test does not necessarily imply accepting the null hypothesis of the other test.

a. Augmented Dickey – Fuller (ADF test)

The standard Augmented Dickey-Fuller (ADF) test to assess the degree of integration of the variables is based on the following specifications:

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad (5.5)$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad (5.6)$$

$$\Delta y_t = a_0 + a_2 t + \gamma y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad (5.7)$$

Equations (5.6) and (5.7) are based on the equation (5.5) with an additional drift term α_0 and time trend t added to the equations. Our interest is in testing whether $\gamma = 0$. In the three specifications above, the null hypothesis is that the time series variable is nonstationary, i.e., it contains a unit root. The procedure is to estimate the above regressions using ordinary least squares (OLS) and then test the significance of γ based on the resulting t statistic. However, the test statistic does not have the conventional t -distribution because we are regressing an $I(0)$ series on a $I(1)$ series under the null hypothesis.

To implement the ADF tests, we follow the method suggested by Campbell and Perron (1991) and Ng and Perron (1993), where the lag length p is chosen by starting with an upper bound p_{\max} on p and estimates an autoregression of the order p_{\max} ¹¹¹. If the last included lag is significant, then $p = p_{\max}$; if not, reduce the order of the estimated auto-regression by one until the coefficient on the last included lag is significant. This procedure is repeated until the last lag becomes significant. If no lag is significant, then p is equal to zero.

In this study, we will perform the ADF test by using three specifications outlined above, i.e. equations 5.5-5.7. The critical values of the ADF test are taken from MacKinnon (1991). The null hypothesis of a unit root is rejected if the value of the t -statistics for γ (in absolute value) is greater than the critical values.

¹¹¹ As recommended by Schwert (1989), we use the Bartlett criteria to choose the maximum lag-length p :
 $\text{int } 12(T/100)^{1/4}$ where int denotes the largest integer less than or equal to $12(T/100)^{1/4}$ and T is the sample size.

b. Kwiatowski et al. test (KPSS test)

It is generally accepted that in the standard unit root tests (ADF(DF) or PP) in which the null hypothesis is that the series contains a unit root against the alternative of stationarity that the null hypothesis for many aggregate economic time series cannot be rejected unless there is strong evidence against it. Therefore, the reason for the failure to reject the null hypothesis of a unit root is due to the lack of power in the standard unit root tests. Kwiatkoswski, Phillips, Schmidt, and Shin (1992), (KPSS hereafter), have developed a test statistic which test has the null hypothesis of stationarity and the alternative of nonstationarity. KPSS considers a component representation of an economic time series variable y_t as the sum of a linear deterministic trend, a random walk, and a stationary error:

$$y_t = \delta t + r_t + \varepsilon_t \quad (5.8)$$

where ε_t is a stationary process and r_t is a random walk given by

$$r_t = r_{t-1} + u_t, \quad (5.9)$$

where u_t is i.i.d. $(0, \sigma_u^2)$.

Kwiatowski et al. (1992) derive the Lagrange Multiplier (LM) statistic for the null hypothesis of stationarity, $\sigma_u^2 = 0$, under the assumptions that the ε_t are i.i.d $N(0, \sigma_\varepsilon^2)$.

Following Kwiatkoswski et al (1992), to test the null hypothesis of level stationarity, in which case under the null hypothesis y_t is stationary around a level or deterministic mean, we define e_t as the residuals from regressing y_t on an intercept only. However, for the null hypothesis of trend stationarity, the residuals e_t are obtained from the regression of y_t on a constant term and a time trend. Let's define the partial sum of

deviations of residuals from the sample mean as $S_t = \sum_{i=1}^t e_i$, and let $S_{e_t}^2$ be the estimate of the variance of ε_t . The LM statistic can be written as:

$$LM = T^{-2} \sum_{t=1}^T S_t^2 / S_{e_t}^2 \quad (5.10)$$

$S_{e_t}^2$ is appropriate to use only when the residuals are iid $N(0, S_{e_t}^2)$. Hence, the LM test statistic should be modified to account for the possibility that the errors are not iid $N(0, S_{e_t}^2)$. Under this assumption, we need to find a consistent estimator, $S^2(l)$, of the long run variance, σ^2 , of the regression error. This can be done by using residuals e_t :

$$S^2(l) = T^{-1} \sum_{t=1}^T e_t^2 + 2T^{-1} \sum_{s=1}^l w(s, l) \sum_{t=s+1}^T e_t e_{t-k} \quad (5.11)$$

In equation 5.11, l represents the lag truncation parameter while following Newey and West (1987), the optimal weighting function $w(s, l) = 1 - s/(l+1)$ is used to guaranteed the is non-negativity of $S^2(l)$. Finally, we end up to a following test:

$$\hat{LM} = T^{-1} \sum_{t=1}^T S_t^2 / S^2(l) \quad (5.12)$$

As for the case of the ADF test, we use the formula $l = \text{int}[12(T/100)^{1/4}]$ suggested by Schwert (1989) to determine lag truncation parameter, l . The null hypothesis of level (or trend) stationarity is accepted if the value of the KPSS test statistics is less than its critical value. Since the distribution of LM is nonstandard, Kwiatowski et al. (1992) use Monte Carlo simulation to provide critical values of the test (Chang et al., 2002).

5.4.2.2. Cointegration Tests

The notion of cointegration has been introduced by Granger (1981) to investigate the long-run relationship between economic time series variables and the concept was further developed by Engle and Granger (1987). If we have variables that are cointegrated then least squares estimation will lead to consistent estimation of the coefficients. Cointegration means that one or more linear combinations of time series variables are stationary even though individually they are not. In other words, cointegration assures that if two variables are nonstationary and they have the same order of integration $I(1)$ then a linear combination of the two variables is stationary. Therefore, the two variables can achieve a long run relationship.

Johansen (1988) and Johansen and Juselius (1990) provide a multivariate cointegration test procedure which allows us to test for the number of cointegrating vectors (r) existing between a number of economic time series variables (n). It also allows us to test selected restrictions on these vectors. In other words, we can both estimate and test the equilibrium relationship among a set of nonstationary variables while at the same time abstracting from short run deviations from the equilibrium.

Johansen's methodology takes its starting point in the vector autoregression (VAR) of order p given by

$$y_t = \mu + A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t, \quad (5.12)$$

where y_t is an $n \times 1$ vector of variables that are integrated of order one, i.e. ; $I(1)$, and ε_t is a $n \times 1$ vector of innovations. This VAR can be re-parameterized as

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \varepsilon_t \quad (5.13)$$

where $\Pi = \sum_{i=1}^p A_i - I$ and $\Gamma_i = -\sum_{j=i+1}^p A_j$

This process from a VAR model to equation (5.13) is called the cointegrating transformation. The long-run information matrix Π is the key to Johansen's cointegration test because its rank r determines the number of cointegrating vectors. Π can also be expressed as $\alpha\beta'$, where α and β are $n \times r$ matrices. α indicates the speed of adjustment of variables to the deviations from equilibrium and each column of β is a cointegrating vector.

Johansen proposed two statistics to test the rank of the long-run information matrix Π , the *trace* and the *maximum eigenvalue* (L-max) statistics:

The trace test statistic is implemented by

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^p \ln(1 - \hat{\lambda}_i), \quad (5.14)$$

while the maximum eigenvalue statistic is given by

$$\lambda_{\text{max}} = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (5.15)$$

where $\hat{\lambda}_i$ are estimated eigenvalues ranked from largest to smallest. The trace statistic λ_{trace} is a likelihood ratio test statistic for the hypothesis that there are *at most* r cointegrating vectors. The null hypothesis for this test is that the number of cointegrating vectors is less than or equal to r against general alternative hypothesis. However, the second statistic λ_{max} tests the null hypothesis of r cointegrating vectors against the

hypothesis of $r+1$ cointegrating vectors. If the null hypothesis is $r=0$, then the alternative hypothesis is $r=1$ (one cointegrating vector). The first (second) test tends to have higher power than the second (first) test does when λ_i are evenly (unevenly) distributed. Johansen and Juselius (1990) and Osterwald-lenium (1992) provided asymptotic critical values for the Trace and Max statistics.

The determination of the optimal lag length is very important in econometric estimation due to the fact that there exists a trade-off between reducing the sum of squares through the estimation of additional coefficients and the associated loss of degrees of freedom. For this purpose, we applied three different statistical criteria:

(1) The Akaike information criterion (AIC),

$$AIC = T \cdot \ln(\text{residual sum of squares}) + 2n, \quad (5.16)$$

(2) The Schwartz information criterion (SBC),

$$SBIC = T \cdot \ln(\text{residual sum of squares}) + n \cdot \ln(T), \quad (5.17)$$

and (3) the multivariate likelihood ratio (LR) test, as suggested by Sims(1980).

$$LR = (T - c) (\ln |\Sigma_k| - |\Sigma_{k-1}|),$$

where n = number of parameters estimated, T = number of observations, k = number of lags in each equation of the system, c = number of parameters estimated in each equation of the unrestricted system ($k+1$ lags), $\ln |\Sigma_k|$ = natural logarithm of the determinant of Σ_k (Enders, 1995).

We first estimated the model and get the lag length from the AIC and SBC. To choose between the outcomes of these two lag selection procedures we performed LR multivariate test adjusted for small samples. It is important to mention that we perform a

set of diagnostic tests such as a test for autocorrelation in the residuals by using the Ljung-Box Portmanteau test and the test for normality (Jacque-Bera test).

5.4.2.3. Granger-Causality Tests

Granger Causality is a testing technique intended to check for the dynamic relationship between time series variables. Specifically, this technique is employed in economic literature to test the direction and magnitude of the relationship between two variables. Granger (1969) defined causality as a one time series variable predicting another time series variable. Granger (1980) assumes that X_t “Granger causes” Y_t if X_t helps in prediction of Y_t . It assumes that the time series of both variables X_t and Y_t contain all information to help to predict X_t and Y_t . By taking lagged values of both X_t and Y_t a time series variable X_t *Granger causes* another time series variable Y_t if lagged values of X_t and Y_t help to a better prediction of Y_t rather than using past values of Y_t alone. Also, we say that a time series variable Y_t *Granger causes* another time series variable X_t if lagged values of Y_t and X_t helps for a better prediction of Y_t rather than using past values of X_t alone. The test is performed using the following bivariate regressions for variables X and Y .

$$X_t = \beta_1 + \sum_{i=1}^p \alpha_i X_{t-i} + \sum_{i=1}^p \mu_i Y_{t-i} + \varepsilon_{1t} \quad (5.19)$$

$$Y_t = \beta_2 + \sum_{i=1}^p \delta_i Y_{t-i} + \sum_{i=1}^p \phi_i X_{t-i} + \varepsilon_{2t} \quad (5.20)$$

Here, ε_{1t} and ε_{2t} are random errors which are assumed to be uncorrelated with zero mean and constant variance. Note that the current values of the variables X_t (Y_t) is explained by lagged values of itself and lagged values of the other variable Y_t (X_t). For equation

(5.19), the null hypothesis that X does not Granger-cause Y is tested against the alternative hypothesis that X does Granger-causes Y . Accordingly, if the null hypothesis of no causality is rejected, then we can say that X does Granger-causes Y . The same procedure is also performed for equation (5.20).

The Granger test has one substantial drawback: it is only valid if the time series data are stationary or $I(0)$. In order to determine the direction of causality by using the Granger test it is therefore necessary to test for the integration properties of each variable. If the series have been determined to be cointegrated, and once a long run relationship has been established between the variables, the Error Correction Model (ECM) is more appropriate for causality analysis¹¹². The difference between the standard Granger causality test and the error correction based causality test is that the ECM introduces an additional channel for Granger causality to emerge since the error term itself is a function of X_{t-1} and Y_{t-1} . According to Engle and Granger (1987), independent variables “cause” the dependent variables either if the error-correction term carries a significant coefficient or if the first difference independent variables are jointly significant.

The error correction model is presented in the following equations:

$$X_t = \beta_1 + ECT_{t-1} + \sum_{i=1}^p \alpha_i X_{t-i} + \sum_{i=1}^p \mu_i Y_{t-i} + \varepsilon_{1t} \quad (5.21)$$

$$Y_t = \beta_2 + ECT_{t-1} + \sum_{i=1}^p \delta_i Y_{t-i} + \sum_{i=1}^p \phi_i X_{t-i} + \varepsilon_{2t} \quad (5.22)$$

5.5. Empirical results

5.5.1. Unit Root Test Results

We use the natural logs for all series. The first step in the analysis will be to determine whether the individual country-specific monetary bases are non-stationary. We tested for the order of integration of the variables by means of two alternative tests. On the one hand, the Augmented Dickey-Fuller test (ADF) was applied under the null hypothesis that the variable has a unit root. And on the other hand, given the small power of this test under certain stochastic properties of the series, the KPSS test for which under the null hypothesis is that of stationarity was used.

Since, for the ADF test, the critical values are sensitive to the presence of a constant and/or a trend term and number of lags used in the estimation, we tested three different models depending on whether we included in the estimated equation a constant and/or a trend term or not. We use a maximum of 12 lags that were initially included in the ADF tests for the error-term. Then, the appropriate number of lags for each model was selected on the basis of the Akaike and Schwartz's information criteria. The ADF results for the monetary base series are presented in panel A of table 5.1. The results indicate that stationarity is rejected for the monetary base series in levels (i.e., $I(1)$ accepted), but stationarity is not rejected for the first-difference of the monetary base

¹¹² Accordingly, if the variables are cointegrated and we use the standard Granger causality test to investigate the causality between variables, the regressions can produce misleading results.

Table 5.1: Unit Root Test Results:

Panel A: Augmented Dickey-Fuller Tests

Country	Levels		First Differences			
	$\tau_{(1)}$	$\tau_{(2)}$	$\tau_{(3)}$	$\tau_{(1)}$	$\tau_{(2)}$	$\tau_{(3)}$
Botswana	-2.385	-0.005	2.394	-5.513*	-6.029*	-5.459*
Mauritius	-2.784	-0.025	4.440	-3.074*	-7.582*	-9.106*
Malawi	-0.590	-1.091	5.895	-1.937**	-9.681*	-2.714*
Seychelles	-1.428	-0.919	1.679	-8.669*	-9.896*	-8.669*
South Africa	-3.303***	-0.432	2.021	-2.959*	-4.182*	-3.671*
Tanzania	-0.217	-1.382	4.845	-1.948**	-8.733*	-2.495*
Zimbabwe	3.979	3.630	2.718	-0.183	-1.999	-0.696

Panel B: KPSS Test Results

Country	Levels		First Differences	
	Without trend	With trend	Without trend	With trend
Botswana	5.611	0.509	0.078	0.070
Mauritius	5.756	0.485	0.036	0.037
Malawi	5.756	1.120	0.251	0.159
Seychelles	5.360	0.575	0.133	0.101
South Africa	5.760	0.454	0.097	0.080
Tanzania	5.879	0.839	0.299	0.135
Zimbabwe	5.384	1.035	1.467	0.321

Notes: $\tau_{(1)}$, $\tau_{(2)}$, and $\tau_{(3)}$ represent values of ADF statistics with drift and trend, with drift only and without drift and trend, respectively.

Critical values for ADF tests are taken from McKinnon, 1993. (*), (**), and (***) : significant at 1%, 5% and 10%, respectively.

Critical Values for KPSS tests are taken from Kwiatoski et al. (1992).

series, the only exception being the case for Zimbabwe. Hence, for these countries results indicate that the level of series are all $I(1)$. For the case of Zimbabwe, further analysis shows that the levels of monetary base series are $I(2)$. One plausible explanation of this result is that Zimbabwe had recently experienced hyperinflation.

According to the KPSS test whose results are presented in panel B of table 5.1, the null of trend stationarity in levels is not rejected for all the monetary bases considered and for both the model with and without trend (with the exception of Malawi and Tanzania, where the null is rejected in the model without trend), while the opposite happens for the levels of the variables. However, as for the ADF test result, the null of stationarity is rejected for the case of Zimbabwe for both models. Even though, we planned to rely on the results from the KPSS test for the next step, both tests lead to the same outcome.

5.5.2. Cointegration Test Results

Having established that all variables are $I(1)$, with the exception of Zimbabwe, we are now free to test for multivariate cointegration. We have applied three alternative lag length-selection criteria in order to choose the appropriate lag length in the VAR. These include the Akaike Information Criteria (AIC), the Schwartz Bayesian Criterion (SBC) and the likelihood ratio (LR) test. The application of all three criteria for monetary base led to the following lags for these countries: 7, 4, 3, 1, 2 and 2 for Botswana, Mauritius, Malawi, Seychelles and Tanzania, respectively. For the case of Zimbabwe, where we did not perform a cointegration test, the lag length of 2 has been obtained and this will be used in the next step.

We tested for cointegration between the South African monetary base growth rate and that of the non-CMA members in our sample in a bivariate setting. Trace statistics for the cointegration of South African and other SADC members' monetary base series are presented in table 5.2. The hypothesis of a single cointegrating vector is not rejected at the 5 percent level of significance in the case of South African monetary base and those of Botswana and Mauritius. For the case of Seychelles, the level of significance is slightly greater than the conventional levels (almost 11 percent). On the basis of such results we conclude that the monetary base series are cointegrated and therefore causality related.

Since there are only two countries for each test, a finding of one cointegrating vector would indicate one common policy shared by the two countries; i.e. full convergence of monetary policy. However, a finding of no cointegrating relationship, means that there has been zero convergence of policy. From the above results, we infer from the fact that there is a long-run relationship between monetary base in South Africa and that of the two countries, namely Botswana and Mauritius. Therefore, these two countries have the ability to follow South African monetary policy. It is not surprising in the case of Botswana since this country is considered a *de facto* member of the CMA. For Mauritius, its economic indicators, especially the rate of inflation and the growth of monetary base, are similar to the CMA average. This result supports the evidence found by Sparks (2002) who suggests that these two countries could be among the first non-CMA members of SADC to join the monetary union if this happens.

5.5.3. Causality Test Results

We run causality tests in order to check whether the non-CMA members were able to follow the SARB leadership in setting this monetary aggregate. The estimated coefficients for the two regressions are reported in tables 5.3 and 5.4. The regression we are mostly interested is the one with South Africa monetary base as dependent variable since we want to know if short-run movements in South African's monetary base have influence on the monetary base of the other countries, this is shown in table 5.3.

Table 5.2: Cointegration Tests: Johansen's Trace Test Results.

Country	$r \leq 0$	$r \leq 1$
Botswana	14.134	5.747*
Mauritius	12.841	5.758*
Malawi	5.980	0.184
Seychelles	8.835	2.363
Tanzania	4.875	0.055
Critical values		
5%	15.4	3.8

Notes: Critical values are from Osterwald-Lenum (1992).

The following vector error correction models were estimated:

$$\Delta X_t = \beta_1 + Z_{t-1} + \sum_{i=1}^p \alpha_i \Delta X_{t-i} + \sum_{i=1}^p \mu_i \Delta Y_{t-i} + \varepsilon_{1t}$$

$$\Delta Y_t = \beta_2 + Z_{t-1} + \sum_{i=1}^p \delta_i \Delta Y_{t-i} + \sum_{i=1}^p \phi_i \Delta X_{t-i} + \varepsilon_{2t}$$

where

ΔX_t represents growth rate of monetary base for South Africa at time t ,

ΔY_t the growth rate of monetary base for another SADC country and,

p is the lag length.

In table 5.5, we present the results of the Granger-causality tests. As we noticed above, if the hypothesis is correct, movements in South Africa monetary base should temporally precede movements in the others, i.e., the causality relationship must run from South Africa to the other countries. For the non-CMA members which exhibit long-run relationship with South Africa, we use a Vector Error-Correction Model (VECM). The likelihood ratio tests indicate that there is a bi-directional causality between South Africa and Mauritius as well as Botswana. The error-correction coefficient for the case of Mauritius is not statistically significant when South Africa is the dependent variable, but the reverse occurs when Mauritius is the dependent variable. In the case of Botswana, the opposite occurs, i.e. the error-correction coefficient is statistically significant in the former case and insignificant in the latter. The Granger-causality results do not provide evidence of South African leadership in the strict sense since, in order for this hypothesis to be valid, the causality must run from South Africa to Mauritius or Botswana, without feedback. This evidence shows that there is a room for these countries to set independent monetary policies.

Table 5.3: Estimation Results for Granger-Causality Tests:

Dependent Variable: South Africa Monetary base

	Botswana	Mauritius	Malawi	Seychelles	Tanzania	Zimbabwe
ΔX_{t-1}	-0.510*	-0.208*	-0.602*	-0.156*	0.383*	0.018
ΔX_{t-2}	-0.299*	-0.053	-0.326*	-	0.243*	0.151**
ΔX_{t-3}	-0.076	0.051	-0.050	-	-	-
ΔX_{t-4}	-0.062	-0.047				
ΔX_{t-5}	0.042					
ΔX_{t-6}	0.240*					
ΔX_{t-7}	0.061					
ΔY_{t-1}	-0.301**	0.005	-0.116**	0.116	0.023	0.026
ΔY_{t-2}	-0.164	0.036	-0.031	-0.048	-0.150	
ΔY_{t-3}	-0.188	-0.140	-0.045			
ΔY_{t-4}	0.144	-0.429				
ΔY_{t-5}	0.042					
ΔY_{t-6}	0.239***					
ΔY_{t-7}	-0.199					
C	0.021**	0.031*	0.022*	0.007	0.030*	0.026*
Z_{t-1}	-0.045	-0.012				
Adj.R ²	0.28	0.04	0.27	0.02	0.14	0.02
JB	63.1***	41.55***	282.67***	1745***	84.57***	272.87***
Q(12)	1.74	15.7	16.5	7.10	7.04	23.4
Arch(12)	1.72	13.8	14.2	7.0	10.8	25.1**

Notes: (*), (**), and (***) represent significance at 10%, 5% and 1% level, respectively.

JB and Q are the values for Jacque-Bera test for normality and Ljung-Box for serial correlations.

Table 5.4: Estimation Results for Granger-Causality Tests:

Dependent Variable: SADC country's Monetary base

	Botswana	Mauritius	Malawi	Seychelles	Tanzania	Zimbabwe
ΔX_{t-1}	0.004	0.030	0.083	0.046	-0.017	-0.024
ΔX_{t-2}	-0.030	0.025	0.120	-	0.003	-0.047
ΔX_{t-3}	0.012	0.011	0.015	-	-	-
ΔX_{t-4}	0.043***	-0.023				
ΔX_{t-5}	0.051**					
ΔX_{t-6}	0.019					
ΔX_{t-7}	-0.001					
ΔY_{t-1}	0.013	0.023	0.019	0.027	0.028	0.021
ΔY_{t-2}	0.030	0.009	0.019		0.014	0.009
ΔY_{t-3}	0.077	0.079	0.091			
ΔY_{t-4}	0.027	0.044				
ΔY_{t-5}	-0.041					
ΔY_{t-6}	0.074					
ΔY_{t-7}	0.190*					
C	0.006***	0.009*	0.008**	0.011*	0.012*	0.014*
Z_{t-1}	0.012	0.015**				
Adj.R ²						
JB	1310***	1369***	1915***	1620***	1703***	1800***
Q(12)	10.7	16.7	16.0	19.2	18.5	17.2
Arch(12)	12.3	18.9***	19.3***	25.3***	24.4***	22.8***

Notes: (*), (**), and (***) represent significance at 10%, 5% and 1% level, respectively.

JB and Q are the values for Jacque-Bera test for normality and Ljung-Box for serial correlations.

Using a VAR model, Malawi presents evidence of being able to follow South African leadership. There is a causality running from South Africa to Malawi. Malawi is responsive to short-run movements from South Africa's monetary base. For the remaining countries in our sample, there is lack of evidence for these countries to follow the leadership of the SARB in setting their monetary policy.

Table 5.5: Granger-Causality Test Results

	Sum of coefficients	ECM term	LR-stat.	DF	P-Value
Panel A. Null Hypothesis: <i>South Africa doesn't Granger-cause country X.</i>					
Botswana	-0.604	-0.045***	11.933	7	0.103
Mauritius	-0.258	-0.012	12.244	4	0.016
Malawi	-0.978		5.987	3	0.030
Seychelles	-0.156		1.100	1	0.294
Tanzania	-0.626		0.514	2	0.773
Zimbabwe	0.169		2.088	2	0.352
Panel B. . Null Hypothesis: <i>Country X doesn't Granger-cause South Africa.</i>					
Botswana	0.098	-0.012	13.991	7	0.051
Mauritius	0.043	0.015**	9.157	4	0.057
Malawi	0.219		3.520	3	0.318
Seychelles	0.046		2.151	1	0.142
Tanzania	-0.017		0.152	2	0.927
Zimbabwe	-0.071		2.545	2	0.280

Notes: (**) and (***) mean significance at 5 and 10%, respectively.

5. 6. Conclusion

In this paper, we have investigated whether the SADC countries which are not currently members of the Common Monetary Area could join the monetary union. We conjecture that for a country to become member of the union, it must satisfy a set of criteria. For our case, membership is conditional on the convergence of monetary policy, using monetary base growth rate, of the potential members to that of the South Africa which is the dominant player in the monetary union and de facto responsible for monetary policy. To test such a convergence we use Johansen cointegration procedure, a testing framework which has long been used in Europe in the case of the German dominance in the European Monetary System.

As we assume that the non-CMA members could join the monetary union on individual basis, our analysis is conducted in a bivariate setting. In order for a country to join the union, we have to find evidence of a long-run relationship between its monetary base growth rate and that of South Africa through a Johansen cointegration test. We also conducted Granger-causality test to see whether short-run movements in South Africa's monetary base have impact on that of the other countries taken individually.

Empirical tests find evidence of long-run relationship between Botswana and Mauritius. These two countries show that they are able to follow the leadership of the SARB in setting their monetary base. Thus, they are good candidates for membership in the CMA. Whereas the Granger-causality test results show that short-run movements in South Africa can influence that of Mauritius and Botswana, there is also a reverse causality from these countries to South Africa. Hence, this shows evidence of possibility for these countries to set independent monetary policies. The leadership hypothesis in the

strict sense is therefore rejected for the case of Mauritius and Botswana. The only other country which shows evidence of following the South Africa's leadership in terms of Granger-causality is Malawi. The relationship runs from South Africa to Malawi. For the remaining countries, there is lack of empirical evidence for them to be able to follow South African's leadership in an expanded Common Monetary Area at this stage.

The results obtained in this study are similar to that of Sparks (2002) in which Botswana and Mauritius were among the countries which could be the first to join the CMA if possible. We have to recall that Botswana is considered *de facto* as a CMA member since its currency is pegged to a basket of currencies where the weight for the South African *rand* is between 60 to 70 percent. Mauritius is one of the most prosperous countries in the region and its economy is stable. Its inflation rate is comparable to that of CMA countries.

Empirical evidence suggests that most SADC countries were not able to follow the South African's leadership and this can be explained in several ways. First, our sample period includes a period where South Africa, our proxy for the CMA, was not member of the SADC or its precursor, the SADCC, and there was no economic link between these countries and South Africa as a result of the Apartheid system in South Africa. Second, there was not a worldwide interest in monetary union as it became after the European countries adopted the Maastrich Treaty and the creation of a single currency in Europe. The accession of South Africa came shortly after the adoption of the Maastrich Treaty which we assume that this could implicitly lead to the emergence of the idea of monetary union in the region since South Africa is the leading country for the CMA. These events should be taken into consideration. We think that a sample period

starting from the accession of South Africa into SADC, more precisely in 1995 where South Africa was given the responsibility for the financial sector, or the creation of the EMU, could provide a better indicator for the convergence in the region. This period is, however, very short in order to conduct test for long-run relationships.

CHAPTER 6: SUMMARY AND CONCLUSION

The launch of a common currency for large industrialized countries in Europe has renewed interests in monetary integration worldwide, and in particular, in the African continent. Even though the idea of creating a continent-wide monetary union has been rooted in the African union's treaty, the European experience constitutes a lesson for the African countries. Several regional economic blocs in Africa are planning to launch a common currency in the next decade as an intermediary step towards the emergence of a single currency for the entire continent. In Southern Africa, through the SADC organization, the goal is to create a regional central bank and to launch a single currency by 2016.

Rather than investigating whether the 14 member states of the SADC constitute an optimum currency area (OCA) or are suitable for a monetary union, we rely on the literature on monetary integration and apply empirically three different economic issues in the context of Southern African countries.

In Southern Africa, a regional free trade agreement has been elaborated and almost completed, while that of a monetary union is still in debate. Several studies have already investigated the impact of a FTA on the intra-regional trade. However, the effect of a regional single currency on the intra-SADC trade has not been examined empirically. In the first essay (Chapter 3), we intend to provide an empirical contribution to this issue. For this purpose, the gravity model of international trade was employed to analyze the determinants of bilateral trade flows for the period 1992-2002 using a large dataset comprised of 70 countries. Our results demonstrate that the observed trade flows among SADC countries are largely greater than the ones predicted by the empirical model. With

respect to the trade potentials between each individual SADC member and South Africa, and we found overall that these countries over-trade with respect to South Africa. However, there is still some unexploited trade potential for several pairs of SADC countries. Hence, this analysis shows that the argument of improving intra-regional trade flows when the countries of the economic grouping share the same currency cannot be empirically sustained in the case of SADC. Moreover, sharing the same currency as well as a FTA would certainly have an impact on the economy of the region for other reasons.

In terms of implementing a single currency in a group of countries, the experience of Western European countries demonstrates that this involves a long period of transition, and this may include pegging bilateral exchange rates. Since SADC member states have different exchange rate regimes and to avoid a high volatility of their nominal exchange rate, we suggest that these countries have to start an exchange rate coordination similar to that of the exchange rate mechanism (ERM) followed by the European countries. For this, the SADC countries have to find a common nominal anchor to which they will peg their currencies. In the second essay (chapter 4), we used the optimum currency area theory to find the optimum currency peg for Southern African countries. We follow the model developed by Bayoumi and Eichengreen (1997). Using a panel of 63 countries, we obtained OCA indices for SADC countries vis-à-vis five potential nominal anchor currencies. Then, we employ a methodology developed by Benassy-Quere et al. (1998), and we find that the optimal nominal currency anchor for these countries is the US dollar. Hence, SADC countries have to peg their currencies to the US dollar. We should note that most of the SADC countries have as main destination for their exports the OECD countries, which are also the main source of their imports. Therefore, pegging SADC

currencies to a major currency such as the US dollar would be preferable than pegging to a regional currency anchor, such as the South African rand. If the rand is used as the anchor currency, then fluctuations of the rand against other currencies outside the union will have a major impact on the export revenues of SADC countries¹¹³.

A further objective of the second essay was to find pairs of SADC countries which are suitable for a common currency using the estimated OCA indices. We found almost 20 country-pairs which appears to be suitable for a single currency in the region¹¹⁴. However, for countries such as Angola, Congo, and Mozambique, the evidence found so far does not favor their membership in a monetary union with their SADC partners.

Finally, in the last essay (Chapter 5), we have investigated whether the SADC countries which are not currently members of the Common Monetary Area could join the existing monetary union in the near future. We conjecture that for a country to become member of the monetary union, it must satisfy a set of criteria. For our purpose, membership is conditional on the convergence of monetary policy, using monetary base growth rate, of the potential members to that of the South Africa¹¹⁵. To test such a convergence we use Johansen cointegration procedure¹¹⁶. Empirical tests find evidence of long-run relationship for the cases of Botswana and Mauritius. Whereas the Granger-causality test results show that short-run movements in South Africa can influence that of

¹¹³ As noted by Grandes (2003), South Africa mainly exports industrial products while the other countries export primary commodities, so the fluctuations of the rand may, in fact, hurt export revenues of its SADC partners.

¹¹⁴ We use estimated OCA indices for pairs of CMA countries as benchmark.

¹¹⁵ South Africa is the dominant player in the monetary union and de facto responsible for monetary policy.

¹¹⁶ Finding evidence of long-run relationship between any given non-CMA country and South Africa implies that the country is able to follow the leadership of the South Africa Reserve Bank in setting their monetary policy.

Mauritius and Botswana, and there is also a reverse causality from these countries to South Africa. Hence, this shows evidence of a possibility for these countries to set independent monetary policies. The leadership hypothesis in the strict sense is therefore rejected for the cases of Mauritius and Botswana. The only other country which shows evidence of following the South Africa's leadership in terms of Granger-causality is Malawi. The relationship runs from South Africa to Malawi. For the remaining countries, there is lack of empirical evidence for them to be able to follow South African's leadership in an expanded Common Monetary Area at this stage.

As mentioned earlier, the African Union's 1999 *Sirte declaration* retained the African economic and monetary union agenda, but made a case for an accelerated implementation of the process for creating institutions of the union. We should bear in mind that the single currency for the entire African continent remains a longer-term possibility and it would depend on the level of integration since the European Union had taken more than 40 years from its inception to the introduction of a single currency, the euro. I think that it would be better for the African Union to start solving the problem of overlapping memberships in economic integration arrangements which undermines collective efforts towards the achievement of the common goal of the African economic and monetary union. Several countries are members of different economic groupings which are planning to have a single regional currency¹¹⁷. Hence, in order to deal with the case of overlapping memberships and to maximize collective efforts to reach the goal of a continental single currency, the African Union should require each country to choose the projected regional monetary union in which it may participate.

¹¹⁷ Tanzania, for instance, is members of EAC, SADC and COMESA, and these three regional economic arrangements plan to launch a single currency.

Following the European example, I think that Africa needs more time to achieve its goal of an economic and monetary union. This can be justified by the fact that a monetary union is only feasible if we have stable macro-economic policies throughout the continent, but few AU member countries can claim to have those policies right now. Moreover establishing a monetary union would also mean that economically stronger countries carry the economically weaker ones, as fiscal decisions affect all members. This has always been a major point of debate within European Union member countries, however overcoming the gaps between the rich and the less rich countries in Europe is relatively manageable. But Africa is a continent where we have many countries which are still economically and politically unstable. Many of these countries do not even have a functional central bank. At this moment, I think that it would make more sense to strengthen the existing regional economic groupings. We should also make sure that Nepad delivers on its peer-review mechanism and in that way achieve economic growth, good governance and strong fiscal policies.

The Southern African Development Community (SADC) agenda is to achieve the goal of a single currency by 2016. For the time being, this deadline seems unrealistic. The organization has several countries which have a track record of bad economic management. Even though these countries show good progress in terms of achieving the targets of the macroeconomic convergence criteria, outlined in the Memorandum of Understanding (See Roussow, 1996), some countries such as Congo and Angola needs time to strengthen their production capacity. These deadlines are helpful in the sense that it would push different countries to work towards these targets and it would also allow countries to compare their performances over time with their peers in the region. The

SADC needs to be more flexible in the adjustments of these deadlines, hence, not only countries which satisfy these criteria would enter the monetary union, but also those which show good progress in the achievement. The road to a single currency in Southern Africa is too long. We should bear in mind that gradualism and realism in designing and implementing regional integration arrangements are very important to achieve the goal of a single currency.

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Appendix 1.1: Stages towards African Economic Union

1. Strengthening of existing regional economic communities (RECs) and establishment of RECs where necessary (not to take more than five years).
2. Stabilisation of tariff and non-tariff barriers, customs duties and internal taxes within each REC and the strengthening of sectoral integration, particularly in the areas of trade, agriculture, finance, transport and communications, industry and energy. Harmonisation of the activities of the RECs (not to take more than five years).
3. Establishment of free trade and customs union areas at the level of RECs with the associated harmonization of tariff and non-tariff barriers (expected to take ten years).
4. Co-ordination and harmonization of tariff and non-tariff systems among RECs with the movement towards a continental customs union (to take two years).
5. Establishment of an African common market and the adoption of common policies (to take four years) including the free movement of peoples.
6. Integration of economic, political, social and cultural sectors towards a single African market and a Pan-African economic and monetary union. The setting up of a single African central Bank, single pan-African currency and the election of the Pan-African Parliament (to take no more than five years)

Source: Masson and Pattillo (2005), and Adams (2005)

<http://www.dfa.gov.za/foreign/Multilateral/africa/treaties/aec.htm>

Appendix 1.2: Proposed regional monetary unions in Africa

1. *The Arab Monetary Union (AMU)* made up of Algeria, Libya, Mauritania, Morocco, and Tunisia;
 2. *The Common Market for Eastern and Southern Africa (COMESA)* with member states including Angola, Burundi, Comoros, DRC, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe;
 3. *The Economic Community of Central African States (ECCAS)* membership includes Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea, Gabon, Rwanda, and São Tomé and Príncipe;
 4. *The Economic Community of West African States (ECOWAS)* that constitutes Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.
 5. *The Southern African Development Community (SADC)* that has Angola, Botswana, DRC, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe as its members.
- (Masson and Pattillo, 2005)

Appendix 3.1: *Trade creation and trade diversion: change in trade flows*

	% increase, SADC trade	% increase, ROW trade
FTA large	9.4	- 0.7
FTA low	9.2	- 0.5
Cumin large	7.2	6.8
Cumin low	7.3	5.2
FT large	6.5	11.7
FT low	6.8	9.1

Note: Percentage increase in trade calculated as the average change in imports.

Source: Evans (2002).

Appendix 3.2: *List of countries used in the empirical analysis*

Angola	Hong Kong	Rwanda
Russia	India	Ghana
Austria	Indonesia	Senegal
Belgium	Antigua and Barbuda	Seychelles
Benin	Ireland	Singapore
Dominica	Italy	South Africa
Burkina Faso	Japan	Spain
Burundi	Kenya	Sweden
Cameroon	Korea	Suisse
Canada	Madagascar	Tanzania
C.A. Rep	Malawi	Thailand
Greece	Malaysia	Togo
China	Mali	Tunisia
Congo, DRC	Mauritania	Philippines
Congo	Mauritius	Uganda
Cote d'Ivoire	Mexico	Portugal
Denmark	Morocco	UK
Egypt	Mozambique	USA
Equatorial Guinea	Netherlands	Guinea
Ethiopia	Germany	Zambia
Finland	Niger	Zimbabwe
France	Nigeria	Grenada
Gabon	St Vincent and Grenadines	St Lucia
Gambia	Pakistan	St Kitts and Nevitt

Appendix 3.3: Gravity Model Coefficient Estimates (OLS Results for each year)

	1992	1997	2002
VARIABLES	COEFFICIENTS	COEFFICIENTS	COEFFICIENTS
Real GDP	0.814(37.74)*	0.710(39.41)*	0.848(41.02)*
Real GDP/capita	0.128(4.42)*	0.123(4.47)*	0.100(3.53)*
Distance	-0.315(-3.28)*	-0.347(-4.12)*	-0.625(-4.81)**
Linder effect	-0.067(-2.35)*	-0.130(-4.82)*	-0.058(-2.04)*
Exch. rate volatility	-1.663(-3.75)*	1.598(2.04)**	0.008(0.06)
Adjacency	1.602(6.66)*	1.021(4.70)*	1.343(5.02)*
Common language	0.335(2.99)*	0.115(0.98)	0.217(1.91)***
Islands	-0.592(-6.38)*	-0.455(-4.81)*	-0.655(-7.55)*
Landlocked	-0.194(-1.52)*	-0.022(-0.22)	-0.142(-1.10)
FTA	0.939(4.77)*	0.798(4.33)*	0.765(3.00)*
Currency union	0.773(2.20)*	1.170(4.12)*	0.209(0.93)
Ever colonized (or by) partner	1.527(9.08)*	1.791(10.25)*	1.514(8.67)*
Common colonizer	0.301(1.39)	0.364(1.70)***	0.611(3.00)*
Constant	-22.306(-22.84)*	-16.282(-18.38)*	-20.977(-21.89)*
No. of observations	1745	1551	1867
R-square	0.805	0.751	0.796

Notes:

All variables except dummies are expressed in natural logarithms.

Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.

t-statistics are in parentheses.

(*), (**) and (***) denote significance at the 1%, 5% and 10%, respectively.

Appendix 4.1: IMF's Exchange Rate Classifications

This classification system is based on members' actual, de facto, arrangements as identified by IMF staff, which may differ from their officially announced arrangements. The scheme ranks exchange rate arrangements on the basis of their degree of flexibility and the existence of formal or informal commitments to exchange rate paths. It distinguishes among different forms of exchange rate regimes, in addition to arrangements with no separate legal tender, to help assess the implications of the choice of exchange rate arrangement for the degree of monetary policy independence.

Exchange Rate Regimes

Exchange Arrangements with No Separate Legal Tender

The currency of another country circulates as the sole legal tender (formal dollarization), or the member belongs to a monetary or currency union in which the same legal tender is shared by the members of the union. Adopting such regimes implies the complete surrender of the monetary authorities' independent control over domestic monetary policy.

Currency Board Arrangements

A monetary regime based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate, combined with restrictions on the issuing authority to ensure the fulfillment of its legal obligation. This implies that domestic currency will be issued only against foreign exchange and that it remains fully backed by foreign assets, eliminating traditional central bank functions, such as monetary control and lender-of-last-resort, and leaving little scope for discretionary monetary policy. Some flexibility may still be afforded, depending on how strict the banking rules of the currency board arrangement are.

Other Conventional Fixed Peg Arrangements

The country (formally or de facto) pegs its currency at a fixed rate to another currency or a basket of currencies, where the basket is formed from the currencies of major trading or financial partners and weights reflect the geographical distribution of trade, services, or capital flows. The currency composites can also be standardized, as in the case of the SDR. There is no commitment to keep the parity irrevocably. The exchange rate may fluctuate within narrow margins of less than ± 1 percent around a central rate-or the maximum and minimum value of the exchange rate may remain within a narrow margin of 2 percent-for at least three months. The monetary authority stands ready to maintain the fixed parity through direct intervention (i.e., via sale/purchase of foreign exchange in the market) or indirect intervention (e.g., via aggressive use of interest rate policy, imposition of foreign exchange regulations, exercise of moral suasion that constrains foreign exchange activity, or through intervention by other public institutions). Flexibility of monetary policy, though limited, is greater than in the case of exchange arrangements with no separate legal tender and currency boards because traditional central banking

functions are still possible, and the monetary authority can adjust the level of the exchange rate, although relatively infrequently.

Pegged Exchange Rates within Horizontal Bands

The value of the currency is maintained within certain margins of fluctuation of at least ± 1 percent around a fixed central rate or the margin between the maximum and minimum value of the exchange rate exceeds 2 percent. It also includes arrangements of countries in the exchange rate mechanism (ERM) of the European Monetary System (EMS) that was replaced with the ERM II on January 1, 1999. There is a limited degree of monetary policy discretion, depending on the band width.

Crawling Pegs

The currency is adjusted periodically in small amounts at a fixed rate or in response to changes in selective quantitative indicators, such as past inflation differentials vis-à-vis major trading partners, differentials between the inflation target and expected inflation in major trading partners, and so forth. The rate of crawl can be set to generate inflation-adjusted changes in the exchange rate (backward looking), or set at a preannounced fixed rate and/or below the projected inflation differentials (forward looking). Maintaining a crawling peg imposes constraints on monetary policy in a manner similar to a fixed peg system.

Exchange Rates within Crawling Bands

The currency is maintained within certain fluctuation margins of at least ± 1 percent around a central rate-or the margin between the maximum and minimum value of the exchange rate exceeds 2 percent-and the central rate or margins are adjusted periodically at a fixed rate or in response to changes in selective quantitative indicators. The degree of exchange rate flexibility is a function of the band width. Bands are either symmetric around a crawling central parity or widen gradually with an asymmetric choice of the crawl of upper and lower bands (in the latter case, there may be no preannounced central rate). The commitment to maintain the exchange rate within the band imposes constraints on monetary policy, with the degree of policy independence being a function of the band width.

Managed Floating with No Predetermined Path for the Exchange Rate

The monetary authority attempts to influence the exchange rate without having a specific exchange rate path or target. Indicators for managing the rate are broadly judgmental (e.g., balance of payments position, international reserves, parallel market developments), and adjustments may not be automatic. Intervention may be direct or indirect.

Independently Floating

The exchange rate is market-determined, with any official foreign exchange market intervention aimed at moderating the rate of change and preventing undue fluctuations in the exchange rate, rather than at establishing a level for it.

Source: IMF's Exchange Rate Arrangements and Exchange Restrictions.

Appendix 4.2. Frankel and Wei's Regression analysis for de facto exchange rate regimes

The monetary authorities are assumed to adopt a currency basket peg consisting of the five major currencies: the U.S. dollar, the Japanese yen, the euro, British pound and South African rand. For example, if changes in the Angolan kwanza against the Swiss franc are largely explained by changes of the US dollar against the Swiss franc, the US dollar would have a weight close to one (100%) in the Angolan currency basket: the Angolan kwanza can be assumed to be virtually pegged to the US dollar. Alternatively, if movements in the kwanza against the Swiss franc are largely explained by movements in the euro against the Swiss franc, then the euro would get a weight close to one in Angolan's currency basket. This reasoning applies, similarly, to the other nominal currency anchors used in this study (euro, yen, pound and rand).

The exchange rate of a given SADC currency against a numeraire, such as the Swiss franc (SF), will be determined as follows:

$$E(SF / X_i) = E(SF / \$)^{\beta_1} E(SF / euro)^{\beta_2} E(SF / Yen)^{\beta_3} E(SF / Pound)^{\beta_4} E(SF / Rand)^{\beta_5}$$

(12)

with $\sum_{i=1}^5 \beta_i = 1$ and where β_1 to β_5 denotes the weights of the dollar, yen, euro, pound and rand, respectively. If the country concerned, for instance, adopts a dollar peg, then it means that $\beta_1 = 1$. Equation (12) can be expressed as equation (13) after taking logarithmic transformation. Therefore, the equation to be estimated is

$$\Delta (\text{value of currency } i)^{118} = \beta_0 + \beta_1 \Delta (\text{value of \$}) + \beta_2 \Delta (\text{value of Euro}) + \beta_3 \Delta (\text{value of yen}) + \beta_4 \Delta (\text{value of rand}) + \beta_5 \Delta (\text{value of pound}) + \varepsilon_{it} \quad (13)$$

where the change in the value of each currency is computed logarithmically. β_0 is the intercept and its sign is interpreted as appreciation (positive sign) or depreciation (negative sign) of the currency during the sample period and ε_{it} is normally distributed.

Such an equation is exceptionally well-specified under a particular null hypothesis, namely that the value of the local currency is determined as a basket peg (perhaps a crawling peg, since we allow a constant term)¹¹⁹.

We impose the constraint that the weights on the five currencies sum to 1 (by subtracting the change in the value of the pound from each of the other variables). A F-test does not reject the constraint that the sum of the five coefficients is 1 for almost all the countries.

Prior to the estimation, the different exchange rate series have been tested for stationarity. For this purpose, we make use of the augmented Dickey-Fuller tests. We also employed the two-steps Engle-Granger test for cointegration to assess whether there is a long-run relationship among the series under consideration¹²⁰. The results for unit roots and cointegration tests are presented in Table A.4.1.

The estimated results show that all series, with exception of Zimbabwe, are integrated of order one, i.e., the series have a unit root. In terms of cointegration, there is evidence of

¹¹⁸ Value of currency *i* (or \$, euro,...) in terms of Swiss franc is calculated as the ratio of the number of units of currency *i* for 1 U.S. dollar over the number of units of Swiss franc for 1 U.S. dollar.

¹¹⁹ By “exceptionally well-specified”, we mean that the coefficients should be highly significant and the R^2 should be close to 1.

¹²⁰ A better estimated model would probably included the lagged values of the exchange rates but, since this is not the main issue in this chapter and to be consistent with the literature on de facto exchange rates, we follow the Frankel and Wei approach.

cointegration among the Southern African exchange rate series and those of their potential nominal anchors, the only exception being Mozambique and Zimbabwe.

Table A. 4.1. Results of Unit Roots and Cointegration Tests

Countries	ADF Test: log levels	ADF Test: log first-differenced	Engle-Granger Cointegration statistic ^a
Angola	-0.100	-3.789**	-3.467**
Botswana	-1.350	-6.667*	-1.491*
Congo, DR	-0.570	-5.407*	-2.934*
Lesotho	-0.721	-6.329*	-4.832* a
Malawi	-2.635	-4.219*	-3.841**
Mauritius	-1.594	-5.992*	-3.142***
Mozambique	-1.561	-4.450*	-3.074
Namibia	-0.721	-6.329*	-4.832* a
Seychelles	-2.532	-6.823*	-3.769**
South Africa	-0.721	-6.329*	-4.832* a
Swaziland	-0.721	-6.329*	-4.832* a
Tanzania	-5.488*	-5.814*	-3.953**
Zambia	-0.053	-7.397*	-4.477*
Zimbabwe	0.070	-3.029	-1.917
Japan	-2.365	-5.424*	
Switzerland	-1.413	-6.492*	
United Kingdom	-1.602	-6.089*	
Euro Area	-1.071	-7.448*	

Notes: *, **, and *** represent statistically significant at 1, 5 and 10 percent, respectively.

Appendix 4.4: List of Countries used in estimation of equation 15

USA	SEYCHELLES	ITALY	MOROCCO	CZECH REP
JAPAN	SWAZILAND	NETHERLAND	NIGERIA	POLAND
GERMANY	TANZANIA	NORWAY	UGANDA	RUSSIA
UK	ZAMBIA	PORTUGAL	CHINA, M.	TURKEY
SOUTHAF	ZIMBABWE	SPAIN	CHINA, HK	IRAN
ANGOLA	CANADA	SWEDEN	INDIA	ISRAEL
BOTSWANA	AUSTRALIA	SWITZERLAND	INDONESIA	KUWAIT
CONGO,DR	NEWZEALAND	FINLAND	KOREA	SAUDI ARABIA
LESOTHO	AUSTRIA	CAMEROON	MALAYSIA	UAE
MALAWI	BELGIUM	GHANA	PAKISTAN	BRAZIL
MAURITIUS	DENMARK	IVORY COAST	SINGAPORE	CHILE
MOZAMBIQUE	FRANCE	KENYA	THAILAND	HUNGARY
NAMIBIA	IRELAND	MADAGASCAR		

Appendix 4.5: The Variability of Real Exchange Rates for SADC Countries vis-à-visPotential Anchors (Annual data)

	US dollar	Japanese yen	Euro	British Pound	SA rand
Angola	0.059	0.073	0.088	0.058	
Botswana	0.593	0.631	0.635	0.600	0.627
Congo, DR	0.037	0.075	0.072	0.040	0.038
Lesotho	0.846	0.881	0.863	0.843	0.866
Malawi	0.057	0.069	0.086	0.055	0.011
Mauritius	0.220	0.278	0.252	0.225	0.244
Mozambique	0.045	0.082	0.071	0.059	0.052
Namibia	0.085	0.141	0.136	0.077	0.106
Seychelles	0.051	0.074	0.087	0.055	0.015
South Africa	0.043	0.090	0.053	0.034	0.066
Swaziland	0.065	0.074	0.092	0.065	0.010
Tanzania	0.048	0.124	0.102	0.054	0.073
Zambia	0.077	0.122	0.118	0.079	0.081
Zimbabwe	0.216	0.240	0.221	0.220	0.232

Appendix 4.6: Optimum Currency Area Regression for Real Exchange Rate Variability

Variables	Regression 1	Regression 2	Regression 3	Regression 4
	Estimated Coefficients	Estimated Coefficients	Estimated Coefficients	Estimated Coefficients
Variability of Output	0.731(0.11)***	0.731(0.11)***	0.133(0.10)	-0.133(0.10)
Trade ratio	-6.837(2.19)***	-6.851(2.20)***	-2.583(0.9)***	-2.562(0.89)***
Size of economy	0.003(0.00)***	0.003(0.00)***	-.002(0.00)***	-0.002(0.00)***
Terms of trade			0.726(0.05)***	0.725(0.05)***
Price differential			0.143(0.01)***	0.144(0.01)***
Colony		0.011(0.04)		0.014(0.03)
Constant	0.032(0.01)***	0.032(0.01)***	0.002(0.01)	0.002(0.01)
Number of obs.	1843	1843	1843	1843
R-square	0.149	0.150	0.448	0.448

Appendix 4.7.

A. Optimum Currency Area Regression for Nominal Exchange Rate Variability. Using Data for the Five Potential Anchors

Variables	Regression 1	Regression 2	Regression 3	Regression 4
	Estimated Coefficients	Estimated Coefficients	Estimated Coefficients	Estimated Coefficients
Variability of Output	2.072(0.68)***	2.067(0.68)	0.252(0.36)	0.252(0.36)
Trade ratio	-15.17(3.17)***	-14.59(3.19)	1.714(2.39)	1.766(2.502)
Size of economy	0.004(0.001)***	0.004(0.001)	-0.003(0.00)	-0.003(0.00)***
Terms of trade			1.983(0.33)	1.980(0.33)
Price differential			0.242(0.04)	0.243(0.04)
Colony		0.044(0.084)		0.005(0.06)
Constant	-0.0307(0.05)	-0.035(0.05)	-0.111(0.04)	-0.111(0.04)
Number of obs.	296	296	296	296
R-square	0.119	0.1209	0.5469	0.5469

B. Optimum Currency Area Regression for Real Exchange Rate Variability

Variables	Regression 1	Regression 2	Regression 3	Regression 4
	Estimated	Estimated	Estimated	Estimated
	Coefficients	Coefficients	Coefficients	Coefficients
Variability of Output	0.962(0.31)	0.960(0.31)***	0.171(0.17)	0.172(0.17)
Trade ratio	-8.927(1.52)	-8.714(1.53)***	-1.553(1.12)	-1.573(1.12)
Size of economy	.002(0.00)	0.002(0.00)***	-.001(0.00)	-0.001(0.00)
Terms of trade			0.877(0.15)	0.879(0.15)
Price differential			0.103(0.018)	0.103(0.02)
Colony		0.016(0.04)		-0.002(0.03)
Constant	0.035(0.023)	0.033(0.02)	-0.001(0.02)	
Number of obs.	296	296	296	296
R-square	0.138	0.139	0.534	0.534

Appendix 4.8: Relative Excess Volatility Index for SADC Countries

(Using data for the five potential anchors)

	US/euro	US/pound	US/rand	Euro/pound	Euro/rand	Pound/rand
South Africa	0.518	0.471		0.908		
Angola	1.350	1.102	1.011	0.816	0.749	0.918
Botswana	0.815	0.998	1.019	1.225	1.250	1.021
Congo, DR	0.754	0.924	0.815	1.225	1.080	0.882
Lesotho	0.751	0.949		1.264		
Malawi	1.030	0.998	0.733	0.969	0.712	0.734
Mauritius	1.412	0.914	0.852	0.647	0.603	0.932
Mozambique	0.944	1.059	0.790	1.121	0.836	0.746
Namibia	1.184	1.103		0.932		
Seychelles	1.288	1.570	0.848	1.219	0.658	0.540
Swaziland	1.071	0.943		0.880		
Tanzania	0.733	0.807	0.573	1.101	0.782	0.710
Zambia	0.490	0.828	0.450	1.689	0.919	0.544
Zimbabwe	0.815	0.935	0.499	1.147	0.612	0.533