

**MACROECONOMIC CONVERGENCE IN SACU:
A PANEL UNIT ROOT ANALYSIS**

By

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DISSERTATION

submitted in partial fulfillment of the requirements for the degree of



MASTER OF COMMERCE

in

ECONOMIC DEVELOPMENT AND POLICY ISSUES

in the

FACULTY OF ECONOMIC AND FINANCIAL SCIENCE

at the

UNIVERSITY OF JOHANNESBURG

SUPERVISOR: DR. A. KABUNDI

MAY 2008

ABSTRACT

This study uses annual data for five SACU members over the period 1991-2005 to investigate the evidence for convergence in macroeconomic variables. Panel unit root test as an econometric tool is utilised together with other several approaches for this analysis. The results show significant evidence that the SACU countries have reached a reasonable level of convergence on specific macroeconomic variables. This can be attributed to common economic policies and institutional features. It is also evident that the countries that are members of the CMA show a dramatically higher convergence rate. As far as monetary policy is concerned, a high degree of convergence has been achieved in SACU. However, the results show no convergence on fiscal policies. This could be attributed to data constraint on debt to GDP which was used as a proxy for fiscal policy.



Acknowledgements

Several people have been instrumental in allowing this dissertation to be completed. I would like to thank my supervisor, Dr Alain Kabundi for his valuable guidance and patience. Alain was always there to listen and to give advice. He showed me different ways to approach a research problem and the need to be persistent to accomplish any goal. He taught me how to write academically, he was one of the few people who believed in me and had confidence in me when I doubted myself.

I thank my parents for giving me life and raising me to be the person I am today. I would also like to thank my three sisters and my brother for their consistent emotional and financial support during the difficult times. My greatest gratitude goes to my brother-in-law, Edward Shoniwa for taking over my father and being such a good father to me for all my university life and part of my high school education.

Last, but not least, I thank my friends for listening to my complaints and frustrations and giving me support in all its form in pursuit of my dream.

DEDICATIONS

This dissertation is dedicated to my late brother Gabriel Rampoetsi Maleke.



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Chapter 1

1. Introduction

1.1. Historical Background

The southern African customs union is one of the oldest customs unions (if not the oldest) to be formed. In 1910, the Southern African Customs Union (SACU) was established between South Africa and the separate associated states, i.e. Botswana, Lesotho and Swaziland. SACU was established in order to maintain the free interchange of goods between the member countries. It was also established to encourage economic development and diversification, especially in the less-advanced member countries (Lesotho and Swaziland); and also to provide to all members equitable benefits originating from international trade (Antkiewicz and Whalley, 2005).

In 1969, the agreement was renegotiated so that it would reflect increases in the regional imports of member countries. This new Customs Union Agreement between South Africa, Botswana, Lesotho and Swaziland then replaced the 1910 Agreement. In 1990, Namibia gained independence and hence became a contracting party to the 1969 Agreement (Kirk and Stern, 2005; Antkiewicz and Whalley, 2005).

Under the 1969 Agreement, South Africa had a highly dominant position. It had the sole authority to determine customs, excise and sales duties as well as trade policies for all the member countries. This, however, limited the power of the other members

when it came to policies, such as monetary policy, foreign exchange policy as well as fiscal policy (Kirk and Stern, 2005; Antkiewicz and Whalley, 2005).

All the union's collections – customs and excise duties – were then placed in the South African revenue fund; and the revenue in turn was later shared between the members according to the revenue formula, which was disclosed in the SACU agreement. Other member countries apparently became unhappy with the way things were going within the union. Some of their concerns were the fact that they did not have any say when it came to decision-making and the revenue-sharing formula, which was unsatisfactory (Fajgenbaum, Sharer, Thugge, and De Zoysa, 1999).

Even though the other members were trying to renegotiate the agreement so as to come up with a new agreement that would please all; it was only after South Africa got its independence that renegotiations actually took place. In 2002, the new agreement was entered into and became effective in 2004. The new agreement stipulates a new revenue-sharing formula, and also democratic decision-making for all member states (Kirk and Stern, 2005).

In accordance with the 2002 agreement, member states cannot enter into trade agreements with other countries that are not members of SACU without consulting other member countries. Indeed, the idea is that member countries should enter into trade agreements jointly. The rationale is to avoid a situation whereby a single member dictates its view without consulting other member states, which could result in it benefiting to the detriment of the union. This new agreement involves all members and gives each a fair chance to join in decision-making (Kirk and Stern, 2005).

South Africa still has a very dominant role within the union. Being the biggest and most influential member; it is South Africa that attracts most investments and trade taking place within SACU. Before 1994, South Africa benefited from the international trade by being the member of SACU. But the tables have now turned: the other members are benefiting from international trade by having South Africa as a member.

The four SACU member countries, excluding Botswana, have also formed the Common Monetary Area, where the other members have pegged their national currencies on par to the South African Rand. Nevertheless, Botswana's currency is linked to the Rand via the currency basket, where the Rand weighs around 60 to 70 per cent (Grandes, 2003). Now that the SACU member states have gone so far in terms of monetary integration, it is of great interest to find out if there is macroeconomic convergence within this region. Therefore, this dissertation seeks to evaluate the degree of convergence that exists within SACU and to determine what degree of convergence is necessary for policy-makers to achieve their objectives.

Even though the quest for supranational problem-solving and international cooperation does not always emanate from globalization, technology interdependence and economies of scale throughout the private and public sectors make it increasingly necessary to go beyond the borders in organising significant aspects of economic, social, and political activity. The history of regional integration in Africa has revealed that the reasons or objectives for integrating have been gradually evolving. They have shifted from the initial focus on the political decolonization of Africa to the current emphasis on socio-economic integration in order to achieve a stronger voice in the global economy, and for other benefits coupled with integration such as accelerated growth and development.

1.2 Theory of convergence

Monetary integration is optimal amongst economies that show a considerable degree of real economic convergence, which have flexible labour markets, which permit capital and labour to move freely between countries; which have in place mechanisms for transfers to struggling member countries; which react similarly and flexibly to shocks; and/or which have high degree of trade openness between them (McCarthy, 2002).

According to Bezuidenhout (2003), about seven different concepts of convergence of macroeconomic variables are commonly used in the literature. The first concept is homogenization, which primarily denotes the diminution of the dispersion among a group of countries in terms of some measure of performance. Bezuidenhout argues

that countries are said to converge if there is less dispersion between the involved countries' performance. The measurement of convergence in this case would require the analysis of the coefficient of variation: if it declines, the countries are converging.

Secondly, Bezuidenhout also mentions a catch-up convergence, which determines if the percentage gap between the performance of the leading country and the other countries has occurred. Therefore, catch-up convergence can be analyzed by making use of a benchmark, whereby the percentage gap between the benchmark and the other countries must decrease overtime.

The third concept is gross convergence. Gross (or unconditional) convergence means that if the coefficient of variation for some variable decreases over time, it means the regions have converged. In other words, the countries that are less developed in a group grow faster than the more developed ones; therefore the countries will have more or less the same steady-state values. This on the other hand refers to convergence in a particular variable disregarding the influence caused by other variables. Further, gross convergence can also be referred to as σ -convergence if standard deviations are employed (Bezuidenhout, 2003).

Explained (conditional) convergence is the fourth concept. It means the analysis (statistical) of the variables in question that are expected to have some influence on the degree of convergence that the countries go through, as well as the time it takes those variables to converge. Explained convergence evaluates if poorer countries grow faster than richer ones, *ceteris paribus*. In other words, this type of convergence entails keeping away any effect other factors might impose on the convergence process, and concentrates only on those factors that are under investigation.

Residual convergence is another concept. This on the other hand takes into consideration the possibility that, after statistically removing the effect of the variables that are expected to influence the degree of convergence and the time it takes for convergence to occur, the remaining residue (in terms of dependent variable) will convey the countries' convergence.

The other concept is asymptotically perfect convergence. This in turn means convergence of two countries whereby in the long run the variables in question grow/fall towards the same level precisely. According to Bernard and Durlauf (1995), this occurs if time series of differences in a variable under investigation between two countries contain no unit root or a time trend so that these differences asymptotically converge to zero. However, if the aim is to determine if there has been convergence in the past, asymptotically perfect convergence is not very useful. Finally, there is bounded convergence, which occurs when the variables in question approach the same or almost the same level. Consequently, this is based on the relation between the variables in question in a particular year.

1.2.1 Macroeconomic convergence

Macroeconomic convergence is a necessary precondition for all countries intending to join the currency union. According to Obwona (2004), these preconditions are put in place as the means of screening out those countries that might impose costs on other countries after the currency union has been formed. Therefore the aim to ensure that macroeconomic policies are in harmony is mainly to create the same culture for the future currency union members. In addition to macroeconomic convergence, other preconditions would include the fact that all central banks in those particular countries must have some independence so that they are able to focus on price stability. They must be prohibited from financing of the budget deficits. The reason for this would be to prepare for the formation of one central bank for all member countries which will require a certain level of price stability in the region, and also to ensure that the governments are more responsible.

According to Bezuidenhout (2003), the convergence hypothesis declares that all countries must ensure that their levels of output, economic development and macroeconomic behaviour are closely linked to one another. Furthermore, that the macroeconomic behaviour is mainly concerned with economic structure. Taking this as a point of departure, the countries entering the monetary integration would agree on the convergence criteria, whereby they set standards for themselves and also come up with a date by which the criteria should have been met. The reason for this is to make sure that the member states develop sound and common macroeconomic policies.

Committing to anti-inflationary policies and fiscal stability will form the basis for macroeconomic convergence (Mutoti and Kihangire, 2006).

However, in the case of SACU the countries have not decided on the convergence criteria which they committed to. Therefore, for this study, the convergence criteria that will be used will be more like those for SADC. The reasons for this include the fact that all SACU members are also members of SADC; therefore these criteria are applicable to them. Moreover, it is because there are no convergence criteria for SACU.

According to the speech by the South African Reserve Bank Governor Tito Mboweni (2003) SADC member countries have agreed to the following criteria:

- CPI inflation rates must be within single digits.
- Budget deficit as a ratio of the GDP must be at least 5%.
- Government debt must be less than 60% of the GDP.
- Foreign reserves must be at least 3 months' imports cover.
- Central bank credit to the government must be less than 10% of the previous year's tax income.

1.2.2 Key factors underlying convergence

The key factors underlying convergence (in the case of this dissertation) will include:

1. Inflation and interest rates, which form part of the monetary policies for the countries concerned.
2. Government debt (as a percentage of GDP), which is used as proxy for fiscal policy.
3. GDP growth rates (annual growth rates), which is used to capture synchronization of business cycles.
4. Exchange rates

These five macroeconomic factors form the core of the analysis of convergence for SACU in this dissertation.

Inflation and interest rates: These factors are required to converge before deeper monetary integration can be formed because convergence in inflation and interest rates will prepare the central banks to focus on the whole region instead of paying attention to their own countries when setting monetary policies (Obwona, 2004). Deeper integration will be more beneficial if inflation rates are already moderately co-moving between the countries.

Similarly, interest rate co-movement is necessary as it determines the degree of financial integration among the countries. It also evaluates the similarities of monetary policy stance between the countries. Thus, a high degree of convergence means that the cost of adopting a common monetary policy will be lower (Durrucci, Firpo, Fratzcher and Mongelli, 2002). However, inflation might converge, but at an early stage of integration, interest rates might not converge, as monetary authorities will be using this monetary tool (interest rates) to achieve the convergence of inflation.

Exchange rates: Exchange rate stability is often regarded as crucial for trade integration. Inordinate variations in exchange rates are a threat to the credibility of integration agreements. Thus, exchange rate stabilization is taken as an effective tool to contain the political pressure against further trade integration, because misaligned exchange rates lead to unfair competition if one partner trades with the undervalued currency. Further, volatile exchange rates heighten transaction costs (Fiess, 2005). Thus, the terms of trade should display minimal fluctuations between countries planning to share a single currency. Low variability in exchange rates and stable currencies will reduce the cost of acquiring a common currency (Durrucci, Firpo, Fratzcher and Mongelli, 2002).

Debt to GDP: The future members of the union must ensure that their public finances are sustainable, and they can only show willingness in this regard by adhering to the requirement of less than 60% of the GDP (which is the SADC requirement). If this is not met, there would be negative effects on the other members of the union (Obwona, 2004). Adherence to this criterion is an indication of the fiscal discipline necessary for regional integration. Furthermore, African countries are known to have corrupt leaders who confuse the state resources with their own, and hence borrow money

from international institutions for their own use. As Mongelli (2005) suggests, convergence in this variable is necessary as a hefty debt relative to GDP will lead to monetary externalities across the currency union. This will then pose a threat to other possible members since a currency union might mean financing such debts and that places a burden on other countries, especially those that initially had stable currencies.

GDP growth rates: As per Kabundi and Loots (2006), convergence can be assessed through synchronization of business cycles, as an understanding of business cycle convergence can explain the extent of economic crisis or benefits across the region. Besides, the degree of business cycle synchronization could be of significant value if countries are considering regional policy coordination. According to Artis and Zhang (1998a and 1998b), a high level of synchronization of the business cycle between two countries shows that the business cycle in each country is driven largely by common external shocks. Further, it could be an indication that the economies of the two countries are highly interdependent. Therefore, a high degree of business cycle synchronization will lead to lower costs in pursuing common policies and deepening integration.

Furthermore, in an analysis of business cycle synchronization between Central America and the United States, Fiess (2005) shows that information about the level of the business cycle co-movement provides additional information that reveals the need for independent fiscal and monetary policy. Fiess asserts that similar business cycles and common shocks make macroeconomic convergence an ultimate goal.

However, economic convergence should be achieved around a higher level of economic growth so that in the long run the countries can catch up economically with the developed economies (McCarthy, 2002). The countries are expected to converge so as to ensure that no burden is placed on one or few other countries. Cheung and Pascual (2004) assert that the country-specific factors play a role in macroeconomic convergence; specific factors can either lead to convergence or divergence. They argue that if countries are differently endowed, then it is likely that such countries' outputs will not converge over time. To be able to understand why there are such major differences in the standard of living in different countries, one has to understand why long-term growth rates diverge so much between countries.

Holmes (2000) and Mutoti and Kihangire (2006) stipulate that convergence in macroeconomic policies will facilitate output convergence. This will hence ensure that similar macroeconomic fundamentals trends are generated. As far as the convergence criteria are concerned, the countries intending to participate in the monetary union must not only aim at achieving convergence for a particular period of time; they must ensure that it is sustainable. They must also be aware that the criteria are one package: they cannot meet one criterion and do without the other – all the factors that form part of the convergence criteria must be satisfied (Rossouw, 2006).

1.2.3 Convergence in SACU

Bezuidenhout (2003) points out that the Southern African policy-makers are looking for broader economic cooperation as a solution to generally weak economies and small markets. Furthermore, they want to deepen the regional integration agreements so as to promote growth in their economies. The SACU member states need to achieve a certain degree of convergence as a precondition for any deeper integration. Taken from Baumol, Nelson and Wolff (1994), the convergence hypothesis is the process that the countries have to undergo – that brings their levels of output performance, economic development and macroeconomic behaviour closer to one another.

Macroeconomic convergence in SACU does not necessarily require greater macroeconomic stability in the region. For example, it is possible to converge at higher and growing levels of the budget deficit, inflation and current account deficit (McCarthy, 2002). Through trade liberalization, the poorer countries will catch up with the richer ones. The countries start with per capita income levels that vary widely from the average for the group, but this difference diminishes over time. For instance, SACU countries do have high government debts, and an example in this respect is Lesotho. However, these debts must be co-moving with each other. This will ensure that, after integration, no country has to finance other countries' debts.

The analysis reveals a high degree of convergence in the region for the period under investigation. It is found that the countries have reached significant convergence on

inflation, exchange rates, GDP growth rates and interest rates. As far as debt to GDP is concerned, no convergence is detected and this can be attributed to lack of fiscal discipline in some of the member countries. Further, countries appear to be converging fastest on inflation rates, and these are followed by interest rates. The convergence process appears to be the slowest in respect of exchange rates.

In addition, greater convergence is found among the countries that are members of the Common Monetary Area, i.e. South Africa, Namibia, Lesotho, and Swaziland, implying that the peg that exists is playing a crucial role in ensuring that the countries are following the same path, especially in exchange rates. For other variables, convergence is as a result of the large amount of trade in the region.

1.3 Research Aim

This dissertation investigates whether the SACU countries have attained a level of development leading to a certain degree of convergence. Therefore, the panel unit root test is used on selected macroeconomic variables to investigate their achievements, challenges and macroeconomic convergence as a key component of regional integration. It is crucial to address the convergence issue as it could have crucial implications for further integration and, thus, regional policies.

1.4 Hypothesis

With the exception of Botswana, all member states have their currencies pegged to the South African Rand. The South African Rand is the working currency in three of the SACU member states. These three countries pegged their currencies to the Rand during the formation of the Common Monetary Area (CMA), with Botswana being the only country within SACU whose currency is not pegged. However, Botswana imports most commodities from South Africa; but during pricing, business owners do not consider the value of the pula; they simply replace the rand with the pula. As a result, people in Botswana prefer doing their shopping in South Africa rather than buying expensive goods in Botswana.

The hypothesis to be tested is whether, with such a high degree of free trade between the SACU member states, there is some degree of convergence within SACU. In

addition, what level of convergence is necessary for these countries to deepen their integration in terms of forming a monetary union?

1.5 Contribution and Relevance of the Study

In recent years, there has been an increase in interest on convergence: a large body of empirical work has been devoted to whether regions, especially countries, are becoming more similar in terms of their macroeconomic fundamentals (see, for instance, Kocenda, 1999, 2001; Mutoti and Kihangire, 2006; Cunado and Perez de Gracia, 2006; and Rossouw, 2006). This dissertation seeks to make a contribution to the debate on the matter by investigating whether there is macroeconomic convergence in SACU whereby smaller and more backward countries grow towards the more advanced countries through the diffusion of technical progress, and whereby the poorer countries learn and copy from the richer ones. According to Kaitila (2004), the poorer countries have some advantage over wealthier ones in economic growth as they are in a position to learn from the past experience of the richer countries and thereby acquire new technologies that will facilitate their productivity and material welfare. However, as the process proceeds, Kaitila (2004) argues that those poor countries will need to become innovative themselves; hence the speed of convergence can be expected to eventually slow down. In addition, output convergence will only occur if the fastest growing economies slow down so that the others can catch-up. All this is as a result of globalization of the world economy, which has added new impetus to regional integration. More and more countries around the world are collaborating within various forms of regional groupings in order to expand markets.

This dissertation has three main aspects. Firstly, the profound implications for the welfare of countries concerned are examined. Convergence has significant implications for the welfare of nations. In addition, it has implications for poverty reduction in the global community (Gondwe, 2001). Secondly, the design of policies followed in these countries, as the lack of economic convergence within this region can lead to social and political instability as economic performance varies significantly across countries. Lastly, as the African countries are planning for single currency, lack of convergence of macroeconomic variables will result in high transaction costs. It is believed, however, that with the amount of trade between the

SACU countries, and with the existence of the common monetary area, the SACU member states should be experiencing a high degree of macroeconomic convergence.

The various studies undertaken to date have focused mainly on the political and economic constraints on integration in Africa. Other studies refer to the overlapping of regionalism as one of the obstacles in the way of deeper integration. The purpose of this study is not to contradict these views but to extend the investigation by determining empirically the level of macroeconomic convergence that exists within the union using panel unit root tests. These give more consistent results compared to time-series and cross-section analysis. Many studies done on SACU are qualitative, thus by incorporating panel unit root tests, reliable results will be obtained and policy-makers will be able to use the results to come up with suitable policies. Adopted from Beine and Coulombe (2004), the problem with time-series data emerges when one is confronted by strong multicollinearity among explanatory variables. It can be very awkward to get the precise estimates of the course of the dynamic adjustment process from time-series data.

However, panel unit root analysis has both cross-section and time-series characteristics; hence, the cross-section dimension ensures that the problem of multicollinearity is reduced, while the time-series dimension disentangles the short-term from the long-term effects. Therefore, panel unit root analysis is robust and is appropriate for convergence analysis. Furthermore, this method has been used by Kocenda (2001) in assessing the degree of integration in Europe.

In the analysis of the selected macroeconomic variables, data from 1991 to 2005 is utilized. However, owing to difficulties in finding data for debt to GDP, analysis is done on the four countries excluding Namibia, and the data used spans 1994 to 2002.

In this dissertation the empirical evidence that offers reasonable support for the hypothesis that there is a high degree of convergence between the SACU member states will be given. The analysis is based on a set of data involving five countries, which are at various levels of development – with South Africa in the lead. The analysis incorporates panel unit root test as an econometric tool. As Beine and

Coulombe (2004) assert, panel data analysis allows for more consistent econometric results than those obtained from pure time-series and pure cross-section analyses.

1.6 Limitations of the study

The primary limitation in this research was the availability of data. Owing to this, the research was limited to cover the period of fourteen years; 1991 as the earliest year for which at least data on four variables could be obtained. Availability of data on debt to GDP created most problems; there was no data available for Namibia and South African data only started in 1994. Therefore the analysis on this particular variable was done excluding Namibia and only for a period of nine years – 1994 to 2002.

1.7 Organisation of the study

In the next chapter, the existing literature on macroeconomic convergence, the main techniques used to major convergence, and any relevant literature on SACU itself, is reviewed.

Chapter Three explains the IPS panel unit root model; the one model used in the investigation. The reasons why this particular methodology is chosen over the others are also incorporated. Furthermore, there is a brief summary of the used data.

Chapter 4 presents and discusses the empirical findings. In addition to this, a brief discussion of descriptive statistics of the data is presented.

Finally, Chapter 5 concludes the paper with some policy recommendations and suggestions for further research.

Chapter 2

2. Literature review

In the discussion below, available literature is used to meet the objectives of this dissertation. Critique on the literature is offered where shortcomings or fallacies are noticed. The important points that enhance the argument towards the objectives of the research are noted and refined where appropriate. Moreover, if there is any research concern that has not been met by the available literature, further research will be recommended.

The study of regional convergence has become an important subject recently. This is observable from numerous empirical studies on regional convergence. There are variable beliefs on regional co-movements; as a result, there are various strategies that can be employed to investigate convergence. Given this, the final results are also inclined to differ.

2.1 Debate on catch-up convergence

Extensive theoretical and empirical literature emphasise various reasons for possibilities of macroeconomic convergence in SACU. The neoclassical growth theory which forms the ground for most convergence debate predicts that smaller poorer countries of the convergence club should catch up with richer ones as they have an advantage to replicate the existing technological advancements without

having to develop their own (Baumo and Sala-I-Martin (1995)). Therefore, SACU members especially the less developed ones are expected to grow more rapidly towards South Africa.

Ramsey (1928), Solow (1956), Cass (1965), and Koopmans (1965) use the neoclassical models for closed economies and find that the per capita growth rate of a country inclines to be negatively related to its initial level of income per capita. With the same predilections and technology, the supposition of diminishing marginal products of capital entails that poorer states grow faster to achieve the level of the richer ones, thus leading to absolute convergence among countries. In cases of heterogeneity, the outcome is conditional convergence, that is, convergence to the steady state of growth but to different levels of per capita income. These studies form the origin of convergence as it is applied in most investigations currently.

Further, even though their work mainly concentrate on convergence between a large number of economies, Baumol (1986), Dowrick and Nguyen (1989), Barro (1991) and Barro and Sala-i- Martin (1991, 1992) have also made significant contributions to the literature. Baumol uses cross-section regressions to argue that countries and regions are converging, or catching up, since initially poorer areas grow faster than richer ones. Baumol investigates 72 countries for the period 1950-1980, and finds that income levels within the industrialized, centrally planned and middle-income countries have converged. The centrally planned economies seem to be converging with the industrialized countries. However, no convergence is identified within the low income economies. Barro and Sala-i-Martin (1991) on the other hand employ cross-section regressions and confirm convergence among countries where the poorer countries grow faster to catch up with the richer ones. Both these studies find the coefficient of the regressor significantly negative, and thus interpret it as grounds for convergence.

Dowrick and Nguyen (1989), further affirm the debate as their results reveal convergence amongst developed countries. They focus their attention to the process of technological catch-up. They use total factor productivity as a measure of technology in 15 OECD countries and investigate whether countries have converged as far as total factor productivity is concerned. In addition, they investigate growth

convergence. They assume a common capital output ratio for all countries being investigated. The results show that total factor productivity converges more rapidly than per capita income. These results are supported by the concept of the convergence club, and hence lead to a conclusion that convergence does not apply among the poorest of the world economies. However, Pesaran (2007) warns that concluding on the existence of a convergence club might be misleading as it might reflect inconsistency in the model structure, choice of sample period and data generation problems. In the preceding findings, the possible reason for the negative results could be the fact that the convergence tests are applied over a large panel which includes many rich and poor countries. Moreover, diversity brought by bringing highly developed and developing countries together could have also played a role. In the case of SACU, South Africa is the only economy that is more advanced than the rest. Owing to this, it is unlikely that it can lead to no convergence in the region.

In dealing with the problems posed by the available literature, Rodríguez-Pose (2000) argues that economic theory identifies factors that bring either convergence or divergence; he suggests that growth models should be grouped according to their convergence predictions. In the first group, poor countries grow faster than the rich ones – keeping other things equal. Keeping other things equal does not take away the prevailing inequality between economies; it simply means that in the long run, per capita income distribution will stabilize only if some structural features are kept the same. In the second group, the rich economies grow faster than the poor ones, leading to even more inequality between the countries. In contrast, De la Fuente (2000) proposes that the long-term income levels vary across economies even in the presence of convergence forces; thus those differences should be controlled for, otherwise the results could be misleading. SACU members are mostly affected by similar forces specifically financial forces due to similarity in monetary policies and dependency on South Africa. Therefore, the smaller countries are expected to converge to South Africa now, and even more in the long run as they are expected to eventually catch-up to South Africa.

Although, Rodríguez-Pose (2000) further proposes that technological progress could be an important divergence factor by arguing that the differences in strengths to innovate or acquire new technologies can lead to different long-term growth rates;

affirming the conditions prevailing in SACU, Abramovitz (1986) argues that provided the poorer countries have capacity to adopt foreign technologies, then they have an advantage in being poor. Therefore the technological catch-up is one of the main factors that lead to convergence. The technology catch-up models as drivers of convergence are supported by Abramovitz (1986) and Barro and Sala-i-Martin (1995). They argue that backwardness in productivity levels shows ability to grow faster. In the presence of a leading country, the followers replicate the new ideas proposed and secured by the leading country. Thus, in the long run the leader and the followers follow the same growth rate. The only issue that is questionable is whether these smaller SACU members do have the capacity to take advantage of the developments in South Africa.

According to Dollar and Wolff (1994), the catch-up convergence is associated with diminishing returns to capital. They argue that the larger the capital gets, the more its marginal productivity declines. Labour migrates to the rich countries in search of employment and hence capital flows to the poor countries. The productivity in the richer countries falls owing to the fall in the capital-labour ratio. As a result, the poor countries tend to catch up with the richer ones owing to the sluggish growth in the rich countries. The other possible reason for catch-up convergence is the diminishing returns on education: after a certain level of education, further education does not lead to more productivity (Baumol, 1994). Therefore, trade of goods and services is the main driving force of co-movement of macroeconomic variables, followed by financial linkages.

In summary, it seems small and poor countries tend to depend heavily on the neighbouring leaders in terms of technologies. This being the case, the less advanced economies learn from their leaders as they take advantage of not having to invent the ideas. This then promotes their growth to eventually catch up with the more advanced countries.

2.2 Trade intensity and convergence

There is a growing consensus that trade openness nurtures catch-up convergence as it implies the flow of capital and goods, thus coordinating economic development of the

economies concerned. Ben-David (1993) establishes that convergence of per capita incomes across countries can occur as a result of international trade. He demonstrates that in the European Economic Community (EEC), European Free Trade Association (EFTA), and the United States of America (USA) and Canada, there is evidence that the narrowing of per capita incomes across regions is associated with heightened trade, which is associated with trade liberalization. Ben-David examines the convergence experience of the three regional groupings. He concedes that in the case of EFTA income convergence preceded trade integration, but for the other groupings he argues that trade integration was a major causal factor promoting income convergence. For Canada and the United States of America, Ben-David shows that between 1964 and 1973 there was a dramatic increase of trade between Canada and the USA. During the same time, growth in Canada intensified and the per capita income gap between Canada and the USA narrowed. He also discovers that rapid growth and income convergence throughout the EEC region led to the need for political conditions that would strip away trade barriers; thus there was a rapid expansion of trade. Hence, the trade intensity may have increased economic growth in the EEC. It may have also stimulated further income convergence.

Ben-David (1995) extends his earlier study to cover a much wider range of countries. He estimates how fast each country's per capita income has converged with the average per capita income of its trading partners. Further, he compares the estimates with the rate of convergence with the equal-sized group of countries that are randomly selected. The results show that convergence is faster with trading partners than with a randomly selected group. The countries for which this finding holds were all economically quite advanced in 1960, when the period covered by the study began, and – with the exception of Australia, Canada and Japan – they were mainly European. Only five non-OECD countries are covered by his study – Argentina, Chile, Mexico, South Africa and Uruguay. Interestingly, none of these countries shows evidence of substantial convergence towards the main trading partners. Thus, these results imply that the relationship between convergence and trade is only valid for more advanced economies. Ben-David (1996) further argues that income convergence is possible amongst countries trading extensively with one another. Given the basis for SACU formation, it is arguable that SACU members should be experiencing high levels of convergence as there are no trade barriers in the region.

As much as most of these countries are not as advanced as South Africa, since they are all neighbouring countries (some of which are landlocked by South Africa), the external shocks affecting South Africa affect these countries as well. Hence the countries are expected to have similar business cycles.

Ben-David and Loewy (1998) extend the work done by Ben-David (1996), but focus more on income convergence brought by knowledge spillovers that come as a result of trade intensity. They find that a country can reduce the income gap between itself and other richer countries by liberalizing its trade. Open economies expose themselves to greater competitive pressures; therefore in order to compete successfully, such countries have to implement foreign knowledge into their production process. Hence, this affirms their assumption that trade liberalization stimulates knowledge diffusion as well as growth. Thus, trade liberalization has a positive effect on the steady-state growth of all the trading regions in the long run. A large number of people working in South Africa come from the neighbouring countries. For instance majority of people in Lesotho work in South African mines. In the long run Lesotho is expected to take advantage of technologies that are used in South Africa and thus develop its own mining sector. Thus bring forth income convergence.

By utilizing the decline in income differentials between regions to qualify convergence, Ben-David (1993, 1996) further affirms that the extensive trade between countries leads to convergence of cycles. Forming a group for regions according to their basic trade links leads to substantial income convergence amongst the groups. Thus, the countries that have reciprocal trade tend to converge more than countries that have less reciprocal trade.

In addition, Calderon, Chong and Stein (2003) use real GDP and bilateral trade for 147 industrial and developing countries to analyze the outcomes of trade intensity on business cycle correlation over the period 1960-1999. In their study, they consider the fact that cycle correlation could lead to currency unions, which could in turn lead to trade intensity. They further argue that countries could also reduce the transaction costs and also synchronize their policies by entering into a currency union.

Macroeconomic convergence could enhance output correlation. Their results also show evidence that trade intensity enhances business cycle synchronization.

Motivated by the fact that most trade in MERCOSOR is natural resource-based, unlike European or NAFTA, Ahumada and Martirena-Mantel (2001) also contribute to the literature by investigating whether trade intensity leads to higher synchronization among MERCOSUR countries including Chile. They find evidence that trade intensity leads to a high degree of convergence. They argue convincingly that the change in correlations between Argentina and Brazil between the periods 1987 to 1992 and 1993 to 1999 is the main reason for the results.

Given convergence of an unknown linear form, Giles and Stroomer (2003) go further and calculate the speed of output convergence among countries. They calculate speed of convergence in terms of half-lives based on both non-parametric kernel regression and 'fuzzy' regression from two time series data-sets. They compare the results with more restrictive estimates established on the assumption of linear convergence. The calculated half-lives are then regressed again on cross-section data to capture the degree of trade openness. All the above literature points to the same conclusion: increased trade openness increases the rate of output convergence between economies.

Further contribution is made by Fiess (2005) who evaluates the level of business synchronization in Central America and the United States by computing the correlation between the cyclical components of the output in countries. Higher correlations mean higher levels of business cycle synchronization. Fiess employs annual data for real GDP and trade ranging from 1965 to 2002. He also uses monthly data for industrial production and economic activity from 1995 to 2002. The results show low levels of business cycle co-movement within Central America as well as between Central America and the United States (US). He concludes that with further trade expansion, business cycle synchronization between these regions is expected to increase. Given all the literature suggesting that trade openness harnesses convergence, SACU economies should be experiencing a certain degree of convergence. The possible reason for this is that increased trade may elevate the co-movements of outputs and prices within the region.

Furthermore, Tondl and Traistaru-Siedschlag (2006), utilize four simultaneous equations on a panel data of all 208 NUTS 2 level EU 15 regions covering the period 1989 to 2002 to analyze the pattern and determinants of convergence of economic activity among regions in the European Union and the Euro Area. They examine the impact of regional trade integration, specialization and exchange rate volatility on correlations of regional growth cycles with the Euro Area. They find that deeper trade integration imposes direct positive effects on synchronization of regional growth cycles with the Euro Area. In contrast, industrial specialization and exchange rate volatility lead to divergence. While industrial specialization has indirect positive effects on growth cycle synchronization through positive impact on trade integration, exchange rate volatility reduces trade integration, and therefore imposes additional negative effects on growth cycle correlations. Prior to European Monetary Union (EMU), positive effects of trade integration on growth cycles were dominant, whilst in the EMU sub-period the negative effects of industrial specialization were stronger. Following their view, trade integration harnesses business cycle co-movement. This would mean that the existence of a customs union could lead to convergence as there are no trade barriers within the union.

To sum up, diffusion of technological knowledge combined with increased trade of goods and services, leads to similar shifts in production functions. In addition, the real business cycle theory asserts that if a specific policy induces business fluctuation, coordinating such policy among countries (members of a group) may lead to business cycle co-movements. Therefore, implementing similar exchange rate policies as well as inflation targeting policies; will ensure that similar output affect and enhance business cycle convergence.

2.3 Similar institutional attributes and convergence

Further literature that is applicable in the case of SACU is the one that looks at institutional factors. Testing the exchange rates convergence, MacDonald (1996) utilises a panel unit root test to examine the presence of a unit root in a group of OECD countries. Based on the results, MacDonald rejects the null hypothesis of a unit root, meaning the exchange rates for the OECD countries are converging. This

can be attributed to domestic and international policy coordination that exists within the organisation. Therefore having similar policies in place can be further interpreted as an incentive for governments to work towards achieving similar goals.

Contributing to the existing literature, Lall and Yilmaz (2000) examine the process of regional economic convergence across United States of America, where they investigate the effects of human and public capital in the convergence process. They control for business cycle and region-specific effects and also specification problems arising from spatial dependence. They find that the speed of convergence is influenced by region-specific characteristics and the availability of trained labour in neighbouring regions. This can be ascribed to labour mobility across borders which affect wages, production and consumption.

Kocenda (2001) also uses panel unit root analysis to investigate the performance of the Central and Eastern European (CEE) transition economies in terms of macroeconomic convergence in selected variables. Kocenda employs monthly data on industrial output, money aggregate, consumer and producer prices for the period 1991 to 1998. The test reveals some evidence of convergence in macroeconomic fundamentals between the CEE countries. Moreover, countries that share common institutional attributes and economic policies tend to have a higher degree of convergence. This corresponds with neoclassical growth theory, which confirms the occurrence of convergence among similar countries.

Kutan and Yigit (2004) further extends the study done by Kocenda by using a more stable period – post-1993 – and by employing the panel unit root test developed by Im, Pesaran and Shin (IPS) (2003), which offers less restrictive assumptions about convergence by allowing heterogeneity in the convergence rates. They find less convergence in price level and money supply variables than reported by Kocenda (2001). They also examine the convergence of the first- and the second-round candidate economies to EU standards. They find that there is significant progress in monetary policy convergence for the first-round candidates but not for the second-round candidate economies.

Furthermore, Brada and Kutan (2001) use the co-integration test to determine convergence in the European Union. They find evidence of strong convergence between growth of base money in Germany and in the countries that joined EU recently as well as in the current market-economy candidates for the EU. Confirming Kocenda's results (2001), they find that transition-economy candidates display no co-integration with growth of base money in Germany. Thus, if the transition-economies are unable to keep up with the macroeconomic discipline inherent in a peg to the Euro, then their future in the union is questionable. What is important to note here is that when countries enter into a currency peg, they abandon most of their monetary policy independence, thus agreeing to follow the monetary policy of the country that they have pegged their currencies to. Given this, it means most of their variables, for instance, exchange rates, inflation rates maybe interest rates as well, will follow the trends set by the country that they have tied their currencies to. Therefore, what Brada and Kutan mean is that if there is no convergence even with the existence of a peg; then the countries that are not co-moving with others should probably not consider joining the monetary union.

Likewise, Darvas, Rose and Szapáry (2005) employ dynamic factor model to analyze business cycle co-movement among 21 OECD countries. Their study covers a period of 40 years. The investigation reveals that the countries with similar government budget positions tend to have more synchronized business cycles. Moreover, there is evidence that low fiscal deficits enhance business cycle synchronization. These results are attributed to the Maastricht convergence criteria, which are said to have encouraged fiscal convergence and deficit reduction. In other words, fiscal discipline has a major influence on business cycle convergence.

In addition, conditional convergence suggests that convergence relies on the structural characteristics – including the public policies – of each country. Thus, these structural differences entail that the countries will have different steady states. In order to test for conditional convergence, it is therefore necessary to hold the steady state of each country constant; this can be achieved by incorporating some additional structural variable (Barro, 1991; Martin and Sunley, 1998). These findings imply that the countries that follow similar policies tend to converge.

Buseti, Forni, Harvey and Venditti (2006) on the other hand examine inflation convergence among the European Monetary Union covering the period 1980-2004. Their analysis entails dividing the period under study into two: before and after the use of the Euro. In the first sample they use univariate and multivariate unit root tests on inflation differentials. They find that there is convergence over the period 1980-1997. In the second sample they use the stationarity test and find diverging behaviour between countries. Two separate clusters are found: a lower inflation group – Germany, France, Belgium, Austria and Finland; and a higher inflation group – Spain, the Netherlands, Greece, Portugal and Ireland. Finally, Italy appears to be falling in between the two groups. These results affirm the findings that countries with similar policies (fiscal and monetary) tend to experience co-movements in their macroeconomic variables.

Moreover, conditional convergence reveals that growth in output per worker does not only depend on capital per worker and technology; it can also be determined by other factors which include political and cultural systems. It is therefore implied here that the countries that have similarities in political and cultural conditions will experience convergence – thus forming ‘growth clubs’ (Mankiw et al., 1992; and Hall and Jones, 1999). This means that political and cultural systems can lead to convergence or divergence between economies. However, in most cases macroeconomic convergence is tested amongst the countries that have something in common; either such countries have similar cultural and political conditions, or they belong to one organisation.

Similarly, Meliciani and Peracchi (2004) investigate GDP per capita convergence across the European region covering the period 1980 to 2000. They apply median unbiased estimators of the rate of convergence to the steady state growth path, whilst allowing for unrestricted patterns of heterogeneity and spatial correlation across regions. They find the lower mean rate of convergence to be zero for most regions. In addition, they find higher correlations amongst neighbouring regions or regions falling within the same country. These findings further confirm the above evidence of convergence among countries that have a certain degree of similarities. Such similarities may include the geographical attributes. This can be further interpreted by considering the fact that the neighbouring states are more often than not affected by

similar external shocks. In addition, the neighbouring countries happen to trade heavily with one another.

Luginbuhl and Koopman (2003) implement a multivariate time series approach to examine gross domestic product in five European countries: Germany, France, Italy, Spain and the Netherlands. Their analysis reveals the convergence features in trends and cycles that are related to some historical event of European integration. In this case, historical events are also said to contribute to convergence. Economies that have similarities in terms of their history in most cases follow similar trends that are imposed by the history they share.

Moreover, Weber (2006) applies co-integration tests, vector error correction models, various common cycle tests and forecast error variance decomposition to deal with macroeconomic integration in terms of stochastic long-run convergence and business cycle coherence in the Asian and Pacific region. Weber finds evidence in favour of cyclical synchronization and equilibrium relations in several leading countries. Weber's findings affirm most of the existing evidence that similar attributes lead to common cycles. This evidence of convergence between the leading countries can be said to imply that those leading countries have something in common; they are more advanced than the rest of the economies being investigated.

Menbere (2004) investigates the conditional convergence debate by analyzing the effects that debt crisis has on disparities in income per capita across countries and over time. Penn World Table's Database is employed, and the findings are that countries appeared to have undergone conditional convergence in income per capita. Thus, the results suggest that poorer countries grow faster than richer ones. Further, it appears that the poor countries that also happen to be heavily in debt experienced conditional convergence, suggesting convergence towards "a poverty trap" instead of convergence towards a steady state. These results are the most intriguing as they suggest that the poor countries converge towards a poverty trap. In most cases convergence is tested within a group of countries because positive results are expected out of such convergence. Now, in this case whether there is convergence between the poor countries leading them to a poverty trap is not very important. What is important is whether the countries belonging to a certain group also have similarities in their macroeconomic variables.

Furthermore, Ben-David (1996) asserts that nations with low inflation levels will be against monetary union that includes countries that follow expansionary fiscal policies. As a result, dedications towards fiscal stability and anti-inflationary policies also form the foundations for macroeconomic convergence. The CMA members are so far on the right path as by following the South African monetary policy (excluding Botswana) they have adopted anti-inflationary policies. In terms of fiscal policies, they are all following what they deem fit. However, all the countries are at the moment implementing appropriate measures in order to meet SADC requirements. Therefore the adequate institutional arrangements along with adjustments in monetary and fiscal policies are expected to yield similar movements in macroeconomic fundamentals. These include reduction in government debts. It is important that the countries follow restrictive monetary and fiscal policies in order to avoid the burden of financing the debts later on (by the union). Therefore, it is highly desirable that countries converge in macroeconomic stability indicators such as inflation, interest rates and budget.

In contrast to most literature, Martin (2000) conducts a study on the role of policy in the process of regional convergence and discovers that policies aimed at changing economic geography and regional developments have conflicting effects. This is as a result of the fact that economic geography is a crucial determinant of welfare, inequalities, productivity, growth and innovation. In addition, the public policies that are aimed at acting upon factor mobility, transaction costs and innovation will lead the economic agents to alter their location decision. The reason for this is that economic geography is endogenous. In other words, policies can only lead to convergence if they are not implemented to change geographical features of the countries.

In summary, the above literature suggests that economic commonalities amongst the economies can lead to macroeconomic convergence as they may result in identical innovations induced by multinational production networks and exposure to similar external shocks.

The concept of convergence is clear intuitively, but difficult to formulate. Several convergence approaches have been developed, the appropriateness of each approach

depending on the context in which it is applied. Moreover, some of the measures have been proven invalid; thus, it is appropriate to briefly look at the literature on most used measures to clarify why they are not employed in this study.

2.4 Review of different approaches to convergence

For many years there have been a considerable number of studies investigating the sources of convergence amongst the economies. This was then followed by the breakthrough of multiple econometric methodologies. The many reasons for so much interest in the study include the fact that validity of the results depends on the approach utilized. For instance, the findings from Kocenda (2001), Evans and Karras (1996) and Islam (1995), who use panel data, oppose the conclusions made by Bernard and Jones (1996), Barro and Sala-i-Martin (1992) and Sala-i-Martin (1997), who employ time series and cross-sectional analyses, respectively.

2.4.1 Cross-sectional data approach

Since Baumol (1986), there has been an increase in literature dedicated to investigation of convergence using cross-sectional data. However, Abramowitz (1986) argues that although the literature on convergence abounds, little has been done so far to develop new theory on the subject. In the literature, there are two main measures of economic convergence on which most studies are based: sigma (σ) and beta (β) convergence. These originated from Barro and Sala-i-Martins (1995).

Sigma (σ) convergence is an approach to convergence in which the behaviour of cross-section levels of the variables is examined. It measures the dispersion, for instance, of per capita income and asserts that this dispersion reduces over time. This convergence framework is consistent with the neo-classical model whereby each country converges to a common rate or level. It occurs when the spread of cross-section levels decreases over time. It is however revealed that the weakness of the σ – convergence becomes evident when series that are in an index form are dealt with. In cases like this, the spread will approach zero at any randomly chosen base period. Moreover, in the case of very strong external shocks to the economies, which may disturb the processes underlying convergence, the spread may be affected. This

implies that in such cases, σ may approach a constant, not zero (Estrin, Lazarova and Urga, 2001; Rassekh, 1998).

Beta (β) convergence is the cross-sectional analysis of the relationship that exists between the growth rate of a variable and the initial level of the same variable over time. It states that the small, poorer economies tend to grow faster than big, richer ones. Intuitively, it means that in a single variable regression, data show an absolute convergence if the coefficient on initial level is negative. On the other hand, in the presence of an additional variable, the negative coefficient then implies a conditional convergence (Barro and Sala-i-Martins, 1995).

However, this catch-up convergence implied above has been criticized in various ways. It is criticized by, for instance, Quah (1993), who proves that the rate of β – convergence cannot be taken to mean catch-up convergence – the poorer countries grow faster than the richer countries so as to catch up (Estrin et al., 2001; Rassekh (1998). Beta (β) convergence is therefore more relevant when regional economies are structurally different. The countries as a result do not converge to the same level but the differences across regions become stationary and, in the long run, their growth rates become the same. This means that regardless of the differences in the initial positions, the technological progress will ensure convergence in the long run (Button, 1998).

Evans (1997), Bernard and Durlauf (1996) and Quah (1993) also dispute the above theory and instead recommend a time series analysis for convergence. First of all, Evans (1997) indicates that there may be wrong inferences resulting from cross-sectional discrepant estimates for convergence rate. Secondly, Quah (1993) reveals that there is coherence between the stable variance in cross-country output and a negative correlation between output growth and initial output level.

Dalgaard and Vastrup (2001) also argue that these two measures yield different results for 121 countries over the period 1960-1988. The standard deviation of logs showed convergence and the coefficient of variation showed divergence. This implies that the standard deviation of log per capita income and the coefficient of variation are just

two of a number of alternative measures of inequality in a particular year (Cowell, 1995).

2.4.2 Time series approach

Even though time series was proposed and used for convergence, Bernard and Durlauf (1995, 1996) discover that it is actually not a very good approach as it tends to accept the no convergence null for various data sets. They define convergence using time series approach. In their first definition, they consider the behaviour of the output differences between two economies over a fixed time interval and equate convergence with the tendency of the difference to narrow. Secondly, they ask whether the long-run forecasts of output differences tend to zero as the forecasting horizon increases. They apply these definitions to various countries to investigate if it is true for each pair. However, Bernard and Durlauf do not find much evidence in favour of convergence as per their definitions. Their findings are further supported by Haug, MacKinnon and Michelis (2000), Evans (1997), D'Amato and Pistoiesi (1996) and Quah (1992). Therefore, the time-series measure generates less convincing findings for the convergence hypothesis. One possible reason for this may be closely related to the empirical procedures used in the studies.

Time series analysis defines convergence as identical long-run trends, either deterministic or stochastic. It assumes that the initial conditions do not matter within samples, and it tests for convergence using the framework of co-integration (Bernard and Jones, 1996). Co-integration does not tell if the distance between the variables declines; it only gives the indication that the variables are co-moving (Figuert and Nenovsky, 2006). This means that where co-integration is used in time series analysis, it is impossible to tell whether convergence is due to declining differences or not.

Co-integration means that the respectable variables have a long-term relationship. If such a relationship exists, it then means there is no need to difference the variables as there is co-movement between them. Moreover, the main reason for testing for co-integration is to determine this co-movement, as its existence means the variables at hand are converging. The weakness that has been identified with this approach is that co-integration takes the whole time history of the series into consideration, even

though the behaviour of the series is restricted. The implication is that this method is only applicable to those countries that have reached their steady dynamics, not on transition countries (Estrin et al., 2001).

Finally, Dobson, Ramlogan and Strobl (2003) assert that in spite of the fact that time series analysis on convergence has not been very helpful, it has contributed largely to convergence literature and a large number of studies are still based on estimating β . However, it is impossible to include results from time series studies in the meta-regression analysis (MRA) as they do not deduce a rate of convergence comparable to that deduced in cross-section and panel studies.

2.4.3 Panel data approach

Panel data analysis endows regression analysis with both a spatial (cross-sectional units of observation) and temporal (periodic observations characterizing the cross-sectional units over time) dimension. The combination of time series with cross-sections can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions (Gujarati, 2003).

In recent years, a great deal of literature has been devoted to panel data analysis to test the convergence hypothesis. This procedure uses cross-sectional and time series analysis. Levin and Lin (1992) instituted the foundations on the panel unit root tests, and, thereafter, a couple of suggestions on panel unit root test have been made. The tests include those suggested by Im-Pesaran-Shin (IPS) (2003), Islam (1995) and Maddala and Wu (1999).

Islam (1995) is one of the people who broadened cross-sectional data to panel data analysis. This was then extended to panel data unit root testing. Quah (1992, 1994), Im, Pesaran and Shin (2003), Bernard and Jones (1996), and Evans and Karras (1996) are responsible for the development of the panel unit root testing procedure. These tests are more or less the same; the differences lie in the assumption and restrictions made. For instance, Quah (1992) does not take fixed effects into consideration, while Bernard and Jones (1996) allow for individual effects. On the other hand, Evans and Karras (1996) allow the autoregressive coefficients to differ across economies.

Compelled by the findings that cross-section analysis also has some shortfalls (including omitted variable bias), Islam (1995) suggests panel data analysis that uses fixed effects to take into consideration individual specific characteristics and time invariant characteristics. Thereafter, Knight, Loayza, and Villanueva (1993) and Tondl (1999) discover that by employing the Least Squares Dummy Variable (LSDV) in panel data analysis, the convergence rates increase.

Furthermore, in panel data analysis, pooled data for the countries is used so as to take advantage of both cross-section and time-series dimensions. Pooling the cross-section and the time series together increases information and hence allows for information to be extracted from the pool that would otherwise not be possible to obtain from pure time series and pure cross-section. Given high multicollinearity among the variables, it is almost impossible to derive the dynamics of change from pure cross-section and time series. Put together, the time-series dimension disentangles the effects of the short term and the long term; at the same time, the cross-section dimension minimizes the collinearity problem. Pooled data will also allow for the number of observations to be increased so as to avoid the degree of freedom problem, which is normally the case when dealing with time series analysis (Beine and Coulombe, 2004).

According to De la Fuente (2000), classical convergence suggests that convergence towards the stable state is a very slow process, perhaps owing to the inadequacy in letting the differences between the countries exist in econometric model specifications. As this has been an observed problem, a number of studies have suggested panel data approaches because they allow unseen fixed effects. De la Fuente, however, says that the panel techniques have led to many confusing questions being asked. She says in one recent study the panel results indicate that investment in education is not productive and that stocks of productive factors have nothing to do with productivity differences across economies. This in her opinion is not true, but it has revealed that the differences in wealth between countries cannot be explained with a simple model.

2.5 Comparison of LL and IPS unit root tests

O'Connell (1998) uses Monte-Carlo simulation to investigate the impact of the cross-sectional correlation on the size and power of Levin and Lin (LL) (1992) unit root test. The results show that cross-sectional correlation in panel data affects the LL panel unit root test negatively. The presence of cross-section correlation reduces the power of the test and also distorts the size. He then suggests that, to increase the power of the LL test, instead of using the OLS estimators the GLS estimators should be used.

Maddala and Wu (1999) perform some tests in which they compare the Levin and Lin test, the Im-Pesaran-Shin (IPS) test as well as their own test. In their analysis, they produce data with cross-sectional correlation and also arbitrarily generate the variance-covariance matrix of the cross-section error terms. Irrespective of the fact that all three tests suffer low power, given the cross-sectional dependence, the Maddala and Wu (MW) test is deemed the best, followed by the IPS test. The Levin and Lin (LL) test emerges as the worst test.

Another test is performed by Im-Pesaran-Shin (2003) to determine the testing powers of the LL and the IPS unit root tests given the assumption of no cross-sectional correlation within the panel. The results demonstrate that the LL unit root test is not as powerful as the IPS unit root test. Meanwhile, Strauss and Yigit (2003) perform a Monte-Carlo simulation and establish that, in the IPS unit root test, the magnitude of the contemporaneous correlation is important. Further, they find that demeaning procedure across the panel does not terminate the problem.

Still on these unit root tests, Jonsson (2005) investigates the LL panel unit root test given the cross-sectional correlations. The findings are in support of what is found by O'Connell (1998): that in the presence of cross-section correlation the power of the LL test is reduced. Jonsson, however, suggests the use of the panel corrected standard error (PCSE) estimator rather than the OLS standard error. The argument for the suggestion is that, in comparison with the LL test, the PCSE-base test induces more power and better size.

Finally, it can be concluded that IPS unit root test has a better testing power compared to LL unit root test. This conclusion is what has led to decision on which unit root test to use in this study. Given this result, it is important to look at the existing literature on SACU as most of the above literature mainly looks at European countries.

2.6 Literature review on SACU and the neighbouring organisations

Employing time-series and panel approach, Carmignani (2006) investigates the level of macroeconomic policy convergence, shocks' symmetry and per capita income convergence in COMESA (Common Market for Eastern and Southern Africa). The results reveal mild monetary policy convergence among countries; however, there are problems in terms of fiscal stabilization for many countries. Carmignani also finds that trade integration is low among COMESA countries even though there is evidence that the shocks are symmetrical. Moreover, as far as per capita income is concerned, there is little evidence of convergence; instead, the results reveal convergence between the poorest countries.

According to Bezuidenhout (2003) and Holmes (2005), catching-up convergence mainly determines if there is a degree of narrowing in the gap between the leading country's (South Africa) performance in the variable in question and that of the other countries. As Bezuidenhout (2003) points out, homogenization and catch-up convergence are two different things. They do indeed normally go hand-in-hand but they are not equivalent. Most policy decisions are based on catch-up convergence rather than homogenization.

According to McCarthy (2005), African countries are exposed to unforeseen external shocks and uncertainties related to the absence of diversified economic activities and their reliance on one or two primary commodities. He argues that those unforeseeable external shocks, the differences in economic structures and other challenges that the countries encounter may require some divergence in the external debt-to-GDP ratio, the budget deficit as a percentage of GDP, growth in the broad money supply (M2), CPI inflation rates, interest rate spreads and current account deficits in the process of adjustment.

Further, McCarthy (2002) postulates that SADC can only succeed if it experiences growth in intra-regional trade: this will then require macroeconomic stability and cross-border investment, among other things. He asserts that macroeconomic convergence for regional integration is not always the best strategy – it can actually work against productivity. Further, the countries should focus more attention on achieving the lowest inflation rates or a fixed value.

Following the convergence goals set by the Southern African Development Community (SADC), Rossouw (2006) assesses if there has been any progress within the region towards the achievement of the goals. Rossouw also investigates the possible challenges for the countries concerned. The findings are that, should South Africa take a leading role and the other states carefully and persistently manage their policies, the SADC countries can overcome all the challenges and achieve their convergence goals.

Kabundi and Loots (2006) use a novel dynamic factor model to investigate the existence and level of co-movement of the South African business cycle with those of other SADC countries. They find a strong evidence of co-movement between the South African business cycle and those of Swaziland, Botswana, Zimbabwe, the DRC, Lesotho and Angola. There is moderate synchronization with Mozambique, Mauritius and Namibia, and no significant synchronization with Malawi and Zambia. They find that regional policy coordination is important. These results suggest that, in the whole region, there is more convergence between South Africa and the countries that are SACU members.

There is free trade in SACU, which means there is free movement of goods, services, labour and capital – one reason why the union was established. Many, including Ben-David (1996), argue that trade openness facilitates the economic development of participating countries. The SACU countries trade heavily with each other, with South Africa being the main trading partner for all of them. Further, there is not only free trade in SACU: the smaller countries have also pegged their currencies to the South African Rand – excluding Botswana, of course.

The Common Monetary Area (CMA) that exists in SACU is also playing the main role in enhancing macroeconomic convergence. Further, for the same reason, the countries' inflation levels are also not expected to deviate a lot from the South African inflation level. As Ben-David (1995) stresses, countries with low levels of inflation will be pitted against countries with fiscally expansionary states. Therefore, it is required that inflation, interest rates, external debt, exchange rates and GDP growth be converging, as these are macroeconomic stability indicators. Hence, the CMA has led to the elimination of exchange rate fluctuations, reduced fiscal deficits and allowed for the alignment of the inflation and interest rates of the member states.

Finally, Jenkins and Thomas (1997) argue that the SACU and the CMA arrangements have been referred to as examples of successful economic integration in Africa. They also mention that studies have shown that as a result of SACU and CMA, the financial sectors of member countries are highly integrated.

Having exploited the existing literature on macroeconomic convergence, the existence of convergence in SACU is therefore highly possible. However, this literature simply forms the basis of an argument for this study; conclusion can not be made based on the literature alone. Thus, the next chapter which is the most important for this study as it separates it from the rest, will assist in deciding whether there is convergence in SACU or not. The most important results for this dissertation are based on the model explained in the next chapter.

Chapter 3

3. Methodology and Data

3.1 The advantages of IPS unit root test

Recent literature (Hoang and Mcnown, 2006) indicates that panel-based unit root tests have higher power than unit root tests based on individual time series. Although these tests are commonly called "panel unit root" tests, theoretically they are simply multiple-series unit root tests that have been applied to panel data structures. Panel unit root tests and the unit root tests performed on a single series are similar, but they are not identical. Convergence among countries on the key economic variables may be tested using several methods. However, the panel-based unit root tests advanced by Quah (1992, 1994) and Levin and Lin (1992) have been used by most researchers. In contrast, this dissertation adopts a panel unit root advocated by Im-Pesaran-Shin (2003).

The (IPS) test, developed by Im, Pesaran, and Shin (2003), allows for individual unit root processes so that they may vary across cross-sections. This test is characterized by a combination of individual unit root tests to derive a panel-specific result (Hoang and Mcnown, 2006). It tests the null hypothesis of non-stationarity for a variable detected in a panel. Basically, it performs the augmented Dickey-Fuller (1979) test for each cross-sectional observation. Then, with the assumption that each individual cross-section is independent, the results are combined using a large sample distribution of t -statistics to investigate the null on the panel as a whole.

The IPS test has an advantage over the other tests as it provides greater flexibility. Under the alternative hypothesis, the IPS panel unit root test allows the autoregressive coefficient (β) to vary across countries while, for instance, Levin and Lin (1992) assume the autoregressive coefficient to be homogeneous across countries (Im, Pesaran and Shin (2003) and Maddala and Wu, (1999)).

3.2 A Formal specification of the empirical model

Following Im-Pesaran-Shin, consider a sample of N cross-sections (i.e. the countries) observed over time periods T . Assume the stochastic process X_{it} is generated by the first-order autoregressive process:

$$X_{i,t} = \alpha + \phi X_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Where X_{it} is growth rate of a specific variable over a period of one year. The fact that the variables are modelled as an autoregressive process is based on common practice in the literature and does not represent any theory of how this variable is determined.

The convergence measure adopted is based on the following relationship, which describes dynamics of the differentials of the respective variables in a panel setting. Formally, this can be transcribed as

$$X_{i,t} - \bar{X}_t = \phi (X_{i,t-1} - \bar{X}_{t-1}) + u_{i,t} \quad (2)$$

where $\bar{X}_t = \frac{1}{n} \sum_{i=1}^n X_{i,t}$. In the presence of pooling, the intercept α vanishes since, by construction, the differentials have a zero mean over all the countries and periods.

Convergence in the above context requires that the differentials of the respective variables become smaller and smaller over time. For this to be true, ϕ must be less than 1 and statistically significant. On the other hand, ϕ greater than 1 and statistically significant indicates divergence. Recent work has established that a sub-

unity convergence coefficient ϕ is indeed a robust indication of convergence, and this is respectively true for divergence when $\phi > 1$. Thus, when neutral data with no strong inclination in either direction is used, the convergence coefficient ϕ tends towards unity. Thus, the null hypothesis of the unit root becomes: $H_0: \phi_i > 1$ for all i ,
Against the alternative: $H_1: \phi_i < 1$.

The standard unit root tests have low power against stationarity, meaning the use of H_0 as the null hypothesis may lead to the bias of accepting the no-convergence hypothesis. Therefore the alternative null hypothesis of convergence is used to address the issue. Taking the convergence null hypothesis (stationarity) into consideration presents a way of determining whether the null of non-stationarity (no-convergence) was accepted because the data truly displays diverging dynamics or because it lacks power (Mutoti and Kihangire, 2006).

However, testing both hypotheses reveals some information to evaluate the competing hypotheses. Should both tests clearly show non-convergence, it means the countries actually diverge; therefore H_1 (stationarity null hypothesis) will be rejected. On the other hand, if the null of non-stationarity is rejected, and the null of stationarity is not rejected, then the evidence is in favour of cross-country convergence. However, failure to reject both nulls means the data at hand does not allow for separation of convergence dynamics (Mutoti and Kihangire, 2006).

The convergence coefficient ϕ for a group of countries can be obtained by estimating equation (3). In order to remove any possible serial correlation from the data, equation (3) can be written in the form of an augmented Dickey and Fuller (1979) test, i.e.

$$d_{i,t} = \phi d_{i,t-1} - \sum_{j=1}^k \gamma_j \Delta d_{i,t-j} + z_{i,t} \quad (3)$$

where the differential $d_{i,t} = X_{i,t} - \bar{X}_t$, and its first difference $\Delta d_{i,t} = d_{i,t} - d_{i,t-1}$. The subscript $i = 1, \dots, k$ indexes a country in a group.

When the separate ADF regressions have been estimated, then the average t -statistics for ϕ_i from the individual ADF regressions $t_{ixi}(p_i)$ are then adjusted to get the desired test statistics to ensure that distribution of the t -statistic (t -bar statistic as per the IPS test) does not diverge under the null hypothesis as the number of countries increases, i.e.

$$t_{NT} = \left[\sum_{i=1}^N t_{ixi}(p_i) \right] / N \quad (4)$$

In cases where the lag order is always zero $p_i = 0$ (for all i), simulated critical values for t_{NT} are provided in the Im-Pesaran-Shin (2003) for different numbers of cross-sections N , series T , and for the equations containing either intercepts, or intercepts and linear trends. E-views (a software package that provides tools for data analysis, regression as well as forecasting) uses the same values (or linearly interpolated values) in evaluating the significance of the test statistics.

Now, in more general cases where the lag order may be non-zero for some cross-sections, Im, Pesaran, and Shin show that a properly standardized t_{NT} has an asymptotic standard normal distribution:

$$W_{iNT} = \frac{\sqrt{N}(t_{NT} - N^{-1} \sum_{i=1}^N E(t_{iT}(p_i)))}{\sqrt{N^{-1} \sum_{i=1}^N \text{var}(t_{iT}(p_i))}} \rightarrow N(0, 1) \quad (5)$$

The Im-Pesaran-Shin test is a way of combining the evidence on the unit root hypothesis from N unit root tests performed on N cross-section units. The test assumption is that T is the same for all cross-section units and hence $E(t_{i,T})$ and $\text{var}(t_{i,T})$, which stand for the mean and variance respectively, are the same for all i , so the IPS test is applied only for balanced panel data.

3.3 The Rate of Convergence

Once calculated, the estimated ϕ provides an indication of the speed of convergence within a group of countries. When ϕ is statistically significant and approaches unity, the rate of convergence declines. The speed of convergence is determined by calculating the half-life, which is the number of periods it takes to divide the gap into half. The half-life is derived and used in Ben-David (1993, 1996). It is therefore given by:

$$\text{Half-life} = \frac{\ln(0.5)}{\ln(\phi)} \quad (6)$$

3.4 Data description and transformation

It is more informative to study macroeconomic variables with high frequency data, but there are constraints on the availability of long period data for most African countries. This study uses the annual data of SACU member states observed from 1991 to 2005. For analysis of debt as a percentage of GDP, there was a problem obtaining data that covers the period – 1991 to 2005. The analysis was therefore done for the period 1994 – 2002. The reason for beginning from 1991 and not earlier is linked to data problem for most countries being investigated. Since there are limited records of data, it is important to interpret the results with caution as the reliability is questionable.

The data comprises of five SACU countries: Botswana, Lesotho, Namibia, South Africa, and Swaziland obtained from World Economic Indicators. Macroeconomic variables that are used for convergence in this dissertation are inflation rates, GDP growth rates, interest rates, exchange rates and debt as a percentage of GDP. These are the key macroeconomic stability indicators that have to be monitored in the process of achieving economic convergence; especially in the countries aiming for monetary union.

Appendix A presents a list of the countries according to regional classifications, while appendix B shows the variables that are contained in the study, their definitions, sources and what is expected in terms of convergence. Tables (1) and (2) indicate descriptive statistics (see the next chapter).

In this analysis, the emphasis is on the growth rates of the aforementioned variables. Therefore, the variable X_t is specified as a logarithmic form of the original data; i.e.

$$X_t = \ln V_t - \ln V_{t-1} \quad (7)$$

where V_t is the original variable at time t and X_t is a growth rate of a variable V_t over the one-year period.

Since most of the variables are in index form, the only variable that is logged is exchange rate (expressed as national currency to the dollar). For further description on data, see data appendix.



Chapter 4

4. Empirical analysis

4.1 Descriptive statistics

Table 1 below provides summary statistics based on data for 1991; the initial period and 2005 the most recent period for this analysis. In 1991, region growth rates were on average 3.175%. All countries except for South Africa experienced positive growth rates. The growth rates decreased for all countries in 2005 except for South Africa whose growth rates increased drastically from a negative value in 1991 to a value higher than the region average. However, Botswana's growth rate remained remarkably stable over the years even though the value was slightly lower in 2005. The inflation rates however, were very high (double digits) for all countries except for Swaziland whose inflation rate was below the average and was already a single digit. By 2005 all the countries had already achieved the single digit target set by SADC for 2008. There has been a slight change in the exchange rates since 1991. The pula however, still remained stronger than the rand (the working currency in the CMA).

In terms of interest rates, only Botswana and Swaziland had interest rates that were below the average; all the other countries' interest rates were above the average. However, by 2005; all the other countries had managed to reduce their interest to the levels below the average except for Botswana whose interest rates were 15.74% while the region averaged 11.84%. The information displayed in the table shows large

differences in macroeconomic performance in the region but most gaps were reduced by 2005.

Table 1: Key Economic Indicators of SACU Countries, 1991 and 2005

COUNTRY	GDP		INFL		EXCH		INT	
	1991	2005	1991	2005	1991	2005	1991	2005
BWA	7.4	6.2	12.6	8.6	0.7	1.63	11.83	15.74
LSO	3.7	1.3	17.3	4	1.02	1.85	20	11.72
NAM	5.5	3.5	11.9	2.4	1.02	1.85	23.36	10.61
SWZ	2.6	1.9	8.9	4.8	1.02	1.85	16.02	10.63
RSA	-1	4.9	15.6	3.4	1.02	1.85	20.25	10.5
SACU AVERAGE	3.175	3.575	13.26	4.64	0.95	1.81	18.29	11.84

Source: - Own calculations

Note: - there are no calculations for debt to GDP since there was no data available for 1991 and 2005

Table 2 reveals country-specific values of the mean and standard deviations of macroeconomic variables under investigation for the period 1991 to 2005. Standard deviation, as a measure of dispersion, is used in this dissertation as a preliminary measure to assess the extent of convergence. If both standard deviation and the mean are decreasing, it means the countries are converging.

Looking at the averages for all countries, South Africa has been growing slower than the rest of the countries, followed by Swaziland. Botswana and Namibia were the fastest growing economies, where Botswana was leading of course. On average, the inflation rates for Botswana followed by Lesotho were the highest. South Africa recorded the lowest mean inflation rate. Botswana's mean exchange rate was lower than the rest of the countries (CMA members). Since Lesotho, Namibia, Swaziland and South Africa are members of the CMA; their mean exchange rate was the same. The mean debt to GDP was highest in Lesotho; it was also above the 2008 target of 60% of GDP. On average, the rest of the countries managed to maintain debt that is below 60% of GDP.

Table 2: The mean and standard deviation

COUNTRY	GDP	INFL	EXC	INT	DEBT
	1991 - 2005	1991 - 2005	1991 - 2005	1991 - 2005	1994 - 2002
Botswana	6.08 (2.426)	9.72 (2.878)	1.32 (0.374)	14.75 (1.193)	11.24 (2.937)
Lesotho	3.15 (2.977)	9.23 (4.051)	1.63 (0.413)	16.70 (2.452)	76.10 (6.12)
Namibia	4.2 (2.457)	8.94 (3.524)	1.63 (0.413)	17.07 (3.6)	*
Swaziland	2.73 (0.721)	8.29 (2.945)	1.63 (0.413)	15.45 (2.686)	21.37 (4.529)
South Africa	2.48 (2.028)	7.71 (3.651)	1.63 (0.413)	16.2 (3.699)	18.79 (2.477)

Source: Own calculations

Note: - values in parenthesis are standard deviations

- * means data not available

- Debt was analysed for period 1994 to 2002

In terms of spread, there is greater variability in Lesotho's growth rates than in other countries as reflected by its standard deviation. As shown in table 2, Swaziland has the lowest spread followed by South Africa. Variability in inflation level is highest in Lesotho followed by South Africa, Namibia, Swaziland and Botswana has the lowest spread. There is less variability in Botswana's exchange rates as compared to the CMA countries. Botswana has the lowest interest rate spread followed by Lesotho, then Swaziland and Namibia and South Africa are very close together; with South Africa recording the highest. This means that it costs more for financial intermediation in South Africa than in the other countries. As far as debt to GDP is concerned, table 2 reveals some very interesting information about Lesotho. It appears Lesotho is an outlier as it has 76.10 % mean debt to GDP and the highest spread of 6.12 followed by Swaziland. Variability of Botswana and South Africa are not very different – 2.94 and 2.48 respectively.

In summary, the above analysis reveals there is potential for macroeconomic convergence in the region. Table 1, indicates that by 2005, SACU countries had achieved most of the set primary goals for 2008. The low and not very far apart levels of standard deviation point to a possibility of macroeconomic convergence. The information in tables (1) and (2) above show that inflation and interest rates are very low in the recent years as compared to those of 1990s. The volatility has also reduced significantly implying convergence towards the lower levels. Finally, it is clear from table (2) that fiscal deficits for Lesotho have stood at high levels, thus the country has to work hard to contain its fiscal deficits.

Even though it carries certain important information, the above analysis is not sufficient for in-depth conclusions about convergence. Therefore econometric test is applied for investigation of the existence of a long term convergence between the variables in the five countries. The sections that follow discuss the graphical representation and the unit root results about the convergence and the co-movements of the variables.

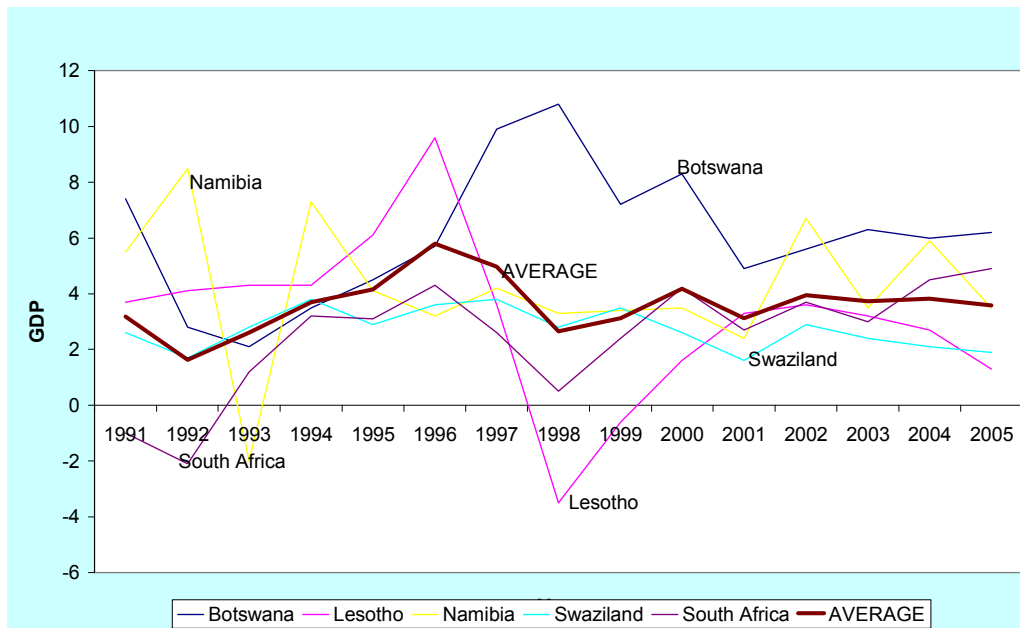
4.2 Graphical representation

A simpler analysis for convergence is undertaken so as to determine the extent to which the growth rates, inflation, interest rates, exchange rates and debt as a percentage of GDP for SACU countries move together. Figures 1-8 show the potential convergence (graphically) of the SACU member states on different macroeconomic variables.

GDP growth rates

Figure 1 shows that Namibia experienced substantial growth rates in 1992 – leading the other countries after it gained its independence from South Africa in 1990. This was then followed by a slowdown the following year. All the other countries moved along together until they all reached a peak in 1994, the year South Africa got its independence. South Africa had been going through a slowdown in the early 1990s; it only saw modest recovery in 1993. 1994 was the year it gained momentum as political instability ceased after the elections. Lesotho, on the other hand, was lagging behind and reached its maximum growth rate only in 1996; this was followed by the recession two years later (in 1998). 1998 was the beginning of political instability in Lesotho and this must have contributed to the recession. Lack of growth in Lesotho is also a result of the fact that most households depend on income from wage remittances from migrant labour in South Africa.

Figure 1: GDP growth rates



Source: - Own calculations

From 2000 onwards, all the countries seem to be moving together, even though Namibia's peaks and troughs are more pronounced than the other countries. The co-movements between South Africa, Namibia and Swaziland are more evident. Compared to the other countries, Swaziland has not seen major slowdowns or booms. This wavering economic growth in Swaziland has been exacerbated by the economy's inability to create new jobs as new job seekers entered the market.

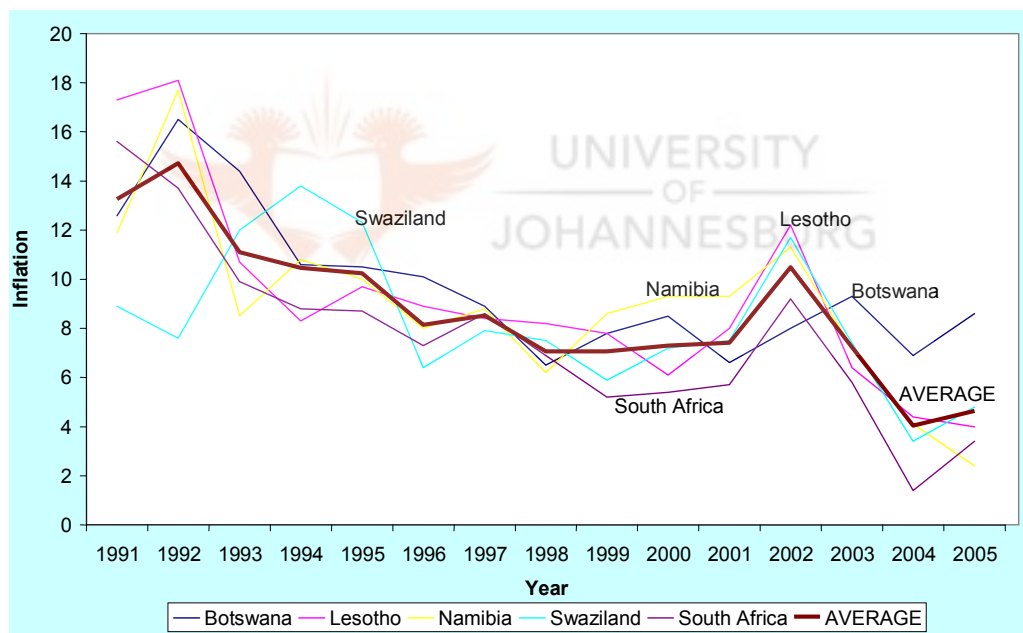
Botswana has experienced the highest GDP growth rates from 1997 until the year that the data ended. This is with the exception of 2002, when Namibia once again grew faster than the rest and reached one of its peaks. From 2002, Botswana's growth rates can be attributed to a rallying global diamond price and a regenerated demand from US and Europe. Moreover, growth in the tourism sector contributed immensely to the GDP growth rates. In the early 1990s, the slowdown in growth rates can be attributed to several causes – for instance, the transient increase in oil prices world-wide. The analysis of the GDP growth rates has shown that economic growth rates for these countries were around 3.5 % on average.

Inflation

The level of inflation is a particularly important indicator of macroeconomic stability.

In 1992, as shown in Figure 2, the inflation rates for Botswana, Lesotho, South Africa and Namibia were all high. Swaziland, however, experienced the lowest levels. A year later the four countries' inflation rates decreased, while that of Swaziland, which had been moving in the opposite direction, increased. In 1994, Lesotho, South Africa and Botswana reached one of their lowest levels while Namibia's and Swaziland's inflation rates reached their maximum levels. Thereafter, all the countries appear to be following similar movements until 1998. This synchronization could be a result of the fact that there was stability in South Africa after it achieved democracy in 1994. From 1998, Namibia and Botswana away drifted from the rest of the countries with a slight decline in inflation rates. This was followed by an increase in 1999, leading the countries into their maximum levels of inflation.

Figure 2: Inflation rate



Source: - Own calculations

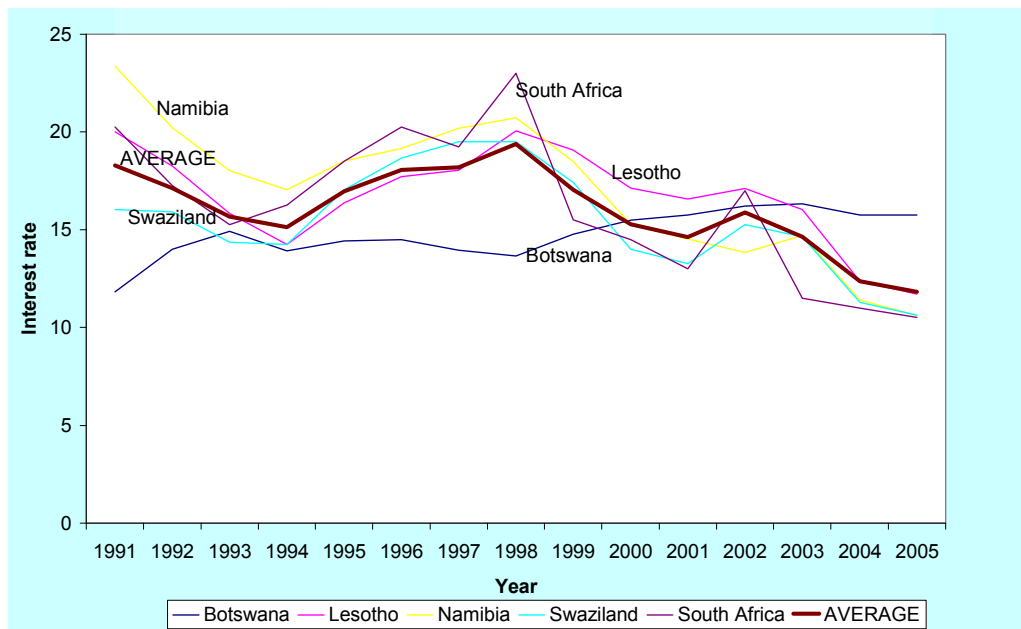
In 2002, all the countries experienced one of the highest inflation levels; the main reason for this setback was the dramatic depreciation of the South African Rand in the final quarter of 2001. This was with the exception of Botswana, which experienced this only a year later. In 2004, all the countries' inflations were low (including Botswana). Now, even though there are some differences here and there, the SACU countries' inflation rates appear to be highly synchronized. The countries are

converging to a single digit and therefore have already accomplished what is required by SADC. All the SACU members' inflation levels are in their single digits and they have all managed to maintain the single digit inflation level since 1997. Before 1997, some countries' inflation levels were double digits. With South African Reserve bank's dedication to fight inflation, it is unlikely that the CMA countries will have double digits inflation levels. Botswana seems to be doing just as well as the CMA members.

Interest rates

The graph for interest rates (Figure 3) shows that Botswana's interest rates had been the lowest until 1998, when they started to increase, reaching the same levels as the other SACU members. However, instead of following the same path as the other countries, Botswana's interest rates kept increasing every year, remaining the highest within the region. Because the smaller members are using the Rand, or rather a domestic currency that is equivalent to the Rand, they maintain monetary policies that are similar to South Africa's monetary policy; therefore, their inflation rates and interest rates are very close to those of South Africa.

Figure 3: Interest rates



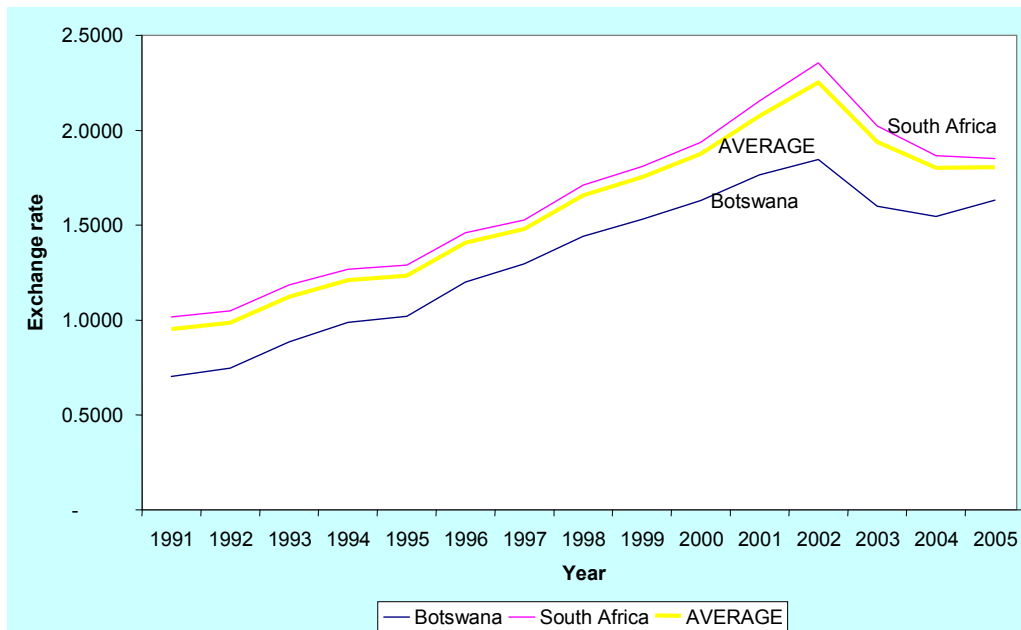
Source: - Own calculations

The rest of the countries appear to be moving together even though South Africa's peaks are more evident. In 1998, Lesotho, Namibia, Swaziland and South Africa reached their maximum levels of interest rates; this was mainly due to the reaction of the South African Reserve Bank on the Asian crisis. The monetary authority reacted by increasing interest rates increases to keep investors in the country. They started to decrease after that, and once again reached their minimum together in 2000; the decline is a result of inflation targeting policy that was adopted in 2000. South Africa, however, was not part of that minimum, as it reached its minimum a year before, and again a year later. South Africa appears to be leading the other countries, as its interest rates either start to increase or decrease first; then a year later, or a few months later; the three smaller countries start to follow. This might be due to the fact that most of SACU members pegged their currencies to Rand; hence, monetary authorities in these countries tend to follow South African monetary policy. This is why the other countries' interest rates lag those of South Africa.

Exchange rates

Figure 4 for exchange rates shows only Botswana's and South Africa's exchange rate movements. This is due to the other countries' exchange rates being exactly the same as the South African exchange rates – ascribable to the peg that exists.

Figure 4: Exchange rates



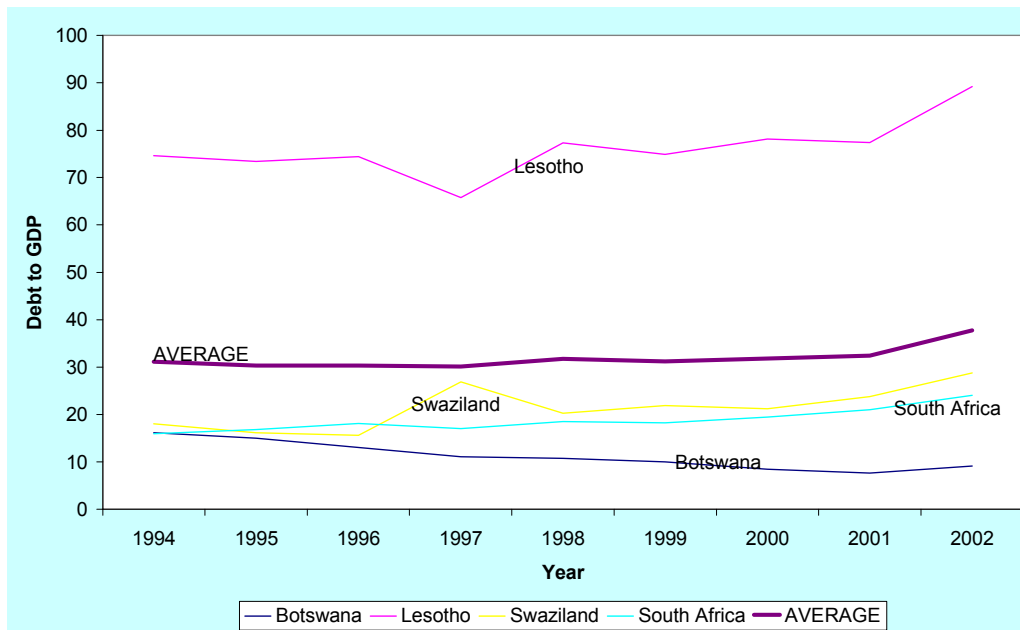
Source: - Own calculations

The movements of these countries' exchange rates are very clear and the countries seem to be sharing the same turning points. In 1992, they were both low and started to rise together thereafter. There was a little stagnation in 1995, followed by a constant increase. The two countries reached their peak in 2002, followed by a cutback until the minimum was reached in 2004. Now, the graph depicts the movements between Botswana and South Africa. This means that the observed synchronization between Botswana and South Africa exists (in the same magnitudes) between Botswana and the rest of the countries.

Debt to GDP

It is crucial that countries that intend to form a common currency area maintain debt within a given benchmark, as servicing any form of excessive debt would put undue strain on the joint foreign exchange. Figure 5 shows that Lesotho has the highest levels of debt; hence it is moving on its own.

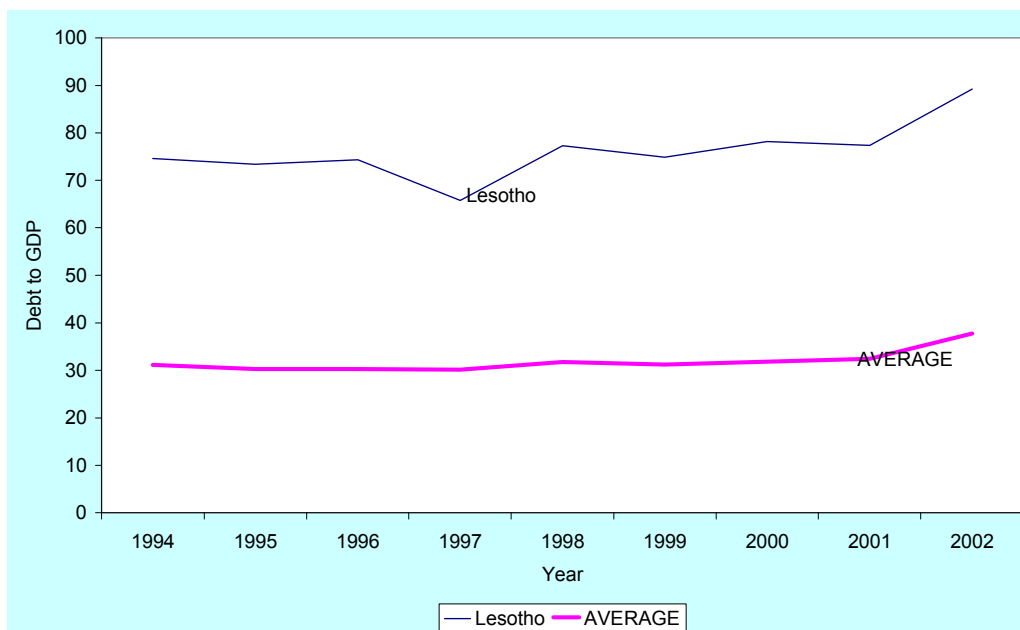
Figure 5: Debt to GDP



Source: - Own calculations

Because this country distorts the whole picture, it was removed from the analysis that follows to try to determine if there is any evidence of the possibility of co-movements. The movements for Lesotho were then observed individually (see figure 6).

Figure 6: Debt to GDP (Lesotho)

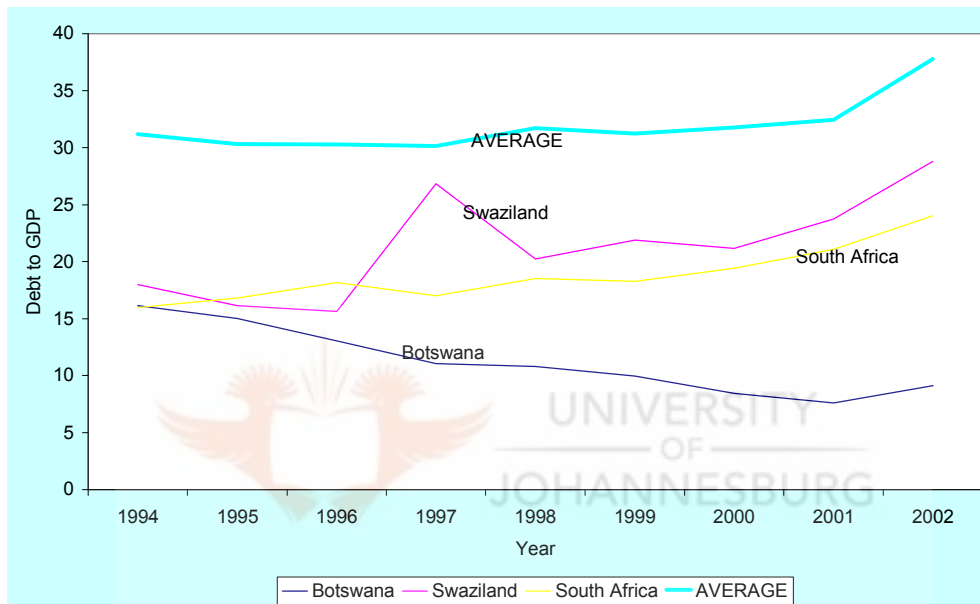


Source: - Own calculations

Figure 6 reveals the differences between Lesotho and the average for the whole region. Lesotho is moving on its own; it is not even approaching the region aggregate.

Figure 7 shows only Botswana, Swaziland and South Africa. South Africa appears to be following a steady decreasing path until 2001; thereafter, its debt to GDP started to increase.

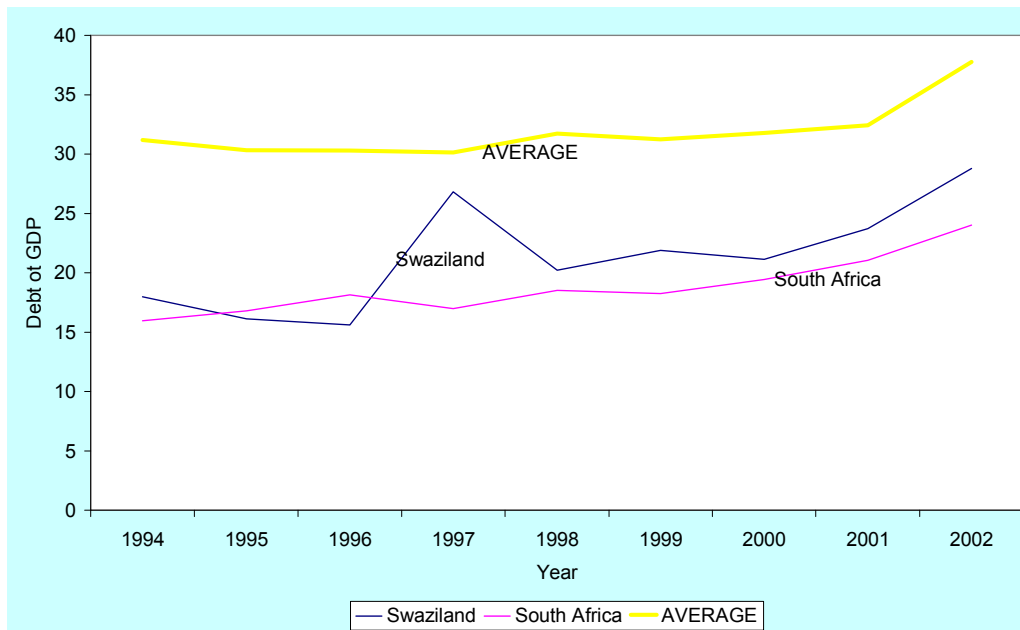
Figure 7: Debt to GDP (Excluding Lesotho)



Source: - Own calculations

Swaziland is moving along with South Africa; however, there was a deviation from this in 1997 when Swaziland's debt went extremely high. This was followed by an immediate decline a year later, and the two countries started to move almost together again. This relationship is further shown in Figure 8, which excludes Botswana and only shows South Africa and Swaziland.

Figure 8: Debt to GDP (Swaziland and South Africa)



Source: - Own calculations

Botswana is also following a steady path like South Africa, but, while South Africa's debt to GDP is increasing, Botswana's debt is decreasing. The two countries are moving together, but in opposite directions. Comparing these results with SADC recommendations, all the countries except for Lesotho have already met the recommendations. Lesotho's debts are way above 60% of the GDP for all the years (from 1994 to 2002). Although other countries' debts to GDP vary, they are below the set benchmark, and they are generally moving together. Lesotho has to work hard to reduce its debt to the required level (as per SADC requirements).

Therefore, from this analysis, it is clear that the countries are moving together. The movements are more obvious between some variables than others. Thus, as much as one can suspect convergence between these countries, it is impossible to state by how much this countries converge, if they do actually converge. This then leads to the second approach for convergence analysis – analysis of the correlations between the countries.

4.3 Bivariate Analysis: Correlations

Another assessment of synchronization of macroeconomic convergence is to determine pair-correlation coefficients for each variable in order to investigate the

existence of co-movements between variables. A correlation coefficient evaluates the degree to which two variables are linearly related, and it ranges from -1 to 1. The correlation coefficient of 1 means there is perfect linear relationship with positive slope between the two variables. This means that, whenever one variable increases, the other variable increases at the same time. On the other hand, -1 means there is a perfect linear relationship with negative slope between the two variables, meaning that the two values vary in opposite directions. A correlation coefficient of 0 signifies no linear relationship between the variables. Finally, if the coefficient is greater than 0.50 (in either direction – positive or negative), there is a likelihood of a significant correlation between the two variables (Koop, 2000).

The correlation matrices, however, are only used to identify if there is a possibility of convergence: they do not form the basis for assessing and quantifying the degree of convergence. Table 3 reports the correlation coefficients for GDP growth rate. It is evident from the results that the cross-sectional correlation coefficients are relatively low. The Lesotho GDP growth has the highest level of co-movement with Botswana (although negative), with a correlation coefficient of -0.55495. All the other variables have correlation coefficients that are below 0.50, which means there is no evidence of co-movement between the countries. The correlation coefficients are -0.03992 for Namibia and Swaziland, 0.09051 for Botswana and South Africa, 0.15392 for Lesotho and South Africa, -0.01582 for Namibia and Botswana and, finally, for Lesotho–Swaziland and Lesotho–Namibia, the correlation coefficients are 0.18408 and 0.058948 respectively. Therefore, for these countries, the correlation coefficients signify the absence of co-movement.

Table 3: Correlation Matrix (GDP)

Country	Botswana	Lesotho	Namibia	Swaziland	South Africa
Botswana	1				
Lesotho	-0.55495	1			
Namibia	-0.01582	0.058948	1		
Swaziland	0.232447	0.184082	-0.03992	1	
South Africa	0.09051	0.15392	-0.16138	0.183237	1

Source: - Own calculations

Further, inflation correlation coefficients (table 4 below) are higher between South Africa–Lesotho and Lesotho–Namibia: they are 0.945699 and 0.857513 respectively. Moreover, the coefficients are also high between South Africa–Namibia (0.806521), South Africa–Botswana (0.759907), and Lesotho–Botswana (0.732871). The other two pairs of countries that show relatively high co-movements are Lesotho–Namibia (0.659414) and South Africa–Swaziland (0.548852).

Table 4: Correlation Matrix (Inflation)

Country	Botswana	Lesotho	Namibia	Swaziland	South Africa
Botswana	1				
Lesotho	0.732871	1			
Namibia	0.659414	0.857513	1		
Swaziland	0.380471	0.389702	0.473828	1	
South Africa	0.759907	0.945699	0.806521	0.548852	1

Source: - Own calculations

It appears from the results that South Africa is moving along with all the countries, as all the coefficients between South Africa and the other countries are above 0.50. South Africa is then followed by Lesotho in terms of co-movements with the others. Swaziland seems to have the least co-movements with the other countries; all the coefficients for Swaziland and the other countries are below 0.50 except for the one given above – i.e. between Swaziland and South Africa. Therefore, from these results one can deduce convergence between the countries.

As far as interest rates are concerned (see table 5), there appear to be positive co-movements between South Africa and the other countries, ranging from 0.872439 (South Africa and Swaziland), to 0.852974 (South Africa and Namibia) and 0.775777 (South Africa and Lesotho).

Table 5: Correlation Matrix (Interest rate)

Country	Botswana	Lesotho	Namibia	Swaziland	South Africa
Botswana	1				
Lesotho	-0.56905	1			
Namibia	-0.87052	0.832676	1		
Swaziland	-0.53379	0.814452	0.803217	1	
South Africa	-0.7449	0.775777	0.852974	0.872439	1

Source: - Own calculations

Co-movement exists between South Africa and Botswana, even though they are moving in opposite directions, and this is represented by -0.7449.

It appears that all the countries have positive and very high correlations except for Botswana. Botswana is moving with the other countries but it is moving in the opposite direction. All the coefficients between Botswana and the other countries are high but negative. This means that, for example, when the other countries' interest rates rise, Botswana's interest rates go down; this actually means that Botswana is lagging, i.e. when South African Reserve Bank decides to increase the repo rate, the Bank of Botswana follows afterward. This is not surprising, as all the other countries are members to the Common Monetary Area and have pegged their currencies to the South African Rand. The existence of the peg leads to all countries working very hard to match the South African monetary policy. As a result, the monetary instruments in Lesotho, Namibia and Swaziland end up moving together because they are all moving along with South Africa.

When members of the Common Monetary Area trade in the international markets, they use the South African exchange rates. This became obvious when the exchange rate data was the same for the four countries. Therefore between these countries the correlation coefficient is 1, see table 6.

Table 6: Correlation Matrix (Exchange rate)

Country	Botswana	Lesotho	Namibia	Swaziland	South Africa
Botswana	1				
Lesotho	0.985945	1			
Namibia	0.985945	1	1		
Swaziland	0.985945	1	1	1	
South Africa	0.985945	1	1	1	1

Source: - Own calculations

The coefficient between these countries and Botswana is also the same: 0.985945. This coefficient is very high and positive, meaning that Botswana's exchange rates and the other countries' are highly synchronized. This implies that the Rand and the Pula appreciate and depreciate more or less at the same time.

Finally, in terms of debt to GDP, South Africa again shows the highest and positive co-movements with the other countries, except for Botswana where there is high co-movement but in the opposite direction. The coefficients are 0.846974 between South Africa and Lesotho and 0.648814 between South Africa and Swaziland. There is no evidence of co-movement between Lesotho and Swaziland as the coefficient between the two countries is below 0.50 (0.32055).

Table 7: Correlation Matrix (Debt)

Country	Botswana	Lesotho	Namibia	Swaziland	South Africa
Botswana	1				
Lesotho	-0.3936	1			
Swaziland	-0.6731	0.32055	*	1	
South Africa	-0.7347	0.846974	*	0.648814	1

Source: - Own calculations

Note: * means data not available

Botswana is once again moving in the opposite direction to all the other countries. This could be because, while the other countries' are experiencing very high debts as a percentage of GDP, Botswana is still doing much better than the other countries because of very high growth (compared to the others), even if its debt to GDP is high.

Lastly, the overall correlation results depict that, to a degree, the variables are moving simultaneously. The correlations tend to be higher between some countries and very low between the others. Moreover, there seem to be noticeable co-movements between countries in terms of exchange rates, GDP growth rates, inflation and interest rates. This can be taken as an indication that information links affecting these instruments are well established between these countries. It can also be due to the fact that all four countries (Botswana, Lesotho, Namibia, and Swaziland) have the same major trading partner, South Africa, which is also a member of the union.

However, the above results cannot be used to make intuitive decisions. There is a possibility that convergence can be found amongst the variables with correlations of the opposite sign. It is also possible that, in the long run, variables that show very high correlations are diverging. This is another reason why graphical representation can also not be relied on even though it plays a very important role in terms of suggesting the presence of converge or divergence between countries. This then leads to a panel unit root analysis which gives a better assessment of convergence between economies as from this analysis, it also possible to calculate the speed of convergence.

4.4 Panel unit root test

The panel unit root test of Im, Pesaran and Shin (2003) is employed to investigate the countries to determine how different they are in various macroeconomic variables. The aim is to determine whether they tend towards the SACU aggregate and also towards South Africa, which is once again used as a point of reference. Above all, the aim is to assess if the differences are decreasing or increasing. As indicated in the previous chapter, the panel unit root results tend to give better and more conclusive results than the results obtained from the graphical representation and correlations. The differentials are computed as the difference between an individual variable and its average for the whole group at time t . Those differentials are then pooled for all the countries in the group.

It is important to remember in this section that, by construction of the test, if ϕ is statistically significant and tend towards zero, then the convergence effect is stronger.

By contrast, the convergence effect is non-existent if ϕ is statistically significant but approaches unity.

4.4.1 Convergence towards the benchmark

GDP growth rate

The panel unit root test shows that there is no convergence towards the benchmark (South Africa). The probability is 0.0721 while the coefficient of convergence is 0.55055. These results are given in table 8 below. Since the graphical representation showed Lesotho to be not really co-moving with the other countries, the decision was then made to take it out and determine if without it in the group the series would reveal some degree of convergence. With Lesotho excluded from the group, it is very interesting to find that the convergence test performed on the four SACU countries reveal some degree of convergence among the countries. Lesotho thus proved to be distorting the convergence in the region as without it the other countries seem to be co-moving with South Africa. The probability and the coefficient of convergence are represented by 0.0424 and 0.49871, respectively. The speed of convergence for the group (excluding Lesotho) is 0.996287. These results justify the elimination of Lesotho from further analysis on GDP growth rates. However, the convergence process appears to be very slow.

Table 8: Benchmark

Series	β	Probability	Half-life
Exchange rates	0.47105	0.1376	*
Inflation rates	0.093928	0.0000	0.247422
GDP growth	0.55055	0.0721	*
Interest rates	0.22705	0.0003	0.467526
Debt	0.88335	0.2780	*

Source: - Own calculations

Note: β and Probability are e-views results

Half-life is calculated using the formula given in chapter 3

* means half-life could not be calculated as there was no convergence

The above results induced some interest in investigating what would happen if one or two countries are eliminated from the group. Thus, the group was reduced by one country at the time. Would the results still be the same as the original results, or does each country have some special influence on the convergence process?

Inflation

The panel unit root test does not display a very strong convergence effect towards South Africa. The probability is 0 and the convergence coefficient is 0.93928. Therefore, the null for unit root is rejected. The speed of convergence is given by 0.247422. The countries appear to be converging quite fast (the values that are closer to zero denote a high speed of convergence, while the values closer to one denote a slow rate of convergence). These results confirm the results obtained from the graphical and the correlation analyses. Graphically all the countries' inflation rates appeared to be highly synchronised with those of South Africa. Correlation analysis also showed high co-movements between the countries and South Africa.

Interest rates

Once again, the countries are co-moving with South Africa in terms of their interest rates. The p-value (the probability) is given by 0.0003 and the coefficient is 0.22705; thus, the null hypothesis is rejected. Moreover, there is relatively rapid convergence between the countries, as their speed of convergence is 0.467526, which is closer to zero than it is to one. This can be attributed to monetary policy cooperation that exists within the CMA. Changes in South African monetary policy are transmitted to other CMA countries through changes in interest rates. Therefore, monetary policy cooperation reduces the inefficiencies which arise when there are differences between the countries over stabilising policies. Now, because the smaller countries are using the domestic currencies that are effectively equivalent to the rand, they are bound to have interest rates that are moving along with those of South Africa. Even if the central banks in those countries use interest rates to maintain the peg, to a certain degree, those countries also gave up some of their control over interest rates when they pegged their currencies to the rand.

Exchange rates

The test results show no evidence of convergence towards South Africa. This is in conflict with the results obtained from the graphical representation and the correlation matrix. The reason for this is that, for all the members of the Common Monetary Area, the exchange rates are already the same as those for the benchmark. This then leaves only data for Botswana to be used to test for convergence. Even though the unit root test results are supposed to be more reliable than the graphical representation and

the correlations, as there are only fourteen observations, the results from tests performed on such limited observations are misleading. This is the main reason for using panel data.

Debt to GDP

The results in terms of this indicator show no evidence of convergence. Therefore, the null hypothesis for the panel unit root is not rejected with the probability of 0.2780 and the coefficient value of 0.88335. These results show that there is no co-movement as far as this macroeconomic variable is concerned. Moreover, the results reveal that there are still drastic differences in fiscal position between the SACU member countries. Given the results from the graphical analysis, it is possible that Lesotho has distorted the results obtained from the panel unit root test. However, Lesotho could not be eliminated from this analysis due to limitations posed by the availability of data. By removing Lesotho from the analysis and leaving only the other three countries, the results obtained would be misleading; there would be a problem of degrees of freedom.

4.4.2 Convergence towards SACU Aggregate GDP growth rates

The panel unit root test shows that there is convergence towards SACU average. The probability is (0.0018) and the coefficient of convergence is 0.31824. Thus, the null of unit root is rejected, meaning the countries' business cycles are synchronized. The same procedure is followed, where Lesotho is eliminated from the group analysis.

Table 9: SACU aggregate

Series	β	Probability	Half-life
Exchange rates	0.47105	0.0073	0.92077
Inflation rates	0.12673	0	0.335551
GDP growth	0.31824	0.0018	0.605395
Interest rates	0.60145	0.0841	*
Debt	0.91756	0.4199	*

Source: - Own calculations

Note: β and Probability are e-views results

Half-life is calculated using the formula given in chapter 3

* means half-life could not be calculated as there was no convergence

In terms of convergence towards the aggregate of SACU, the countries are eliminated one at the time and none of them seems to be having any influence on convergence process except for Namibia. Namibia appears to be playing a very important role in the convergence process. Without it in the group, the convergence that was initially observed vanishes. This can be subscribed to high average output growth in Namibia that exceed that of the other members of the Common Monetary Area (Miyajima, 2007).

Generally, this group of countries only converge towards the SACU component. As far as the benchmark is concerned, the convergence effect is limited. It is therefore evident that eliminating one country out of the group does not radically affect the group's convergence except in the cases reported above – when Lesotho and Namibia are excluded. This can be subscribed to slow GDP growth in Lesotho, while Namibia's presence certainly has some kind of influence on the business cycle.

Inflation

The test results for convergence towards the average inflation show that the countries are co-moving. The p-value and the coefficient are (0) and (0.87327) respectively. Therefore, the null hypothesis for unit root is rejected. This is inevitable because all these countries have the same trading partner – South Africa – which is also a member to the union. It might also be due to the fact that the South African monetary policy of inflation rate targeting has an indirect impact on the region, as SACU members follow the South African policy. The speed of convergence is thus given by 0.335551. Inflation rates are so far the fastest in the convergence process. This is not surprising, as the data shows that all the countries have single digit inflation rates.

Interest rates

The panel unit root tests show no convergence towards the average within SACU as far as this particular variable is concerned. The IPS probability is 0.0841, which is substantially above 0.05. However, when Botswana is excluded, as it is not a member of the Common Monetary Area, the results change, indicating convergence of the remaining countries.

The CMA members have pegged their currencies to the South African Rand, and the only way to maintain the peg, it would appear, is by manipulating interest rates. At

times where the Rand appreciates or depreciates naturally without interference from the reserve bank, the other countries have to manipulate their interest rates to ensure that their currencies are in line with the Rand. Therefore, this is a possible reason for no convergence towards the SACU component. These results confirm the findings of the correlation approach.

Exchange rates

The results obtained from the IPS panel unit root test show the great evidence of convergence amongst the group. The probability and the coefficients are 0.0073 and 0.47105, respectively. These therefore lead to a rejection of the null hypothesis of unit root, which means that the exchange rates for the SACU countries are simultaneously moving together. It is very important to note that since the other three countries have pegged their currencies to the South African Rand, they are mostly using the South African exchange rates in international trade. Therefore, their exchange rates were taken to be the same as South Africa's exchange rates, and this is probably what has induced convergence. The speed of convergence is 0.9207697. This value is too close to one, and therefore implies a very slow convergence.

Debt to GDP

Once again, the panel unit root test on debt to GDP shows that there is no convergence within the union. The null hypothesis is not rejected with the probability of 0.4199 and a 0.91756 convergence coefficient.

Finally, it appears that convergence is occurring faster on inflation than any other macroeconomic variable as the half-lives are the smallest on inflation than on others. This high convergence in inflation rates is brought by the amount of trade that exists among the countries. Inflation is then followed by interest rates. This slow convergence is also evitable, as in CMA countries the central banks are actively using interest rates as monetary policy instruments.

Furthermore, GDP growth rates seem to be converging faster than exchange rates even though convergence is quite slow. As mentioned above, the results on exchange rates are not a true reflection of what is actually happening, as there was limited data. Lastly, the countries are not converging at all in terms of debt to GDP. The non-existence of convergence in this case is because the countries still have independent

fiscal policies: therefore nothing is really forcing them to follow the same fiscal policy.

It appears from the graphical representation, correlation matrices as well as from econometric analysis that there is some degree of convergence in SACU – with the remarkable exception of Botswana, where convergence is present in virtually none of the spheres. The possible reasons for the above results would include the following:

- the existence of a currency union; the smaller countries forfeited, through the peg, autonomous monetary policies and opted for more consistent policies with South African monetary policy
- free trade between members
- similarities in macroeconomic policies
- transfers from South Africa to other members under an enhanced customs revenue formula

The joint null hypothesis of non-stationarity was rejected for most variables. The IPS statistic has p-values that are less than 0.05, which are well above 5% or 10% levels. Therefore, the application of the IPS test shows there is some evidence for convergence found in most series.

In summary, all the findings (obtained from all the measures) assist in the conceptualization of the main results of this paper. Macroeconomic convergence exists among the SACU member countries. It is also evident that the countries that are members of the CMA show a dramatically higher convergence rate. As far as monetary policy is concerned, a high degree of convergence has been achieved in SACU. However, the same cannot exactly be said for fiscal convergence. There is still a long way for the countries to go in order to achieve the same level of convergence on fiscal policies.

Chapter 5

5. Conclusion

5.1 General Approach of the dissertation

This study examined macroeconomic convergence in SACU using annual macroeconomic data spanning 1991 to 2005. The investigation was done so as to determine if GDP growth rates, inflation rates, interest rates, exchange rates and debt as a percentage to GDP of the SACU countries have attained a certain degree of convergence. In addition, what level of convergence is necessary for these countries to deepen their integration in terms of forming a monetary union?

Many tests of the convergence hypothesis that can be found in the empirical convergence literature have been reviewed. The literature suggests mixed empirical evidence as far as the convergence hypothesis is concerned. This paper employs the heterogeneous panel unit root test developed by Im-Pesaran-Shin (2003) to scrutinize the historical trends of the macroeconomic variables mentioned above.

5.2 Findings

In terms of GDP growth rates, there is evidence that the countries are converging. However, the convergence is only towards the average and not towards South Africa, which was used as a benchmark. When Lesotho, which seemed not to be following the same path, was excluded, the rest of the countries show some evidence of convergence towards the benchmark even though the speed is quite slow. Moreover, the results obtained after the elimination of Lesotho from the group raised a few

questions; hence it was then decided to eliminate each country in turn to determine if the countries have any special individual effect on the convergence process. Namibia appeared to be playing a major role in the convergence process towards SACU aggregate. When it is eliminated from the group, the convergence that was observed disappeared. The other countries do not have any special influence on the convergence process.

Strong evidence has indicated that the countries studied have made significant progress in inflation convergence towards both the aggregate and the benchmark – suggesting that, within the region, the countries are undergoing similar price shocks. This is not surprising, as the countries are extensively trading together.

Further, significant exchange rates convergence was observed. Four countries out of five are members to the Common Monetary Area – Lesotho, Namibia, Swaziland and South Africa. These countries, excluding Botswana, are using the Rand as the working currency. Thus, the exchange rates for these countries are the same as the exchange rates for South Africa, meaning the countries are following exactly the same path as far as the exchange rates are concerned. The econometric test proves this to be right and it appears Botswana is also moving along with the rest.

In terms of interest rate convergence, not very strong evidence was found. The countries are not converging towards the SACU aggregate: convergence is seen only after exclusion of Botswana from the group, as it is not the member of the CMA. For the countries that are members, it is assumed that they use interest rates as monetary instrument in order to maintain their national currencies at the same level with South Africa. Interestingly, elimination of Botswana from the group leads the remaining countries to convergence. As far as the benchmark is concerned, there is evidence of significant convergence. Thus, from these results, the CMA countries seem to be converging and Botswana appears to be distorting the convergence process. Therefore, it is important to realize that convergence on interest rates seems to occur only at a relatively modest rate.

There were problems in getting data on external debt as a percentage of GDP for all the countries for the period being investigated. Since Namibia only gained its

independence in 1990, there was no data available for it; hence, it was eliminated from the analysis. Moreover, data was also not available for South Africa for the period before 1994 owing to the sanctions that prevailed at the time. Therefore, the analysis for debt as a ratio of GDP was only done for the period spanning from 1994 to 2002. There is no evidence whatsoever for convergence in terms of this variable. As much as there is evidence that the countries' debt to GDP is falling, these countries are not following the same path. Lesotho proved to have the highest debt level, and in future this could have negative implications for the union. If Lesotho keeps accumulating such high public debt, this might pose a threat to the possibility of a currency union, as it could raise fears that the currency union could mean monetizing such debt by other members. As a result, even if the countries go ahead and form a currency union, countries like Lesotho must ensure that they reach the required minimal levels of debt to GDP, as this might put a strain on the interest rates of a currency union.

A comparison of the convergence across the variables reveals that the highest degree of convergence has occurred in relation to inflation rates. Therefore, the countries are more homogeneous in their inflation rates than in other macroeconomic variables. This suggests that inflation targeting may indeed have been the best choice of regime for these countries over the past few years. Another variable that shows a high level of convergence after inflation is interest rates. GDP growth rates are third in terms of speed of convergence followed by exchange rates. It is concluded that increased openness in trade is associated with a shorter half-life (high speed) of convergence in GDP growth rates across countries. Debt to GDP proved to have not gone through convergence at all.

In general, it can be concluded that the SACU countries have reached a reasonable level of co-movement on specific macroeconomic variables. This can be attributed to common economic policies and institutional features. Regional integration seems, at this stage, to be the only way of incorporating Africa into the world economy. Should this be successful, Africa will start growing and the poverty that has beset the continent for decades will be reduced.

5.3 Implications of the findings

This dissertation considers macroeconomic convergence as a tool for regional integration or as part of an innovative vision of economic practice amongst countries that share a geography, values, common history, and financial and economic relations, with a great capacity for deepening all of these. Hence, the observed macroeconomic co-movement should try to put into perspective limits for fiscal deficit, growth rates, interest rates, inflation and exchange rates. Similarly, it should substantially reduce instability in the region and also harness the benefits of a deeper integration process by making it possible for troubled countries (for instance Lesotho is politically unstable) to work together with well-off countries.

Should SACU countries proceed with the formation of a currency union, which is appropriate at this stage, the effects of a free market will be strengthened. Moreover, a single currency union will be an indication of commitment to greater harmonization of social policies and regulations, thus signalling desire for more convergence amongst the member countries. This will eventually encourage further political integration, as there will be positive long-term relationships between the countries.

The introduction of a single currency will contribute to reducing trading costs, e.g. by removing exchange rate risks and the cost of currency hedging. This will also lead to a reduction in information costs. There will be more price transparency, and, furthermore, price discrimination will be discouraged, thus leading to fair competition. A single currency will elevate the existing macroeconomic convergence as it will be more efficient as a medium of exchange and a unit of account than having multiple currencies.

What happened in the past is crucial in understanding of the current developments and what is likely to happen in future. Therefore, SACU history is very important in this thesis as the synchronization of macroeconomic variables that prevails at the moment can mostly be ascribed to it. It is evident that in most cases Botswana is an outlier and it can be argued that it is due to CMA non-membership.

5.4 Policy recommendations

This research suggests that South Africa, as the most powerful member of the union, should continue playing the role of regional leader. This will lead to improvement in the countries' welfare as other countries will be following the same path as South Africa. Moreover, the coordination of macroeconomic policies is of utmost important to increase the speed of integration. It would be beneficial to the region if Botswana joins the Common Monetary Area.

The trade intensity that exists in SACU appears to have significant influence on business cycle co-movements. This factor has crucial implications for the SADC region, which is considering entering into a currency union. Regional integration represents trade policy reform, whose intention is to complement and reinforce liberalisation undertaken as part of the structural reform process. Moreover, it gives the countries concerned power to tackle the forces of globalization for economic growth and development. But regional integration is only possible if there is macroeconomic convergence amongst the participating countries.

SADC countries should work together and increase their intra-industry trade, as trade intensity has the greatest effects on convergence, including the reduction of the costs of joining a currency union. Moreover, the synchronization of business cycles in the region leads to standardization of economic policies; thus the cost of forgoing independent national policy is smaller. Similarly, other costs related to monetary union are also reduced. Since macroeconomic convergence is the main precondition that has to be met by all countries intending to join the currency union, SACU can be seen as starting ground for regional integration in SADC.

Substantial progress has been made with SACU, and it is therefore advisable that preparations towards a single currency be continued. However, if this has to be done for SADC as a whole, it would be better if the countries started with institutional preconditions that do not immediately abolish the countries' policy autonomy. Therefore other countries should try to implement policies similar to those in South Africa – especially monetary policies – in anticipation of the formation of one central bank for all member countries. Synchronizing macroeconomic policies with countries that enjoy a good reputation, e.g. South Africa, can yield positive results.

There is evidence of strong incentives for monetary union in SACU. However, in the case of SADC, the incentives will need to be solid to keep the countries dedicated in diverse circumstances. The SADC countries have instituted one of the most positive incentives for monetary union, which is setting regional macroeconomic targets that increase the potential to achieve more stringent internal discipline in each of the countries. This shows that there is political will amongst the countries to integrate and reduce the poverty and volatility that currently exist; therefore, it makes sense for the countries to continue and form the currency union. But, to ensure that the members achieve the targets, there is a need for an institutional presence with sufficient power that will exert counter pressure to the one imposed by the markets as well as the citizens on the governments. Moreover, such an institutional framework should be able to enhance the credibility and also bring about the necessary transparency in the process. Under the present circumstances, it would appear that the South African Reserve Bank is suitable for the job.

Finally, a caveat against the results should be sounded, as the empirical study for macroeconomic variables might be subject to great variation depending on different sample periods and the type of data used. Moreover, it is important to realize that some of the positive effects that have been identified in this dissertation might not present themselves immediately; they may require a little more time to unfold.

5.5 Propositions for further research

An explicit testing for causes of macroeconomic convergence in SACU is of utmost importance. It will shed some light for many policy objectives, especially with in SADC.

Furthermore, a detailed analysis using panel unit root approach to study monetary and fiscal convergence in SADC would also be very informative in explaining the progress in SADC since the convergence goals for 2008 were set.

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Data Appendix

Appendix A: Regional classification

Countries	Abbreviation	SADC membership	CMA membership
Botswana	BWA	Y	N
Lesotho	LSO	Y	Y
Namibia	NAM	Y	Y
South Africa	RSA	Y	Y
Swaziland	SWZ	Y	Y

Note: - Y means country is a member
 - N means country is not a member
 - SADC means
 - CMA means

Appendix B: Variables used in the study

Variable	Abbreviation	Description
Inflation rate	INFL	Inflation rate is used to explain the percentage change in inflation level each year. Annual data for the period 1991 to 2005 is used.
Exchange rate	EXCH	Data for this variable is annual market exchange rates of national currencies per dollar. The variable is taken in logarithm form.
Interest rate	INT	This variable is used as an annual percentage change in interest rates. Annual data for the period 1991 to 2005 is used.
Growth rate	GDP	This variable represents the real percentage growth rate for each country. The annual data from 1991 to 2005 is used.
External debt	DEBT	Data is only available for Botswana, Lesotho, Swaziland and South Africa. Namibia is not included for analysis. Annual data for the period 1994 to 2002 is used.

Note: - All data is extracted from World Bank Economic Indicators