UNIVERSITY OF THE WITWATERSRAND

FACULTY OF COMMERCE, LAW AND MANAGEMENT

PhD Thesis

Title: Convergence, Asymmetry and Monetary Policy in a Common Monetary Area.

SUBMITTED TO THE SCHOOL OF ECONOMICS AND BUSINESS SCIENCES FOR THE DEGREE OF DOCTOR OF PHILISOPHY

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Abstract

This thesis examined the extent to which there is convergence in inflation rates, interest rates and incomes in the Common Monetary Area (CMA). It also investigated if countries in the area exhibit asymmetric adjustments to aggregate shocks. Based on optimum currency area theory, lack of convergence and the presence of asymmetric adjustments to shocks is likely to pose serious challenges that need to be addressed as the CMA moves towards a fully-fledged monetary union.

I formulated and estimated a macroeconomic model to capture the transmission of shocks in the CMA. The model consists of four equations namely; Phillips curve, IS curve, exchange rate and monetary policy rule. The model links the CMA countries via the aggregate demand, inflation and interest rate equations. I simulated the model to assess the economic performance of the smaller countries when subjected to either a single monetary policy rule or country specific monetary policy rules. Such an analysis is used to gauge if a move towards a fully-fledged monetary union will result in higher benefits for the smaller countries. Furthermore, I estimated a structural VAR model based on the theoretical model. The identification restrictions in the VAR are also derived from the model.

The analysis confirms monetary convergence, which is supported by the strong evidence of co-movement in interest rates and inflation rates in the CMA. Monetary convergence is an indicator of strong financial sector integration in the area. There is also evidence that inflation in the smaller countries is driven by that of South Africa. This result is mainly attributable to the strong trade links in the area as well as the existing parity between currencies in the area. The results also show that countries in the area are likely to face asymmetric shocks based on their composition of exports as well as the low correlation of growth rates. However, this asymmetry does not mean that countries cannot move towards

creation of a fully-fledged monetary union, but rather that the existing asymmetries should be considered seriously by ensuring that other adjustment mechanisms are put in place. Extending the analysis to the SADC region shows that this region exhibits weak monetary convergence even though the poor countries show some form of real convergence with South Africa. Simulations from the VAR model show a price puzzle for Swaziland and South Africa but it is not prolonged. Based on the analysis the study concludes that a monetary union is possible in the CMA and is likely to be less costly. However, the evident asymmetries call for gradual step by step phasing in of the monetary union.

Keywords: Monetary union, convergence, asymmetry and monetary policy.

DECLARATION

I hereby declare that this is my own unaided work except where due recognition has been given. It is submitted for the degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree in any other University.

Dumsile Faith Dlamini
Johannesburg, South Africa.

Date:

DEDICATIONS

To my Husband, children, mom and sisters, thanks for the love, belief and enormous support. Giving up has not been an option throughout my studies because of all of you.

ACKNOWLEDGEMENTS

I would like to sincerely thank my supervisor Professor Christopher Malikane for his guidance and support throughout my work from the very first draft. I am also grateful for the invaluable comments received from the participants in the various African Economic Research Consortium (AERC), my sponsors, biannual workshops. I am especially thankful for Dr. Christopher Adamsô comments on his very useful comments at the proposal stage of my thesis. I also benefited a lot from comments from the School of Economics and Business Sciences faculty members during my presentation of the proposal to the higher degrees board.

I am grateful for the support and behind the scenes role that my husband, Sikelela M. Dlamini and close family played during my whole period of study, especially looking after the kids while I studied. To Joyce Spence, thanks for listening and all the administrative effort you made so that I could focus on my studies. Your presence made a difference in my stay in South Africa, Johannesburg. I also thank my fellow colleagues who were with me through the programme, especially Pamela Nakamba. My sponsors, AERC, keep up the good work and many thanks for all the support and exposure to the world of Economics.

The almighty God deserves all the praise and glory for walking me through my studies. It was not easy but following your lead God made it bearable and doable.

Any errors and omissions in this work are entirely my own.

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Convergence, Asymmetry and Monetary Policy in a Common Monetary Area

1.1 Introduction

One of the principles of the New Economic Partnership for Africa's Development (NEPAD), the operational arm of the African Union (AU), is acceleration of regional and continental integration. These are seen as a way to generate economies of scale found in larger markets and ensure solidarity in Africa. It is true that most African countries are small judging by their per capita incomes and population sizes. As a result, they fail to provide potential investors with enough variety in investment opportunities and attractive returns. In the United Nations Economic Commission for Africa (UNECA) (2004) report, it is stated that NEPAD was set up to provide a development framework premised on regional integration, among other things. The report further stipulates that given the challenges posed by regionalism and globalisation, African countries stand a better chance if they act collectively to reduce marginalisation in the global economy.

According to Masson and Pattillo (2004), motivations for creating currency unions, especially in Africa, go beyond the benefits identified under optimum currency area (OCA) framework due to Mundell (1961). They believe that it can create central bank independence by providing an agency of restraint which would create commitment and credibility of monetary authorities. Furthermore, besides being able to effectively deal with external challenges, Maruping (2005) points out that African governments believe that by joining forces they will be better able to create stable macroeconomic environments that will effectively stimulate economic activity and sustainable development of their economies.

In the same light, the AU continues to stress the importance of ensuring that all the existing regional economic communities in all four cardinal parts of the continent are supported and enhanced. As stated by the Central Bank of Swaziland (2006), the AU envisages eventually having a common currency and central bank by 2025. This means that all regional integrations can be seen as springboards for a united Africa.

Discussion on monetary integration, according to Jefferis (2007), has been at the forefront in economic policy discussion agendas mainly because of the European and Monetary Union (EMU). When countries form a currency union, according to literature on OCA theory, they anticipate the following benefits:

- Reduced transaction costs as they no longer need to convert currencies and hedge against exchange risk in transactions among partners. Also the costs of translating foreign exchange values for corporations and individuals with assets and operations in the monetary union. Furthermore, as currencies are phased out speculators in those currencies also disappear.

- Increased gains from trade as trade volumes rise and increased market access through the creation of a larger regional market. However, there is a lot of debate on the impact of monetary unions on trade. Some studies have found that the impact on trade can be insignificant while others find a significant impact. Recent studies on EMU, according to Bonpasse (2006), have found that trade does improve but they fail to quantify this result.

- More business cycle synchronisation as countries trade more with each other. The congruence in business cycles reduces the costs incurred due to the loss of monetary policy autonomy.

- Enhanced economic competitiveness due to increased specialization by member countries. However, such specialization could result in asymmetric business cycles.

- Elimination of nominal exchange rate volatility, hence, lower interest rates, lower real exchange rate volatility, deeper financial integration, and wider acceptability of currency.

- Low inflation as monetary expansion is constrained and governments restrain excessive spending. This enhances the credibility of the monetary authorities hence impacting formation of inflation expectations by the private sector and individuals. As a result, economic growth is enhanced as appropriate investment decisions are made.

- Increased asset values as currency risk and interest rates decrease. This leads to reduced country risk and increased economic growth and national wealth.

- Reduce costs of operating and maintaining a separate monetary system. This requires highly qualified personnel to carry out the vast complex tasks involved.

- Separate the value of money from the value of a country as the value of money in a monetary union depends on the joint custodians of the money instead of a single country or the state of the economy or the calibre of a countryôs leaders.

- Above all, countries expect to enjoy more stable macroeconomic environments hence high economic activity, low unemployment rates, and higher investment emanating from coordination and harmonisation of macroeconomic policy in the region. For instance, in EMU countries have to satisfy certain macroeconomic convergence criteria before

being allowed to join. The reason being that any domestic crises and macroeconomic instability in a member country is likely to have Union wide spill-over effects.

These convergence criteria, according to Carr´e (1997), concern macroeconomic stability indicators such as budget deficits, public debt ratios, inflation rates, interest rates and legislation governing the financial system. Aziakpono (2003) notes that even though countries are expected to achieve some convergence in policies following integration differences in geographical size, population size, socio-cultural diversity, political stability and levels of institutional development remain. These tend to lead to heterogeneous development patterns among countries. Such differences must be taken into account when forming any economic integration as they are likely to instigate divergences in economies which may complicate functioning of the grouping.

Monetary integration also poses serious challenges:

- Beetsma and Bovenberg (2001), identify the loss of control over monetary and exchange rate policies as tools that can be used to deal with domestic or idiosyncratic external shocks. This is because common monetary policy will not deal with idiosyncratic shocks which may lead to reduced co-movement of macro variables among member countries. This requires that other adjustment mechanisms be in place to deal with national or country specific shocks, such as wage and price flexibilities and capital and labour mobility.

- According to Bean (1992), countries also lose the privilege of seigniorage revenue because monetary unification calls for convergence of inflation rates and maintenance of low budget deficits which cannot be monetised.

- Fears of negative consequences from being associated with less successful economies as this can drag more successful economies

down resulting in lost credibility in the international economy. They fear negative consequences due to adverse selection and moral hazard as they are likely to be painted in the same brush.

- Corsettti, Pesenti and Blinder (1999) note that existing asymmetries in terms of shocks and monetary policy transmission mechanism among countries may be exacerbated if costs and benefits emanating from a monetary union are unfairly distributed. This is also supported by Hughes-Hallett and Weymark (2001) who further state that asymmetries also exist in national preferences for price stability, income distribution, and output growth. Dellas and Tavlas (2005) argue that the costs of participating in a monetary union for member countries tend to rise, the more asymmetric their economic structures and nature of shocks are. This is because a common monetary policy will not be suitable for all members.

- Further Dellas and Tavlas (2005) note that costs will rise due to the nature of existing nominal rigidities. For example, they indicate that if countries have the same kind of labour market rigidities they will benefit more from forming a monetary union. They use the example of the UK, being the country with more flexible wages, and Germany and France as having more rigid wage structures. They conclude that the UK would incur large costs by joining a union together with these countries. They conclude in their study that wage asymmetries tend to involve larger welfare effects compared to any other asymmetries among countries within a monetary union.

- Feldstein (2005) identifies the inherent conflict between using a single currency and operating independent fiscal policies. Governments, he argues, as a result tend to run large budget deficits so long as there is no market feedback to discipline for such. This creates market failure as some countries free ride because they will not face a disproportionate share of the resulting burden from running high

deficits. This could threaten the stability and survival of the arrangement.

- Bordo and Jonung (1999) identify the challenge of ensuring that institutions set up to oversee operation of the area have clear and non-overlapping mandates in order to avoid conflicts and also be able to resolve them smoothly should they occur. There should be checks and balances to mitigate policy being biased in favour of some countries given the existing heterogeneity among countries. There is a lot of literature, such as Bordo, and Jonung (1999), Alesina and Perotti (2004), Demyanyk and Volosovych (2005), Feldstein (2005), and Kocenda et al. (2006), on how EMU institutional set-ups are flawed, which may threaten its stability and survival, especially as the membership increases.

This study focuses on the impact of monetary policy on economic activity in the Common Monetary Area (CMA) which comprises Lesotho, Namibia, Swaziland and South Africa. These countries are also members of the Southern African Customs Union (SACU), which allows for free trade among members and a common external tariff on goods from outside the Union. Botswana is also a member of this union.

In the CMA, smaller members enjoy benefits such as relatively stable inflation, elimination of uncertainty concerning exchange rate fluctuations which lower costs and boosts investor confidence, restraints on government expenditure, constrains on monetary expansion as these must be in line with CMA guidelines. However, smaller members face constrained monetary and exchange rate policies such that they cannot use these to effectively deal with domestic or idiosyncratic shocks. Mihov (2001) points out that to the extent that such shocks are significant, common monetary policy may worsen cyclical misalignments as it will only deal with common shocks. The smaller members are also unable to effectively participate in the monetary policy formulation process in the area.

1.2 History and main features of the CMA

Historically the CMA has undergone various stages and is one of the oldest arrangements to have survived together with the financial cooperation in Central Africa (CFA) franc zone. Originally, the pound, under British rule, followed by the South Africa rand circulated in Botswana, Lesotho and Swaziland before these countries gained independence from Britain. According to Wang et al. (2007), flows of funds among these countries were not restricted and all external transactions were effected by South Africa banks subject to their domestic exchange controls. In 1972 negotiations to formalize the already existing monetary relationships began after successful renegotiation of SACU in 1969. In 1974 the Rand Monetary Area (RMA) agreement was signed. However, later in 1975 Botswana pulled out to pursue independent monetary policy. According to Grandes (2003), Botswana has kept the pula linked to the rand via a currency basket, in which the rand weighs 60-70%.

Following major economic events in South Africa, which included the depreciation of the rand in 1986, Swaziland renegotiated the RMA. It was then replaced by the CMA. Namibia joined in 1992 after gaining independence from South Africa in 1990. The main thrust of the CMA as captured in the 1992 agreement, is to foster and sustain economic development in member countries, with special emphasis on the smaller members, by means of coordinating monetary and exchange rate arrangements. Furthermore there has to be fair and equitable distribution of benefits generated among members.

Nielsen et al. (2005) assert that the main goal of monetary policy in the CMA is to sustain the pegged exchange rate by upholding enough foreign exchange reserves and keeping interest rates at levels that will not result in alteration of the peg. Given this, central banks in the smaller members influence monetary policy by using a variety of techniques. Namibia uses the liquid asset requirements, lending and deposit facilities. Swaziland exercises direct control on interest rates to police capital flows and to shield the

domestic economy from the effects of monetary policy specifically instituted to deal with South African matters. Lesotho uses Treasury bill auctions to restrain excess liquidity in the domestic economy.

The prominent features of the CMA include the following:

- Currencies of smaller members are pegged one to one to the South African rand. The exchange rates within the CMA are not irrevocably fixed. The parity reduces transaction costs among members and eliminates exchange rate risks.

- Issue of own currency by member countries which, is legal tender in the issuing country. Currencies of smaller members are not legal tender in SA but circulate in border areas of South Africa. The note issue for Lesotho and Namibia, as stipulated in their bilateral agreements, must be backed 100% by foreign reserves to ensure discipline, hence stability of the CMA. These reserves could be made up of rand balances held by central bank, special rand denominated deposit accounts held with South African Reserve bank and South African government stock. Smaller members are responsible for their monetary policy and control of their financial institutions. Management of the Rand currency, gold and foreign exchange reserves of the CMA is the prerogative of South Africa.

- Free flow of funds for current and capital account transactions within the area except where Lesotho, Namibia and Swaziland require funds for prescribed financial institutions investment or liquidity purposes. This exception permits these countries to curb the flow of funds to South Africa where returns are higher.

- Smaller members also have access to South African capital and money markets via prescribed investments or approved securities that South African financial institutions can hold. This kind of access was expected

to make more funds available for development purposes of the smaller members.

- Independent authorisation of gold and foreign exchange transactions and dealers by individual members, in line with set regulations within CMA. Gold and foreign exchange holdings by individuals are subject to a surrender requirement in the area. Non-residents of CMA and current international transactions face no exchange restrictions.

- Bilateral agreements between South Africa and smaller members that govern the latterís access to South African foreign exchange markets. These safeguard monetary stability within CMA where South Africa could give temporary central banking credit facilities.

- Compensatory payments for seigniorage forgone by using the rand, applying an established formula stipulated in the CMA agreement. This formula is equivalent to the product of two-thirds on the annual yield of the most recently issued long-term South African government bond and the volume of rand approximated to be circulating in each smaller country. In 1986 Swaziland no longer accepted the rand as legal tender, even though the rand continued to circulate in the country, and as such was no longer eligible for the compensation. Cessation of the randís legal status also meant that Swaziland no longer needed to have a 100% backing for any currency issued thus, affording the country extra scope in its reserves management. However, later in 2003 the legal tender status of the rand was reinstated by the government which in a way underscores the importance of the compensation revenue for the smaller members.

- Reconciliation of monetary and foreign exchange policies through a CMA commission consultative process. The commission meets annually, but can also meet at the request of any member, to consider matters arising including any changes in the conduct of monetary

policy by any member in the area. Central bank Governors also meet quarterly ahead of the South African Reserve Bank Monetary Policy Committee meetings. However, influence on policy formulation by smaller members is constrained as the South African constitution does not allow non-South Africans to be part of monetary policy decision making process.

Wang et al. (2007), assert that certain features of the CMA are notable when compared to those of other monetary integrations in the following ways: First and foremost, the CMA is dominated by South Africa which, accounts for over 90% of the whole areaôs GDP, trade and population. This feature is supported by table 24. Secondly, the CMA is not a fully-fledged monetary union as there is no common central bank, pool of reserves, and regional surveillance of domestic fiscal and structural policies. The rand is a de facto common currency in the area and conversion from one currency to the other is at zero cost making the currencies perfect substitutes. Thirdly, the existing exchange rate arrangement of smaller countries resembles that of a currency board even though there is no prohibitions on smaller countries holding domestic assets as would be the case under a currency board. Further, the parity is not irrevocable and there exists no provision for mutual support of the exchange rate peg should it come under strain .Fourthly, the CMA is based on SACU, a free trade area that entails high capital mobility making it similar to the Euro area. Finally, there exist no fiscal transfers among countries to assist them deal with asymmetric shocks should they arise.

In support of the above comparison, Grandes (2003) argues that indeed the CMA is a hybrid of a currency board and a monetary union. The rand is the dominant currency; however, countries have not made an irrevocable commitment to maintain a given parity. Foreign assets back domestic currency issuance and the monetisation of fiscal deficits is not allowed making it a currency board. According to Masson and Pattillo (2004), the CMA is therefore eclectic and highly adaptable, factors that are likely to have contributed to its survival over the years. They further argue that the relative size of member countries ensures that the responsibility of monetary policy

lies with the bigger partner, a factor that has contributed to its continued existence. Wang et al. (2007) argue that the survival of the CMA can therefore be attributed to, among other things, political and historical factors. The commitment of a hegemonic power therefore is often cited in the literature as a precondition for the success of a monetary union.

Table 1 Features of monetary unions

	WAEMU	CAEMC	Euro Area	CMA
Membership	8	6	12	4
Single currency?	Yes	Yes	Yes	No, but de facto common currency
Common central bank?	Yes	Yes	Yes	No, but SARB has immense influence
Common pool of reserves?	Yes	Yes	Yes	No
Regional surveillance of fiscal policy?	Yes	Yes	Yes	No
Free trade area?	No	No	Yes	Yes
Degree of capital mobility within region?	Low	Low	High	High
External exchange rate anchor?	Yes, peg Euro	Yes, peg Euro	No	No

Source: Wang et al. (2007)

Note: WAEMU=West African Economic and Monetary Union
CAEMU=Central African Economic and Monetary Union
SARB= South African Reserve Bank

Table 1 provides a brief summary of the main features of four different monetary unions and it brings out how the CMA differs from existing monetary unions. In the CMA there is no single currency but the rand is legal tender in all the smaller countries. However, currencies of the smaller countries are not legal tender in South Africa. There is also no common central bank as each country has its own central bank however; monetary policy set in South Africa by the SARB de facto applies to the whole area. This is because of the fact that currencies of the smaller countries are at par with the South African rand.

Regional surveillance of fiscal policy is not applicable in the CMA but fiscal policy is somehow constrained due to the CMA.

1.3 Monetary policy in the CMA

The primary focus of monetary policy in South Africa is to stabilise the value of the rand in an effort to promote balanced and sustainable growth of the economy. The SARB follows an inflation-targeting framework introduced in the year 2000. According to Aron and Muellbauer (2006), adoption of this framework was intended to improve policy so that it is more predictable, transparent and policymakers are more accountable. Under the framework, the target for the consumer price index (CPIX), excluding the mortgage interest rate, is between 3 and 6 per cent per year. The main instruments of monetary policy include the repurchase rate (repo rate) and open market operations.

Monetary policy in the rest of the CMA centres on protecting the pegged exchange rate by preserving adequate foreign exchange reserves. The smaller members have to back all domestic currency issued with these reserves. Interest rates are also kept in line with those pertaining in South Africa to avoid any distortions to the fixed exchange rate. Nevertheless the smaller members have set up various ways that they use, to a limited extent, to direct monetary policy in their countries, which is to a large extent is influenced by monetary policy in South Africa.

The bank of Namibia uses the bank rate to influence commercial banksô reserves. It also uses the call rate, defined as the rate paid to commercial banks on funds kept on a short-term basis with the central bank. The reserve requirement is used, but its use is limited because most of the commercial banks in the country are owned by South African banks. The Central Bank of Swaziland uses the discount rate, reserve and liquidity requirements, open market operations, and moral suasion. The bank ensures that interest rate differentials with South Africa are at their lowest. This helps to manage capital flows and shield the economy from any negative consequences from

monetary policy instituted by South Africa. The Central Bank of Lesotho (CBL)ôs principal mandate is price stability followed by anchoring monetary policy to that of South Africa through the rand-loti peg. The CBL utilises open market operations to regulate domestic banking sector liquidity and maintain adequate reserves to support the peg.

1.4 Statement of the problem

Recent developments in international monetary arrangements, including the launch of the Euro, have led to considerable debate and analysis of the economic effects of currency unions (See: Frankel and Rose (1996a) Hughes-Hallet, and Weymark (2001), Mongelli (2002), Ternreyo and Barro (2003). Masson and Pattillo (2004), and Adams (2005). Under a currency union, countries forego individual monetary and exchange rate policy autonomy. They create a common central bank responsible for conducting monetary policy based on economic situations for the entire union. The CMA is a non-fully fledged monetary union and monetary policy, set in South Africa, based on domestic factors, de facto applies across the area. Currencies of smaller members are not irrevocably linked to the rand so smaller members are free to deviate from the peg. Furthermore, there is no adjustment mechanism in place to support economies in the event of asymmetric shocks and regional surveillance of domestic fiscal and structural policies is absent.

This study seeks to investigate if a move to a fully-fledged monetary union would be more beneficial or detrimental compared to the current arrangement. Masson and Pattillo (2004) indicate that the South African Reserve Bank Governor, though not optimistic, mentioned that they would consider if a move towards a multilateral monetary union, hence a common central bank, is feasible. The smaller members have noted with great concern that they have very limited, if any, influence over monetary policy in the area. This is particularly more important now for the smaller members whose economies continue to show poor performance compared to the South African economy.

According to Sander and Kleimeier (2006), Grandes (2003) and Wang et al. (2007), the four countries conduct a hybrid of a currency board and a monetary union arrangement. The rand is the anchor currency in the area. Masson and Pattillo (2004), note that monetary policy in the CMA is set by the South African Reserve bank based primarily on domestic South Africa objectives. This makes the arrangement asymmetric as it represents interests of the dominant partner. The smaller countries have raised this issue on numerous occasions and have continued to deliberate on ways to ensure their active participation in monetary policy decision making. The movement towards a full monetary union is viewed as an essential move for better monetary policy coordination and harmonization in the area. In addition, such a move is also viewed as a means to generate improved responses to both supply and demand shocks in member countries, particularly the small countries. It is therefore important to investigate how the monetary policy actions instituted by the South African Reserve Bank affect the smaller countries. Such an exercise will help determine if the arrangement's objective, that is, development of the whole area with particular emphasis on the smaller members, is being satisfied.

CMA members are different in terms of economic, financial, institutional and legal structures despite the strong existing ties among them which date back to the colonial era. Trade statistics in the area show that trade flow is one way, from smaller members to South Africa. The latter's main trade partners are the UK, EU and the US. Smaller CMA members are highly dependent on imports from South Africa but they export relatively less to South Africa, with the exception of Swaziland. According to Rose (2000), there is empirical evidence on the probable endogenous link between trade and monetary integration. This means that it is likely that CMA countries will exhibit even greater trade ties due to the monetary arrangement in place.

However, it appears that intra-zone trade intensities, as noted by Grandes (2003), have not been appreciably enhanced by the monetary arrangement in the area. Furthermore, these countries show some divergences in terms of trade shocks, especially Namibia, mainly because of differences in the

composition of their exports and imports. Such differences indicate that idiosyncratic shocks are likely to persist. Under a monetary union, monetary policy cannot be used to cushion individual economies against such shocks. The current arrangement has been stable since inception despite all the differences that exist in the area. Whether a fully-fledged monetary union would also be stable will depend critically on the institutional set up and the political will to ensure that it survives, especially on the part of the larger country.

Against this background, it becomes important to investigate monetary policy transmission mechanism in the CMA. Specifically, the study will focus on the following research questions:

1) What are the channels through which monetary policy actions instituted by the South African Reserve bank are propagated to the smaller members in the CMA?
2) Are the responses to monetary policy and other aggregate shocks from SA the same across CMA member countries?
3) Are member countriesômonetary policies coordinated and harmonised in any way to promote convergence and co-movement in macroeconomic variables in economies of the whole monetary area?
4) Is there any scope for smaller members to respond to idiosyncratic shocks should they choose to pursue independent monetary policy?

1.5. Study Objectives

The study seeks to analyse the monetary policy transmission mechanism in the CMA. The specific objectives are:

- Analyse how smaller members are impacted by shocks instituted by South Africa authorities. This is useful for Lesotho, Namibia and Swaziland governments to know so that they fully understand what to expect from certain policy interventions.

- Establish if the smaller members enjoy the benefits expected, especially macroeconomic stability, from being integrated with the larger more sophisticated and developed South Africa economy.

- Shed more light on how monetary policy affects the economy, especially small open developing countries. It is important for policymakers, especially in developing countries where the transmission mechanism is less understood, to understand the transmission mechanism so that appropriate growth enhancing policies are instituted.

This study is therefore a useful input in the on-going discussions by central bank governors in the CMA on moving towards a fully-fledged monetary union. Such discussions are a stepping stone to the AUôs dream of a common currency and central bank for the African continent.

1.6 Layout of the thesis

The rest of the thesis is organised as follows:

- Chapter 2 measures convergence and asymmetries in CMA countries. I will measure convergence using three methods namely: error correction model, univariate analysis, and a β-convergence model. These capture the extent to which the CMA economies are integrated and the degree to which monetary policy is harmonised in the area. To measure asymmetry of business cycles, I will use correlation of growth rates and the composition of exports in the area. For comparative purposes, I analyse the level of convergence and asymmetry in the rest of the SADC countries.

- Chapter 3 formulates and estimates a structural macroeconomic model that will be used to simulate the behaviour of member countries in response to aggregate shocks. The theoretical framework used to

formulate the model underpins the vision of the transmission of aggregate shocks across the CMA and within member countries.

- Chapter 4 details the VAR approach and analysis of generated impulse response functions. This will provide a robustness check of how close the theoretical model replicates the empirical dynamics.
- Chapter 5 proffers the overall conclusions for the study derived from the analysis.

Chapter 2

Convergence and Asymmetries in the CMA and SADC

2.1 Introduction

This chapter examines the extent to which there is convergence and asymmetric adjustments to aggregate shocks in the economies of the Common Monetary Area (CMA). Macroeconomic convergence and asymmetric adjustments are crucial issues if the CMA is to evolve into a fully-fledged monetary union. Frankel and Rose (1996a), Calderon et al. (2003), Masson and Pattillo (2004), and Cheung and Yuen (2004), among others, indicate that standard literature on Optimum Currency Areas (OCA), which dates back to Mundell (1961) and McKinnon (1963), identifies some key criteria in determining if countries are suitable candidates for a monetary union. Firstly, countries must exhibit close international trade links. Secondly, business cycles for potential members must be synchronised. Thirdly, member countries must also have flexible labour and capital markets.

Close international trade links are important in a monetary union because the benefits derived from the reduction in transaction costs will be larger as trade and investment flows intensify among members. Such transactions costs include costs of converting currencies, and costs incurred in hedging against exchange rate risks and uncertainty. Synchronised business cycles reduce the costs incurred as a result of giving up the use of monetary and exchange rate policies as stabilisation tools. The effectiveness of a common monetary policy is curtailed when at the same time the dominant economy faces a contractionary phase of the business cycle while others are on an expansionary phase. This is because the common monetary policy will fail to stabilise both economies simultaneously. Such occurrences complicate the decision making process within the union and may even threaten its very existence. According to Dellas and Tavlas (2004), a major result in the

literature on OCA is that the costs faced by countries engaged in a monetary union will be higher if they face asynchronised business cycles.

Flexibility in the labour market ensures access to alternative adjustment mechanisms given that the use of monetary and exchange rate policies is restrained. Such flexibility therefore acts as a shock absorber. When one country faces a shock resulting in a slump, which in turn leads to a rise in unemployment, then labour can move to other member countries to find work. This will ease the pressure and reduce the burden of adjustment costs in the affected member. According to Dellas and Tavlas (2005), the costs of forming a monetary union will rise due to the nature of existing nominal rigidities. For example, if countries have the same kind of labour market rigidities they will benefit more from forming a monetary union because their adjustment processes following any shock will be similar.

It is important to note that the OCA criteria noted above are treated as exogenous in the traditional OCA literature. However, studies such as Frankel and Rose (1996a and 1996b) argue that these criteria are endogenous. They are reinforced by the creation of a monetary union. This implies that candidates of a monetary union can satisfy the OCA criteria ex-post rather than ex-ante. This is due to the fact that economic structures are expected to be transformed as countries join a monetary union. This means that the conclusions reached using historical data; to establish if countries should form such a grouping need to be evaluated carefully. Countries may appear to be unsuitable candidates for a monetary union when in fact they are. Adams (2005) highlights that political factors play a pivotal role in determining the formation and success of currency unions. This study examines only economic factors, as they are likely to shape political factors.

According to Debrun et al. (2003) and Jeffris (2007), the success story of the European Union has made currency unions a topical issue in policy discussions the world over. In the CMA discussions are already underway on establishing a fully-fledged monetary union. Tavlas (2007) asserts that the CMA is dominated by South Africa, which accounts for approximately 95% of

the whole areaôs GDP. It is not a fully-fledged monetary union because there is no common central bank, pool of reserves and regional surveillance of domestic fiscal and structural policies. CMA countries have very strong economic links, which date back to the colonial era. They are also members of the Southern African Customs Union, a free trade area that entails a high degree of capital mobility, making it similar to the Euro area. Most of the features of the CMA resemble closely those of the European Union. Given the foregoing evidence, should the CMA form a fully-fledged monetary union?

Studies on the feasibility of forming a well-functioning monetary union focus on measuring convergence and asymmetry of business cycles among members. To measure these, studies such as Anthony and Hughes-Hallett (2000), Wang et al. (2007), Kocenda et al. (2006), and Eichengreen and Bayoumi (1996) focus on GDP growth rates, inflation rates and interest rates. In this chapter I assess the behaviour of these variables to identify if there is any convergence and asymmetry within the CMA. First, I measure convergence using an error-correction model premised on the assumption that variables in the smaller countries follow those of the larger country in the area. This model is an extension of the model by Wang et al. (2007). I also measure βï convergence to gauge if the smaller countries tend to catch up with the larger country overtime as in Kocenda et al. (2006). Furthermore, I apply univariate modelling to assess if overtime the variables of interest in the member countries tend to move towards the same long run equilibrium values. I measure asymmetry using the correlation of countries GDP growth rates to that of the area as a whole. I also consider the composition of countriesôexports as a proxy for the likely presence of asymmetric shocks in the CMA.

I find strong evidence of co-movement in inflation rates and interest rates. This is not surprising because smaller members import over 80% from South Africa. It is also ascribed to the existing parity between currencies in the area, which makes the inflation targeting framework followed by South Africa, de facto applicable to the whole area. Interest rates in the CMA have fallen

overtime and they move together, reflecting the existing close integration of the financial sectors in the area. The behaviour of inflation and interest rates confirms monetary convergence, hence nominal convergence, in the area. Per capita income dispersions have fallen over time, indicating some real convergence. I also find that countries in the CMA are likely to face asymmetric shocks given the differences in their compositions of exports. The asymmetry of shocks is also supported by the low correlation between growth rates for the smaller members and that of the whole area. Nevertheless this does not vitiate a move towards creating a common Central Bank. For example, within South Africa some regionsô growth rates exhibit a similar pattern but they all face the same monetary policy implemented by the Reserve bank.

I extend the study to the SADC region and find that, with the exception of Angola, Botswana and Mauritius display high per capita income dispersions. The region also shows weak monetary convergence, which indicates low financial sector integration that would make it difficult for countries to implement uniform monetary policy. The poor countries namely, Angola, Tanzania, Zambia, Mozambique, Congo DR, show high correlation with that of South Africa as well as the whole CMA. This indicates some real convergence and the extent of their dependence on South Africa. These countries therefore exhibit synchronised business cycles which would make them suitable candidates for a monetary union.

The rest of the chapter is structured as follows: Section 2.2 presents measures of convergence followed by measures of asymmetry in section 2.3. The empirical analysis is presented in section 2.4. Synchronisation of business cycles of South Africa and its provinces is in section 2.5 followed by a presentation on convergence and asymmetry in the Southern African Development Community (SADC) in section 2.6. The conclusion is in section 2.7.

2.2 Measures of Convergence

In this study I use three measures of convergence. Firstly, I use an error correction model, which is a modification of Wang et al. (2007). It assumes that key macroeconomic variables of smaller members are affected by those of the larger country in any monetary grouping. Given the hegemonic role of the larger country, there is no feedback effect expected from smaller economies to the larger country. Furthermore, in the short run, should there be any deviation of the smaller countryôs variables from those of the larger country, an adjustment process is triggered until they equalize. The adjustment speed varies across smaller countries depending on a variety of factors such as differences in economic and institutional structures.

The model is specified as follows:

$$\Delta X_t = \alpha + \sum_j \theta_j \Delta X_{t-j} + \beta \Delta X_t^* + \gamma (X_{t-1} - X^*_{t-1}) \qquad (1)$$

X_t represents either inflation, GDP or interest rates and X^*_t represents the relevant variable for the larger economy, β captures short term response of X_t in each of the smaller members to changes in the larger country variable, X^*_t. The convergence speed to long run equilibrium values for each variable is captured by γ and θ measures the presence of persistence in each of the variables. Persistence gives an indication of differences in economic and institutional structures among countries. The convergence speed variable must be negative to support that smaller countries adjust their variables should they deviate from those of the larger country. If it happens to be zero this would indicate that there is no relationship among these economies. A positive convergence speed coefficient would indicate that if divergences occur they would be persistent.

In eq. (1) variables of the smaller member countries are assumed to be linear functions of the larger country in the long run. For example, this means that

interest rates in the smaller countries follow those of the dominant partner. There is no feedback effect expected given the hegemonic role played by the dominant partner in the area. In this case interest rates adjust to the long run equilibrium rate should there be any disturbance to the linear relationship. The same reasoning applies to inflation rates and GDP growth rates in the area.

I assume that the variables for the larger country are driven by the following process:

$$X_t^* = \delta + \sum_j \theta_j X^*_{t-j} + \varepsilon_t \quad (2)$$

Eq. (2) presents the larger country equation which captures internal persistence.

To examine if all member countries tend to converge towards the same long run equilibrium inflation, interest and growth rates values I use univariate time series models. This second measure of convergence is given by the following model:

$$X_t = \beta_0 + \sum_{i=1}^{p} \beta_i X_{t-i} + \eta_t \quad (3)$$

Where X_t represents inflation rate, interest rate and growth rates.

The third measure is based on Kocenda et al. (2006). It captures the extent to which smaller countries catch-up with the larger country overtime. It measures convergence towards a benchmark. They argue that this measure has recently been used on time series methods to capture a second dimension to β-convergence. This is because most cross-sectional tests used tended to over-reject the null hypothesis of no convergence. The model is given as:

$$x_t = \delta + \alpha t + u_t \quad (4)$$

Where; x_t is the percentage deviation of a small country variable from that of a large country variable, δ captures the original deviations in the variable of interest between two countries, t is a time trend and u_t is a random error. In this setting βï convergence occurs if first, on the onset δ is negative and statistically significant. This would indicate that the small country is lagging behind the larger country. Second the time-trend coefficient α should be positive and statistically significant, indicating that overtime the lagging country catches up with the leader. In this study x_t is the percentage deviation of real per capita GDP of the smaller countries from that of the larger country.

2.3 Measures of Asymmetry

At the core of the debate on whether countries should form monetary unions is the extent to which they exhibit synchronised business cycles. Asychronised business cycles within potential members of monetary unions, based on traditional OCA literature, indicate that countries do not form an OCA. In such a case they would not be suitable candidates for such a grouping. This is because such asymmetry can lead to complications in the decision making process of the union leading to its collapse. Corsetti and Pesenti (1999), argue that many of those who were opposed to the idea of a common currency emphasized that Europe was more heterogeneous than the United States. In their view, this meant that Europe was more prone to asymmetric shocks, which would be solved by allowing exchange rates to be flexible. Therefore, in monetary integration literature, emphasis is on synchronisation of business cycles. Hence, symmetry of shocks is one of the key prerequisite for establishing a monetary union.

The first asymmetry measure I use in this study is based on Anthony and Hughes-Hallettôs (2000) study on the Caribbean monetary union. It examines the correlation between annual GDP growth of each member country and GDP growth of the whole area. This measure captures the extent to which member countries will be subject to the same shocks given the observed differences in their economies. These include differences in size, cultures,

economic, and institutional structures. In Mihov (2001) and Demyanyk and Volosovych (2005), this measure is identified as a conventional way of measuring synchronization of economic activity. Low correlation is interpreted to mean that countries could be subject to asymmetric shocks. Kalemli-Ozcan et al. (2004) and Eichengreen and Bayoumi (1996), also stress that if economies face asymmetric shocks it means that they show asymmetry in GDP. They argue that to the extent that large GDP asymmetries exist, the monetary union may reduce welfare because individual countries lose monetary policy autonomy. In such a situation, it is only if there exist risks sharing mechanisms such as fiscal transfers that the costs of adjusting to shocks will be reduced.

The other measure I use is based on Eichengreen and Bayoumi (1996) and Wang et al. (2007). It uses differences in the composition of exports among union members as a proxy for the asymmetry of shocks. The argument is that when member countries export the same products, industry specific shocks will be more symmetric. As countries face symmetric shocks, such as terms of trade shocks, their business cycles would tend to become more and more symmetric, making them good candidates for a monetary union.

2.4 Empirical Analysis

2.4.1 Data Description and Sources

I use annual data sourced from the International Finance Statistics (IFS) and World Development Indicators (WDI). Interest rate data for Namibia begins in 1993 as the country gained independence in 1990. I estimate eq. (1) to (4) using Ordinary Least Squares (OLS). The lag length is chosen using the Akaike Information Criteria (AIC). Using the results from the error-correction model I carry out simulations to observe how CMA country variables under study behave when subjected to a shock. I also run Granger-causality tests and see how they compare with the results from the error correction model.

Table 2 Data description

Sample	Variables	Description
1980-2006	Interest rate	Lending rate
	Inflation rate	Consumer Price Annual % change
	Growth rate	Real GDP annual % growth
	Real GDP per Capita	GDP constant US $ divided by population

Note: Interest rate and inflation rate data for Namibia cover the period 1993-2006 and 1981-2006 respectively**.**

The data I use in this study, as shown in table 2, are annual data from 1980 to 2006, drawn mainly from the IFS, African Development Bank (ADB) statistics pocket book and WDI. I use annual data because quarterly data are not easy to find for all the countries and in some cases are not reliable and have gaps. Data set for Namibia interest rates start in 1993 as the country gained independence in 1991.

2.4.2 Empirical Evidence on Convergence in the CMA: Error-Correction model

Estimating eqs. (1) and (2) for each of the variables yields the results presented in table 3. The appropriate lag length for eqs. (1) and (2) is chosen using the AIC.

Table 3 Error-correction model results for selected macro-variables

	Lesotho			Namibia			Swaziland		
	Δr_t	$\Delta \pi_t$	Δy_t	Δr_t	$\Delta \pi_t$	Δy_t	Δr_t	$\Delta \pi_t$	Δy_t
β	0.70	0.71	0.74	0.73	0.72	0.91	0.85	1.03	0.70
	(0.07)	(0.22)	(0.19)	(0.10)	(0.20)	(0.45)	(0.11)	(0.38)	(0.31)
γ	-0.23	-0.97	-0.30	-0.57	-0.52	-1.33	-0.25	-1.11	-0.67
	(0.11)	(0.18)	(0.16)	(0.23)	(0.18)	(0.28)	(0.17)	(0.20)	(0.17)
θ_1	0.20					-0.04	-0.24		
	(0.08)					(0.19)	(0.11)		
θ_2	-0.17								
	(0.08)								
R^2	0.90	0.58	0.56	0.83	0.51	0.89	0.72	0.53	0.46
S.E.	0.82	2.70	2.34	0.72	2.25	1.69	1.42	4.35	4.17
AIC	2.64	4.91	4.65	2.37	4.57	4.13	3.66	5.87	5.80

Note: Standard errors are reported in parenthesis. r_t = Interest rate. π_t = Inflation rate. y_t = growth rates.

The results indicate that interest rates in the smaller countries are highly influenced by those of the larger country, South Africa. This is shown by the coefficient β which is large and significant with the correct sign for all the smaller members. The coefficient γ, which captures the speed of convergence in interest rates in the long run, ranges between -0.23 to -0.57. For Swaziland, though the convergence coefficient has the right sign, it is not significant. Lesotho has the lowest convergence coefficient, though not significantly different from that of Swaziland. This could be due to the underdevelopment of the financial sector in Lesotho.

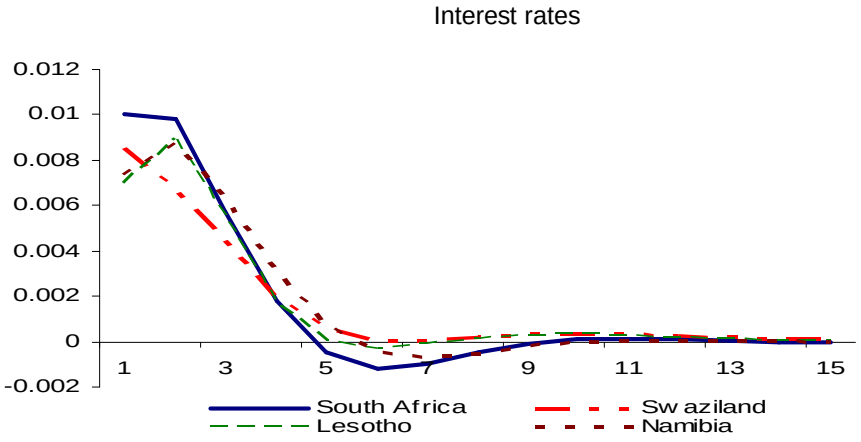
The results also show that inflation rates in South Africa affect those of the smaller countries as captured by β. This coefficient has the right sign and is statistically significant for all countries. It is much higher for Swaziland at 1.03 and very similar for Namibia and Lesotho at 0.71 and 0.72 respectively. The convergence speed is higher for Swaziland at -1.11 followed by Lesotho at -0.97 and Namibia at -0.52. For all the countries there is no evidence of persistence in inflation. This is shown by the insignificance of the coefficients. These results are reasonable given that smaller countries rely heavily on imports from South Africa. Further, the currencies of member countries are pegged one-to-one to the rand. This makes the inflation targeting framework being pursued by South Africa applicable to the whole area.

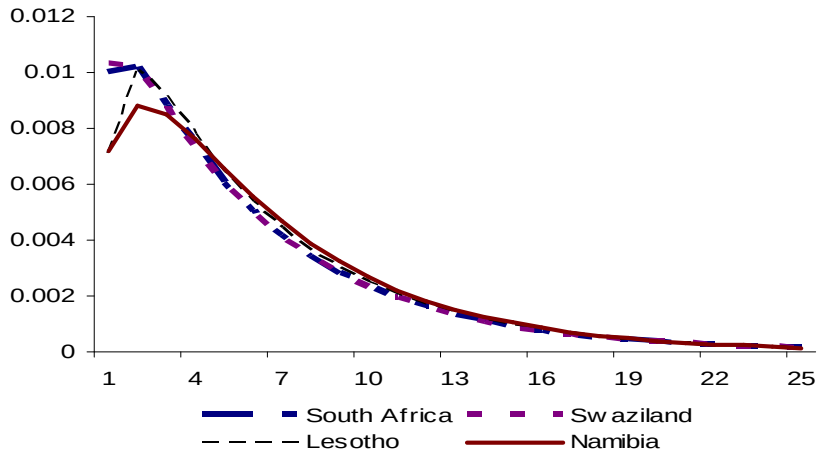
GDP growth in Swaziland, Lesotho and Namibia is positively related to growth in South Africa as captured by the β coefficients. The γ coefficients show that there is convergence in the long run. This is shown by the significance of the coefficients, which also carry the correct signs. The convergence speed for Swaziland, Lesotho, and Namibia is -0.67, -0.30 and -1.33 respectively. For Namibia, the reported persistence is insignificant. It is however important to note that the model does not include other factors, such as structure of economies, and level of quality of production factors that influence economic activity in each economy. However, the results obtained are useful in that they bring out that growth in South Africa does influence that of the smaller countries.

In general, these results are the same as those found by Wang et al. (2007). Slight differences reflect the inclusion of persistence parameters and the use of annual data. For Lesotho and Swaziland, there is persistence in interest rates, which indicates that adjustment following any disturbance will be gradual rather than fast and immediate. As a result, current lending rates in Lesotho and Swaziland will be affected by their past two and one year values respectively.

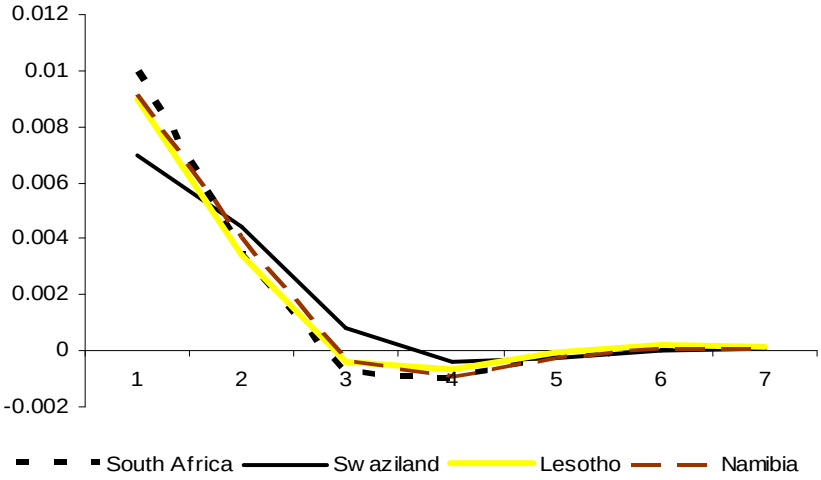
Using the results shown in table 2, simulation of the behaviour of the economies of the CMA when faced with a 1% percent shock from South Africa yields the responses in figure 1. The graphs show that following the shock, in the very short run economies may react differently. However, they tend to behave the same way as they approach long run equilibrium together. This indicates that there is convergence in the CMA in terms of inflation, interest and GDP growth rates. This means that business cycles of these economies should be fairly synchronised.

Figure 1 Error-Correction Model results simulations





GDP growth rates



The behaviour of inflation in the CMA is further supported by evidence from running Granger-causality tests. These tests are based on the assumption that causality in inflation is unidirectional from South Africa to the smaller members. This assumption is based on the hegemonic role South Africa plays in the area. The results presented in table 4 show that inflation in the smaller countries is Granger-caused by inflation in South Africa.

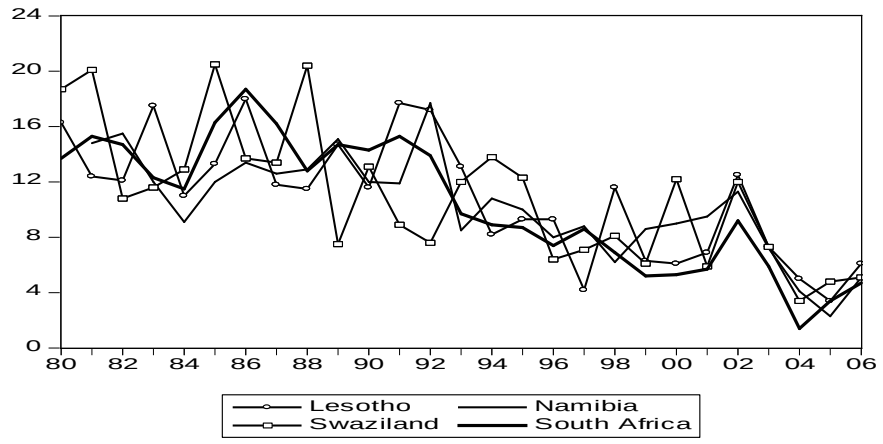
Table 4 Pairwise Granger-Causality Tests: Inflation in the CMA

Null Hypothesis	F-Stat	Prob
South Africa inflation does not Granger-cause Swaziland inflation	7.00	0.0
Swaziland inflation does not Granger-cause South Africa inflation	2.42	0.13
South Africa inflation does not Granger-cause Lesotho inflation	16.52	0.0
Lesotho inflation does not Granger-cause South Africa	0.29	0.59
South Africa inflation does not Granger-cause Namibia inflation**	10.03	0.0
Namibia inflation does not Granger-cause South Africa inflation	1.45	0.24

Note: **No. of observations for Namibia is 25 compared to 31 used for Lesotho and Swaziland. F-Stat= F-Statistic and Prob= probability.

The close co-movement of inflation in the CMA supports a finding by Tenreyro and Barro (2003) that a common currency increases price co-movements as shown in figure 2. Since inception of the inflation targeting framework in South Africa inflation rates in the area move even closer. This is also supported by table 24 in the appendix.

Figure 2 Inflation in the CMA



In the literature on OCA trade integration is one of the key criteria used to determine if countries are suitable candidates for a currency union. This is because as trade integration intensifies business cycles tend to be more synchronised. However, Frankel and Rose (1996a) point out that from a theoretical point of view, as trade intensifies among countries; it could lead to either synchronous or asynchronous business cycles. This is because

countries could become more specialised in their production, leading to idiosyncratic cycles as noted among others by Eichengreen (1992) and Krugman (1993). On the other hand, business cycles could become more synchronised if intra-industry trade intensifies, demand shocks preponderate, and when countries face common shocks.

Table 5 CMA Direction of trade, 2003

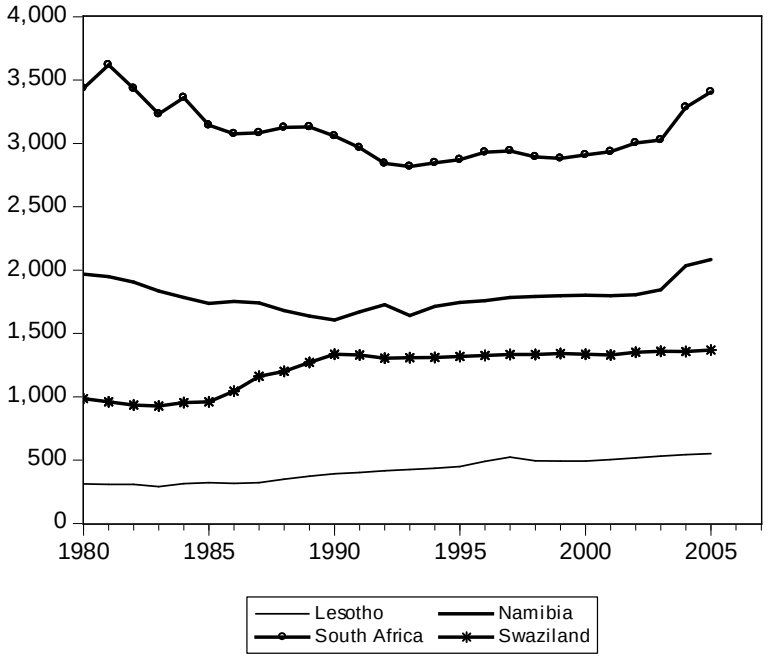
Trade direction	Lesotho	Namibia	South Africa	**Swaziland**
Exports to:				
South Africa	19.4	28.6	7.3	68.2
Europe	0.1	49.7	30.6	1.9
United States	79.8	5.9	9.7	9.1
Rest of world	0.7	15.8	59.7	20.9
Exports/GDP*	46.0	47.4	30.8	80.5
Imports from:				
South Africa	86.0	81.5	1.3	89.0
Europe	0.1	6.2	43.4	1.2
United States	0.2	0.8	9.7	0.3
Rest of world	13.7	11.5	46.9	9.6
Imports/GDP*	84.4	46.5	34.5	86.8

Source: World Economic Outlook (2007) and Wang et al. (2007). * indicates figures for 2007.

From table 5, it emerges that the smaller members are more open, especially Lesotho and Swaziland, judging from the exports and imports to GDP ratios. They are also highly dependent on imports from South Africa, which account for over 80% of total imports. For Lesotho and Namibia, most of their exports are destined for the US, about 80% and Europe about 50%. Swaziland on the other hand, exports over 68% to South Africa which is much higher compared to what the other smaller members export to South Africa. South Africa on the other hand is engaged in trade with countries outside the CMA. According to Grandes (2003), intra-industry trade does not seem to have intensified in the area. Hence, member countries are likely to face asymmetric shocks leading to divergences in business cycles.

Figure 3 plots GDP per capita for countries in the CMA. It depicts the extent to which income gaps have fallen over the years among members.

Figure 3 GDP per capita for CMA countries (in thousands constant 2000 US$)



Source: World Development indicators, 2007

The graph shows that there has been some convergence within these countries in the last two decades as evidenced by slight narrowing of income dispersions, σ-convergence. This supports the conclusion made by Masson and Pattillo (2004), Jefferis (2007), and Wang et al. (2007), that the CMA forms a core convergence club or group. From figure 3, the gap in per capita incomes between South Africa, the richest member, and the poorest country in per capita terms, Lesotho, has continued to decrease over the years. From the late nineties, Swaziland has been faced with a serious slowdown in economic activity while growth in South Africa has been robust. Should this pattern continue, per capita income dispersions are likely to grow larger.

2.4.3 Univariate Modelling

Estimating eq. (3), I test if countries converge to the same long run equilibrium values, denoted by X^{**} . The results are displayed in table 6 below.

Table 6 Univariate modelling results

Parameters	Lesotho			Namibia			South Africa			Swaziland		
	r	π	Δy	r	π	Δy	r	π	Δy	r	π	Δy
β_1	0.93	0.56	0.44	0.96	0.64	-0.53	0.98	1.02	0.34	0.72	0.37	0.53
	(0.18)	(0.16)	(0.18)	(0.15)	(0.16)	(0.23)	(0.18)	(0.19)	(0.18)	(0.13)	(0.17)	(0.17)
β_2	-0.53						-0.39	-0.16			0.23	0.20)
	(0.17)						(0.18)	(0.20)			(0.18)	(0.14)
β_3												
β_4												
β_0	9.75	4.86	2.00	0.14	3.38	6.51	6.43	1.23	1.45	4.03	4.00	1.16
X^{**}	(2.79)	(1.95)	(0.92)	(2.46)	(1.81)	(1.14)	(2.28)	(1.20)	(0.61)	(1.88)	(2.86)	(1.04)
	16.25	11.05	3.64	3.5	9.39	4.25	15.68	9.46	2.2	14.39	10.00	4.30
R^2	0.55	0.30	0.20	0.79	0.40	0.28	0.58	0.76	0.13	0.53	0.22	0.41
$\chi^2(2)$ AIC	3.03	4.85	2.74	0.81	2.75	4.39	1.45	5.44	0.37	4.31	4.41	2.84
	(0.22)	(0.08)	(0.25)	(0.67)	(0.25)	(0.11)	(0.48)	(0.07)	(0.83)	(0.51)	(0.11)	(0.24)
	4.26	5.48	5.1	3.99	5.01	4.51	4.83	4.54	4.52	4.61	5.93	5.01

Note: Standard errors are reported in parenthesis. r = Interest rate. π = Inflation rate. Δy = growth rates. X** represents calculated equilibrium values.

The equilibrium interest rates for Lesotho, South Africa, and Swaziland are not very different. For Namibia however, the equilibrium value is too low at about 4%. This could be attributable to the short data series used. For inflation, the equilibrium values in the same order are very close to each other. This is to be expected given the close financial integration between these countries, which was earlier confirmed by the presence of nominal convergence in the area. Equilibrium figures for growth are around 4% with the exception of South Africa with a figure of about 2%.

Overall the results confirm close integration of financial sectors as they tend to converge to the same long run interest rates. Inflation behaviour in the long run also shows convergence. The inflation targeting followed by South Africa, as well as the parity among the currencies in the area has led to this behaviour in interest and inflation rates.

2.4.4 β-Convergence Model in the CMA

In this subsection I measure the extent to which the smaller countries in the CMA catch up with the dominant partner, South Africa. For β-convergence to occur, the country lagging behind initially must catch up with the per capita income of the larger country. If convergence occurs, then countries are better candidates for a monetary union. I measure β-convergence by estimating a model based on Kocenda et al. (2006) specified in eq. (4), which yields the results in table 7 below:

Table 7 β -convergence results

Parameters	Lesotho	Namibia	Swaziland
δ	-3.26	-1.30	-3.13
α	(0.05)	(0.04)	(0.03)
	0.04	0.01	0.02
R^2	(0.003)	(0.002)	(0.002)
Residua(-1)	0.88	0.67	0.94
			0.99
			(0.07)

Note: Standard errors are in parenthesis. The results for Swaziland were corrected for serial correlation.

For all three countries, the initial deviation shows that they are all lagging behind South Africa. This is shown by the statistically significant and negative δ coefficients. The trend coefficient α is positive and statistically significant for all three countries. This shows that over time the smaller countries catch-up with South Africa. Hence, this confirms that there is β -convergence in the CMA. All the three measures of convergence show that there is evidence of convergence among these countries.

2.4.5 Empirical Evidence on Asymmetry in the CMA: Correlation of Growth Rates

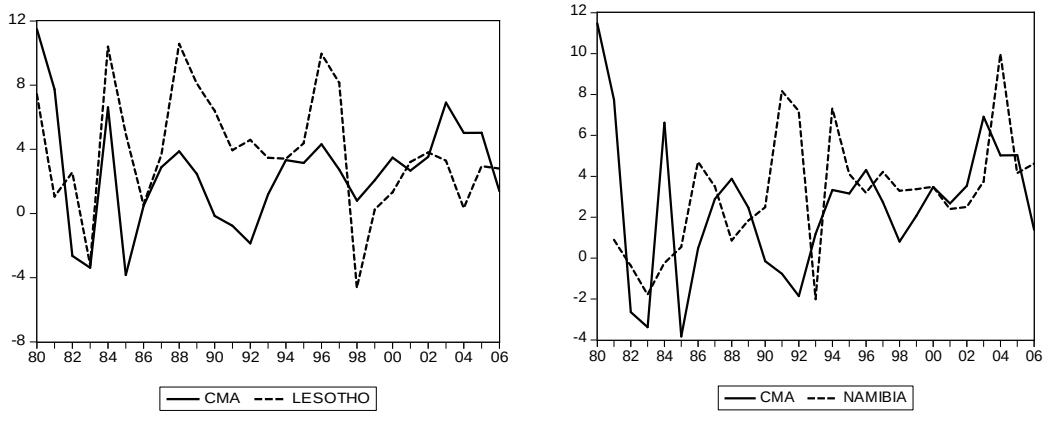
To measure asymmetry among CMA members I analyse the correlation of national annual real GDP growth with that of the whole area. Low or negative correlation is interpreted as an indication that member countries are not suitable candidates for a monetary union.

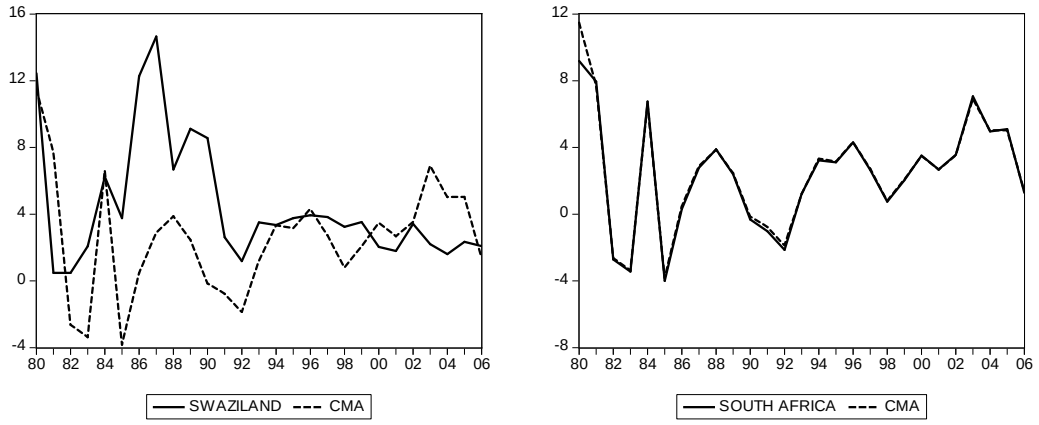
Table 8 Correlations of growth rates

Country	Correlation with CMA growth	Correlation with SA growth
Lesotho	0.25	0.24
Namibia	0.14	0.12
Swaziland	0.004	0.004
South Africa	0.99	-

Table 8 shows that the correlation between South Africaôs growth and that of the whole area is higher, very close to one, which is to be expected given that South Africa contributes approximately 90% of GDP for the whole area. Lesotho has the second highest correlation followed by Namibia. However, the correlation for Swaziland is extremely low at 0.004. These differences could possibly reflect differences in economic and industrial structures. They also indicate that CMA members are likely to face asymmetric shocks. The correlations of growth rates between the smaller members and South Africa are not significantly different from that with the whole area for Lesotho and Namibia. For Swaziland the correlation of growth rates with that of South Africa is actually negative. It is likely that this is due to the fact that Swaziland exports above 60% to South Africa. The nature of the goods exported is likely to fall as growth rises in South Africa.

Figure 4 GDP growth rates of individual countries and the CMA.





Source:World Development Indicators, 2007

Plots of the growth rates, in figure 4, of each member country against that of the whole region confirm the correlations reported in table 8 above.

2.4.6 Composition of Exports

The composition of exports is used as another proxy of whether countries will face asymmetric shocks or not. From table 8, it is evident that all the countries have hardly diversified their export mix as they are all largely dependent on few primary goods. Such lack of diversity diminishes the ability to diversify negative terms of trade shocks away and is likely to lead to asymmetric terms of trade shocks. Debrun et al. (2003) confirm that countries that specialize in a limited variety of goods and are therefore less diversified, as is the case in the CMA, are more likely to face large asymmetric shocks. Table 8 below presents the export products of the CMA member countries.

Table 9 Composition of exports in the CMA

Countries	Export Products
Lesotho	Textiles and apparel assembly.
Namibia	Fish, gold and diamond.
South Africa	Gold, platinum and automobile assembly.
Swaziland	Sugar, sugar derivatives and textiles

Source: African Development Bank Report, 2006

The differences in the composition of exports together with variations in world prices of these export commodities are likely to result in asymmetry in terms of trade shocks in the CMA. Evidently, prices of gold, platinum, and other minerals, for example, have surged since the 1990s, which means improving terms of trade for South Africa and Namibia. At the same time, prices of textiles have continued to plummet. This has resulted in weakened terms of trade for Lesotho because textiles account for a large amount of the countryôs exports. For Swaziland, sugar prices have fallen and preferential treatment in various markets has either been reduced or lifted, leading to deterioration in terms of trade. Wang et al. (2007) analysed correlation in the terms of trade for CMA member countries as a measure of asymmetry. They found that the terms of trade are not well correlated.

The differences in the composition of exports are related to the differences in industrial structures in the CMA shown by the contribution of each sector to output. Differences are an indication that countries will be impacted differently by industry specific shocks. For example, a shock in the agricultural sector is likely to affect Lesotho and Swaziland more than it would the other countries. Table 8 shows that Lesotho and Swaziland are highly dependent on agriculture, a sector that is highly vulnerable to shocks, compared to South Africa and Namibia. South Africa and Namibia are highly dependent on services and industry which also contribute a lot to output for Lesotho and Swaziland.

Table 10 Structure of output by sectors (%) for CMA Countries, 2005.

Countries	Agriculture	Industry	Manufacturing	Services
Lesotho	16.9	43.3	20.3	39.8
Namibia	9.8	31.6	13.5	58.6
South Africa	2.8	30.5	18.8	66.8
Swaziland	12.3	46.7	38.3	41.0

Source: African Development Bank Report, 2006.

The low correlation of growth rates and the differences in composition of exports in the CMA indicate that business cycles in the area are likely to be asymmetric. This, according to OCA literature, implies that these countries would incur huge adjustment costs should they form a monetary union. Does this mean that these countries, though highly integrated, should not move towards forming a fully-fledged monetary union? In an attempt to answer this question, in section 2.5 show the correlation of business cycles among South African regions. These regions are subject to the same Reserve Bank policy yet they seem to have asymmetric business cycles. This supports the idea that asymmetry of business cycles should not stop countries forming a monetary union hence being subjected to a single monetary policy.

2.5. Business Cycle Synchronisation among South African Provinces

South African provinces have different industrial structures hence, economic structures. Table 11 shows the differences in the contributions of different industries to total industrial output. Some regionsôreliance on agriculture is higher while some show heavy reliance on tertiary industries. These differences suggest that these regions are prone to face asymmetric shocks. Hence, their business cycles are likely to be asynchronised, which suggests the use of a single monetary policy across provinces may not be appropriate.

Table 11 Structure of output by industries for South African Provinces, 2003

Province	Primary	Secondary	Tertiary
Eastern Cape	0.025	0.216	0.758
Free State	0.154	0.176	0.670
Gauteng	0.030	0.250	0.70
Kwazulu-Natal	0.069	0.287	0.644
Limpopo	0.279	0.087	0.634
Mpumalanga	0.252	0.274	0.474
Northern Cape	0.358	0.070	0.572
North West	0.319	0.107	0.574
Western Cape	0.047	0.237	0.715

Source: Statistics South Africa Database, 2002

Table 12 shows how correlated the growth rates of South Africaôs provinces are to the national growth rate. High correlation would be an indication that the different provinces face symmetric shocks. This would mean that their business cycles are highly synchronised. The correlations show Limpopo province growth rate is negatively correlated with that of the country as a whole. This means that these business cycles move in opposite directions. The Northern Cape Province has a very low correlation of 0.05 with that of the whole country. These two cases indicate that the two provincesôbusiness cycles are not synchronised with those of the other provinces.

Table 12 Correlations of growth rates for South Africa and the Provinces

Provinces	Correlations with National growth
Eastern Cape	0.81
Free State	0.78
Gauteng	0.70
Kwazulu-Natal	0.75
Limpopo	-0.33
Mpumalanga	0.71
Northern Cape	0.05
North West	0.58
Western Cape	0.81

Source: Own generated results based on GDP growth rates obtained from Statistics South Africa Database, 2002.

When business cycles are less correlated the effectiveness of a common monetary policy for stabilisation purposes is hindered. It is likely to correct the instability in one region while worsening the situation in the other region. However, this does not necessarily mean that if business cycles appear to be asynchronised then the provinces should have independent Central banks. Other adjustment mechanisms, such as flexible labour and capital markets and fiscal transfers, can be used as shock absorbers.

Correlations of growth rates in the CMA are very low indicating asynchronised business cycles. Economies of the CMA have very strong ties and all the convergence measures used in the study find both nominal and real convergence. Asymmetries in business cycles should not hinder progress towards creation of a currency union within the CMA. As alluded to above, countries may need to find other adjustment mechanisms to facilitate recovery whenever shocks occur in the area. Creating a fully-fledged union in the CMA can be part of the African Union strategy of strengthening regional integration. It can be used to facilitate setting up a monetary union for the SADC region and later a wider African currency union. In the next section I consider if the SADC region is getting ready to adopt the common currency by 2018 by assessing if there is convergence and any existing asymmetries.

2.6. Convergence and asymmetry in SADC

The Southern African Development Co-ordination Conference (SADCC) was established in 1980 and it became the Southern African Development Community (SADC) in 1992. The 13 member countries are Angola, Botswana, Democratic Republic of the Congo (Congo DR), Lesotho, Malawi (Mal), Mauritius (Maur), Mozambique, Namibia, South Africa (SA), Swaziland, Tanzania (Tanz),

Zambia (ZA), and Zimbabwe. SADC, being an important element of the African Economic Community, aims to promote regional integration, peace, and security in the region.

Tavlas (2007) highlights several differences among SADC countries. These include; size, economic structures, and composition of exports whose prices do not move closely together. These countries show very low shares of intra-SADC trade mainly because of; low per capita incomes that constrain internal market size, high concentration on few primary goods for exports, poor infrastructure connecting population centres and the large presence of the informal sector. South Africa is the dominant country as it accounts for about 67% of total SADC GDP and is comparatively more industrialised and more diversified.

According to Jefferis (2007) the African Union has in principle concurred to put into operation a monetary union and a single currency by the year 2021. This plan hinges on the establishment of regional monetary unions that will afford building blocks for the Africa-wide monetary union. In this section I assess if essential economic and monetary variables such as, per capita incomes, inflation rates, growth rates, and interest rates are converging in the SADC region. Such convergence is a necessary element in creating a more conducive environment for the operation of a successful currency union.

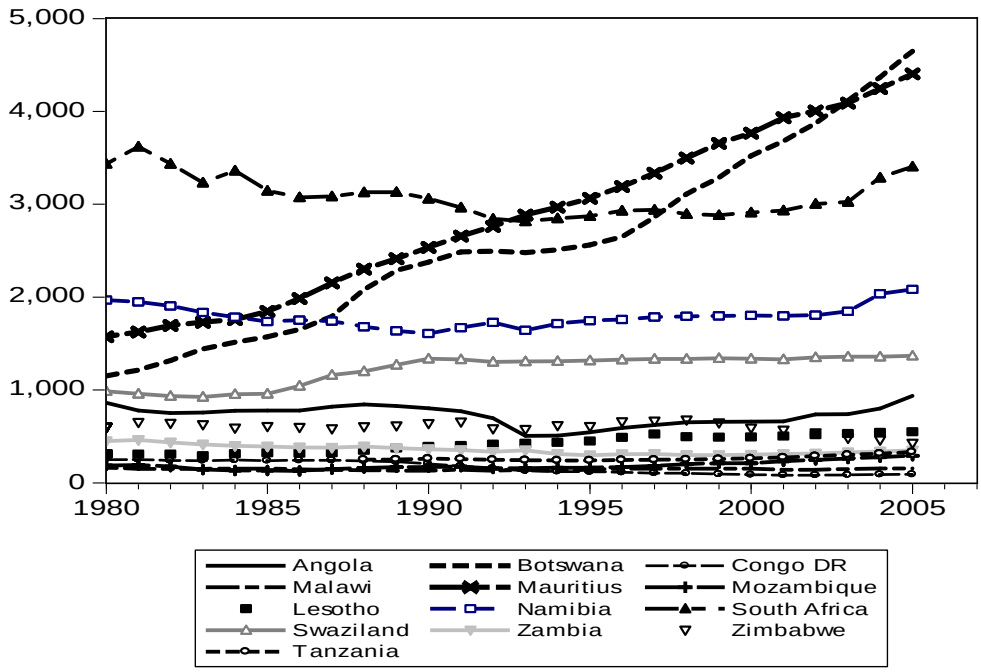
In some of the analysis Angola, Congo DR, and Zimbabwe are excluded owing to data unavailability and unreliability due to economic instability, civil war, and internal strife. I define SADC to exclude the CMA countries for this analysis. The data are sourced from the International Financial Statistics, World Development indicators, IMF Zambia country office reports, and African Development Bank statistics pocket book.

Figure 5 demonstrates that in the 1990s per capita incomes for Botswana and Mauritius surpassed that of South Africa. On the other hand, incomes of the rest

of the SADC countries continue to lag behind those of the CMA countries. Angola, Botswana, and Mauritius show convergence with incomes of the CMA. For Angola, this could be as a result of the oil reserves, while Botswana and Mauritius have continued to post robust economic performance due mainly to their successes in their mining and tourism industries respectively. The rest of SADC countries show no convergence in per capita incomes as opposed to the convergence displayed by the CMA countries. This non-convergence could be explained by a variety of factors. Firstly, most of these economies are small and less diversified, which leaves them vulnerable to external shocks. Secondly, some of them have been through major civil wars and internal strife which have created major economic instabilities. Finally, performance of the agricultural sector, the backbone of their economies, has been poor due to adverse weather conditions.

Figure 5 GDP per capita for SADC countries (in thousands constant 2000 US$)

Sour



Source; World Development Indicators, 2007

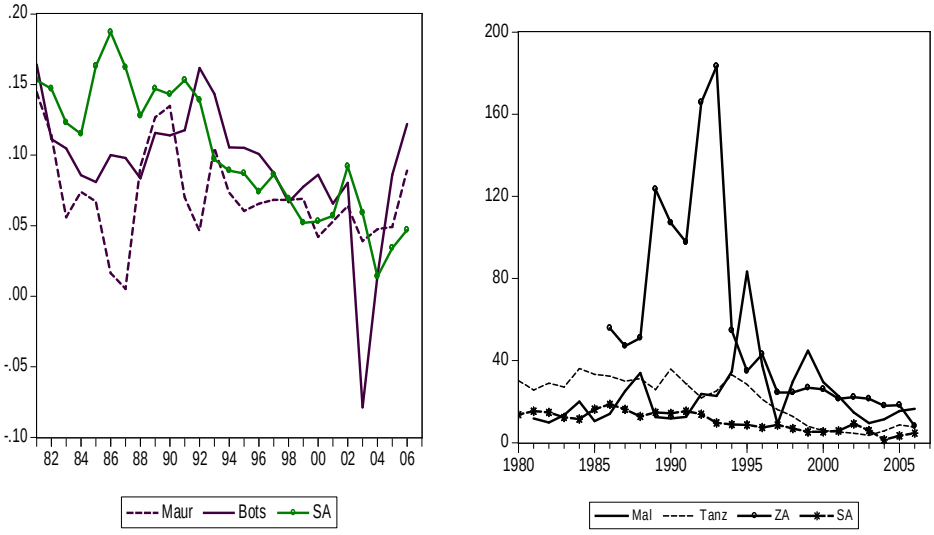
The results displayed in table13 show that like the smaller members of the CMA, SADC countries start off lagging behind South Africa as indicated by the negative sign of δ. However, overtime standards of living for most of the SADC countries are converging towards those of South Africa, the benchmark. Congo DR, Zambia, and Zimbabwe display continued divergence. For Zimbabwe the divergence is likely to be a result of the economic crisis that has hit the economy in recent times. Zambia faced a major macroeconomic crisis in the early 90s which eventually forced the country to undertake an IMF structural adjustment programme.

Table 13 β -Convergence in SADC

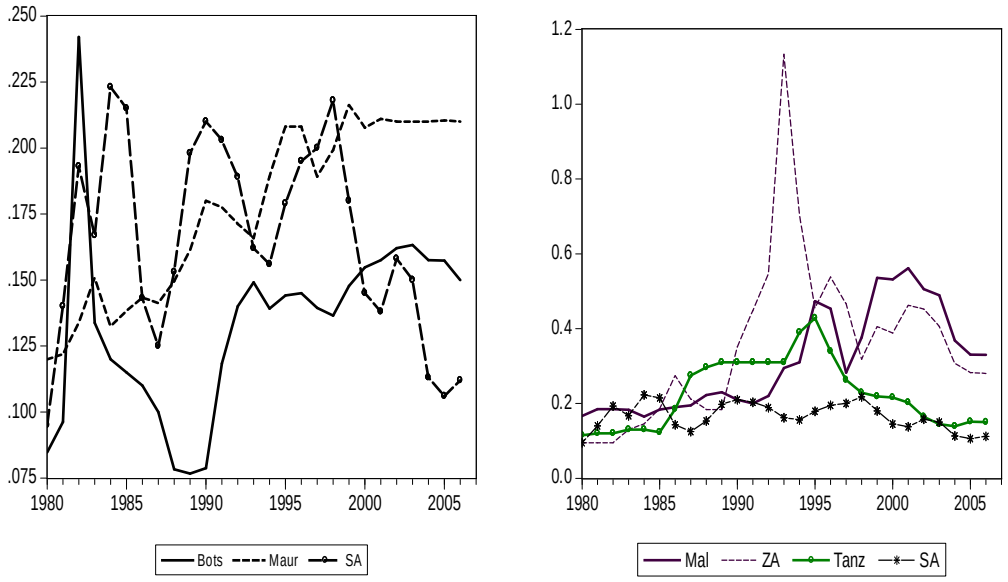
Countries	Parameters			
	δ	α	R^2	S.E
Angola	-1.45	0.0009	0.84	0.051
	(0.021)	(0.0014)		
Botswana	-0.93	0.054	0.99	0.043
	(0.018)	(0.001)		
Congo DR	-2.36	-0.05	0.93	0.038
	(0.018)	(0.001)		
Malawi	-3.121	0.005	0.50	0.056
	(0.023)	(0.0015)		
Mauritius	-0.70	0.045	0.97	0.038
	(0.016)	(0.001)		
Mozambique	-3.22	0.030	0.95	0.055
	(0.023)	(0.002)		
Tanzania	-2.61	0.011	0.87	0.024
	(0.021)	(0.001)		
Zambia	-2.04	-0.010	0.85	0.034
	(0.014)	(0.001)		
Zimbabwe	-1.54	-0.009	0.88	0.054
	(0.022)	(0.002)		

I plot inflation and interest rates in SADC in figure 6, to ascertain if there is any monetary integration in the SADC region. Botswana, Mauritius, and South Africa exhibit co-movement in inflation rates. For the rest of the SADC countries, their inflation rates have, until the late 90s, been much higher than those in the CMA. Interest rates for SADC countries display weak co-movement with those for the CMA, which are much lower. This behaviour of inflation and interest rates, especially in the poor SADC members, signifies weak monetary integration among them and the CMA member countries.

Figure 6 Inflation rates



Lending interest rate



Source: International Finance Statistics, 1979-2007

Results from an error-correction model for inflation and interest rates in table 14 also support the weak monetary convergence in SADC as displayed in figure 6 above. Weak monetary convergence is revealed by the deviations of inflation and interest rates from those of South Africa, captured by γ, which tend to persist for most SADC countries.

Table 14 Error-Correction results

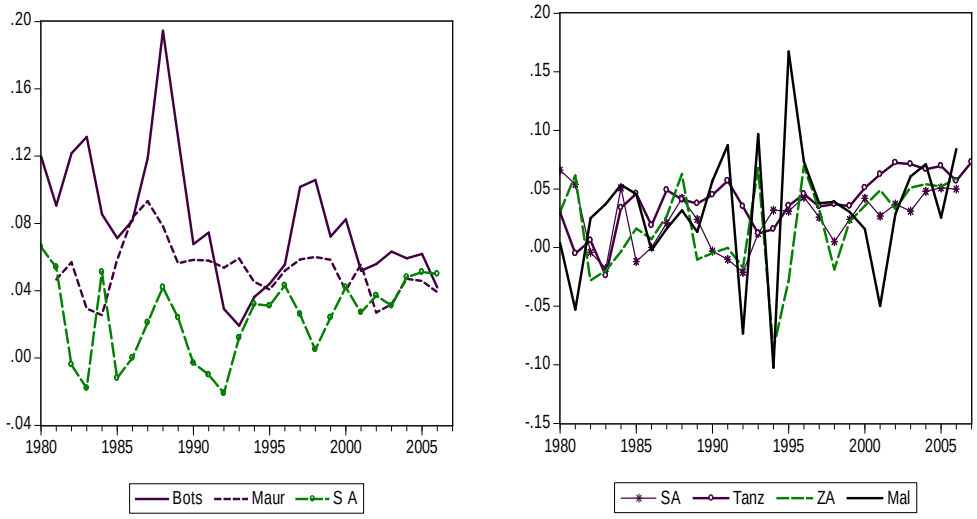
	Botswana		Malawi		Mauritius		Tanzania		Zambia	
	π_t	r_t	π_t	r_t	π_t	r_t	π_t	r_t	π_t	r_t
β	0.82	-0.04	-0.29	-0.36	0.31	-0.005	-0.32	-0.46	-1.38	0.003
	(0.20)	(0.11)	(0.62)	(0.35)	(0.22)	(0.02)	(0.29)	(0.14)	(1.07)	(0.008)
γ	0.33	0.46	0.71	4.19	0.30	-0.91	-5.66	-4.02	5.22	0.45
	(0.10)	(0.12)	(0.09)	(6.72)	(0.09)	(1.40)	(10.27)	(5.67)	(5.74)	(0.11)
θ_1	-0.75	-1.02	-0.42			0.90		0.71		0.51
	(0.12)	(0.12)	(0.14)			(0.31)		(0.12)		(0.18)
θ_2	-0.20		-0.38	-0.32						
	(0.09)		(0.08)	(0.16)						

R^2	0.90	0.81	0.91	0.72	0.90	0.56	0.61	0.82	0.96	0.71
S.E	1.75	1.24	6.58	4.43	2.24	0.26	3.34	1.89	9.20	0.10
AIC	4.20	3.47	6.86	6.05	4.65	0.35	5.45	4.32	7.52	-1.48

Note: Standard errors are in parentheses.

Having established that there is weak nominal convergence in the SADC region I measure real convergence using correlations of growth rates and by comparing the composition of exports. South Africa, Botswana, and Mauritius exhibit some co-movement in growth rates, as displayed in figure 7 below, from the year 2000 onwards which can be taken as an indication that these countriesô business cycles are becoming more and more synchronised. Economic growth for the low income countries has been poor due to factors such as wars, adverse weather conditions and poor policy decisions.

Figure 7 Growth rates in SADC



Source: World Development Indicators, 2007

The correlation between SADC member countries growth rates and that of the CMA and South Africa is shown in table 15. Angola, Congo DR, Mozambique, Tanzania, and Zambia have higher growth correlations with both South Africa

and the whole CMA. This could be explained by the dependence of these countries on South Africa, the larger and dominant economy in SADC. These economies have for a long time either faced internal strife or wars or adverse weather conditions which hampered growth of their economies. It is likely that shocks facing South Africa will be propagated to these countries. As a result, their business cycles will move together with that of South Africa.

Table 15 Correlations of SADC, CMA and South Africa growth rates

Countries	CMA	South Africa
Angola	0.253	0.437
Botswana	0.058	-0.050
Congo DR	0.398	0.480
Malawi	-0.022	0.062
Mauritius	-0.243	-0.293
Mozambique	0.478	0.487
Tanzania	0.322	0.353
Zambia	0.432	0.494
Zimbabwe	-0.106	-0.107

Botswana, a member of SACU, has a low but positive correlation with the CMA and a low negative correlation with South Africa. The economies of Botswana and Mauritius have continued to record impressive growth rates, above those of the CMA countries. In Botswana, this has been mainly driven by the mining sector while in Mauritius it has been the textiles and tourism industries. Having looked at the growth correlations I look at the composition of exports to assess if countries are likely to face asymmetric shocks.

Table 16 Exports composition and trade partners for SADC countries

Country	Exports	Export partners	Import partners
Angola	Crude oil, diamonds, refined petroleum products. Gas, coffee, sisal, fish and fish	US, China, France, Taiwan and South Africa (4.6%).	Portugal, US, South Korea, China, Brazil, South Africa (6%), France and the UK.

	products, timber and cotton.		
Botswana	Diamonds, copper, nickel, soda ash, meat and textiles.	European free Trade Association (EFTA), SACU (7%), Zimbabwe.	SACU (74%), EFTA, and Zimbabwe.
Congo DR	Diamonds, copper, crude oil, coffee and cobalt.	Belgium, China, Brazil, US, Finland, France and Zambia.	South Africa (22.2%), Belgium, Zambia, Zimbabwe, France, Kenya, US and Cote d'Ivoire.
Malawi	Tobacco, Tea, Sugar, cotton, coffee, peanuts, wood products and apparel.	Germany, South Africa (10.5%), Egypt, Zimbabwe, US, Russia and Netherlands.	South Africa (36.4%). India, Tanzania, US and China.
Mauritius	Clothing and textiles, sugar, cut flowers, molasses and fish.	UK, UAE, France, US, Madagascar, Italy and Belgium.	India, China, South Africa (7.4%).
Mozambique	Aluminium, prawns, cashews, cotton, sugar, citrus, timber and bulk electricity.	Italy, Belgium, Spain. South Africa (12.2%), UK and China.	South Africa (38.1%), Australia and China.
Tanzania	Gold, coffee, cashew nuts, manufactures and cotton.	China, India, Netherlands, Germany and UAE.	China, Kenya, South Africa (7.6%), India and UAE.
Zambia	Copper/cobalt, electricity, tobacco, flowers and cotton.	Switzerland, South Africa (12%), Thailand, Congo DR, Egypt, Saudi Arabia and China.	South Africa (47.4%), UAE, China, India and UK.
Zimbabwe	Platinum, cotton, tobacco, gold, textiles and clothing and ferroalloys.	South Africa (35.1%), Cong DR, Japan, Botswana, Netherlands, China, Italy and Zambia	South Africa (50.6%), China, US and Botswana.

Source: SADC trade statistics, 2005

SADC countries rely on a few, mainly primary, commodity exports, such as agricultural produce and mineral resources as shown in the table 16. This lack of diversification of exports and reliance on primary products in the region means

that countries are more vulnerable to external shocks due to international market price fluctuations. From the differences in the composition of exports, economic structures, and stages of development, SADC countries are more likely to face asymmetric shocks. Even if they were to face the same shocks, it is more likely that their economies would be affected differently due to these existing dissimilarities.

2.7 Conclusion

Adopting a common currency by countries is perceived as a more staid and long-lasting commitment. This is because it prohibits member countries from engaging in competitive devaluations. It also encourages foreign direct investment as well as long-term relationships among members. Moreover, it also encourages political integration. As a result, trade, economic, and financial integration intensify, which results in synchronisation of business cycles. This tends to boost economic performance as evident in the Euro area.

This paper has confirmed that countries in the CMA have strong ties. Firstly, there is strong evidence of nominal convergence depicted by the behaviour of interest rates and inflation rates. This suggests that the financial sectors in the area are highly integrated and there is harmonisation in setting interest rates. Secondly, there is a fall in dispersions in per capita income overtime. This suggests that the smaller countries in the area are catching up with the larger country, South Africa. By forming a fully-fledged monetary union, CMA countries are likely to derive more benefits associated with such groupings. These include a more stable macroeconomic environment hence, high economic activity, low unemployment rates, and higher investment emanating from coordination and harmonisation of macroeconomic policy in the region.

Empirical evidence also shows that CMA countries are likely to face asymmetric shocks. This is supported by the low correlation between individual countriesô

growth rates and that of the entire area, with the exception of South Africa. Furthermore, these countries export different products, which suggest that they are likely to face dissimilar terms of trade shocks. Based on the OCA criteria, when countries are prone to asymmetric shocks they are not suitable candidates for a currency union because they would face high adjustment costs. However, the existence of asymmetric adjustments among member countries does not provide sufficient reason against a move towards a monetary union.

To back this claim, I use correlation of growth rates among South African provinces to argue that low correlation of business cycles should not stop countries from forming monetary unions. Instead, adjustment mechanisms must be put in place to reduce costs for individual countries should they be subject to asymmetric shocks. Moreover, it is argued in the OCA literature that the OCA criteria are endogenous and dynamic. This means that the net benefits of a monetary union increase after joining the union because trade integration and business cycle correlations are enhanced.

A monetary union in the CMA is likely to further enhance economic integration and induce changes in economic, financial, legal, and institutional structures in the CMA. Such a move in the area could facilitate much needed economic structural reform in the smaller members, especially Lesotho and Swaziland whose economies continue to falter. Given the foregoing, then the CMA is better off moving ahead to form a fully-fledged monetary union. Such a move can also be seen as a stepping stone for the creation of a SADC wide monetary union hence, an Africa-wide monetary union as envisaged by the African Union.

Empirical evidence shows that even though some countries in SADC show convergence in per capita incomes most are still lagging behind incomes of the benchmark, South Africa. There is also a weak indication of monetary convergence in the region based on the behaviour of inflation and interest rates. These are lower in the CMA compared to most of the rest of SADC countries.

SADC is also prone to exhibit asynchronised business cycles mainly due to asymmetric shocks that economies are likely to face. Countries are different in economic size, structures, and level of economic development. This could mean that even in the face of similar shocks, these economies will be affected in dissimilar ways and thus require country-specific responses. The results therefore indicate that even though the CMA countries form a convergence club, the same cannot be said about the SADC region.

Chapter 3

The Transmission of Shocks in the CMA: A Structural Macro-model

3.1 Introduction

The chapter formulates and estimates a macroeconomic model which captures the transmission of shocks in the Common Monetary Area (CMA). The CMA comprises Lesotho, Namibia, South Africa, and Swaziland. These countries have very strong economic links, which date back to the colonial era. The other CMA currencies are pegged one to one to the South African rand while monetary authorities in South Africa float the Rand against other major currencies. The CMA is dominated by South Africa, which accounts for over 90% of the whole areaôs GDP, trade, and population. It is not a fully-fledged monetary union because there is no common central bank, pool of reserves, and regional surveillance of domestic fiscal and structural policies. In principle, each country is responsible for its own monetary policy. However; monetary policy set in South Africa, and based on that countryôs objectives, de facto applies to the entire area.

This chapter provides an analysis of how shocks are transmitted across the CMA and how smaller members are affected by South Africaôs response to those shocks. Furthermore, I assess the economic performance of smaller members if they are subjected to a single monetary policy. Such an investigation considers if CMA countries, especially the smaller members, are likely to derive even higher benefits by forming a monetary union. Dellas and Tavlas (2005) and Hughes-Hallett and Weymark (2001) argue that the costs of being subjected to a single monetary policy tend to be higher due to the nature of existing asymmetries, nominal and real rigidities among potential members. Such asymmetries and

rigidities, due to different institutional, financial, and industrial structures, have an impact on the effectiveness and suitability of a single monetary policy for the entire area.

The macro-model I develop in this chapter is based on models by Svensson (1997 and 2000) and Ball (1997, 1999). It summarizes in quantitative form a description of the economic structure and it consists of four equations. Firstly, is the Phillips curve equation, which provides the supply side that is consistent with inflation inertia. Secondly, an open economy IS curve equation which describes the demand side in each country. Thirdly, there is the exchange rate equation which is an uncovered interest parity condition. Lastly, there is a policy rule of the Taylor (1993), type which allows for the elimination of the money market equilibrium function, the LM curve. This rule specifies how the central bank manipulates the interest rate in order to attain its inflation and other objectives.

In multi-country models such as Mckibbin and Sachs (1988,1989), Mckibbin and Wilcoxen (1998) and Mckibbin (1998), countries are linked through goods and financial markets. This is necessary in order to analyse the transmission of shocks among the countries. Following these models, I link CMA countries via three channels. Firstly, they are linked through the goods market as portrayed in the IS specification of the model, which takes into account the fact that CMA countries have very close trade links with South Africa. Secondly, they are linked in inflation rates; this is depicted in the specification of the expectations augmented Phillips curve. Due to the heavy reliance on imports from South Africa, the smaller countries import inflation from the dominant partner. Finally, these countries are linked through interest rates via the monetary policy rule because monetary policy for the entire area is de facto set in South Africa. This is due to the fixed exchange rate prevalent in the area.

I assess if a single monetary policy is appropriate for the entire CMA countries, given their inherent differences and very strong economic links. To this end, I

estimate separate monetary policy rules for the smaller countries. This is useful in judging if these countries perform better under a single rule or separate rules. I compute volatilities from the simulations under the two monetary policy rules to measure which of the rules is more suitable. For the country specific rules, monetary authorities will manipulate the nominal interest rate, which is positively related to its own lag, the real exchange rate, output gaps, and deviations of inflation from target.

The results show that inflation in the small countries is mainly driven by that of South Africa. Domestic factors have limited influence on the small countriesô inflation processes. Except for Lesotho, I find that monetary policy has an effect on output in South Africa and Swaziland. Furthermore, there is evidence of interest rate smoothing by the South African Reserve bank. The model simulations show that macro-variable volatilities under one or country specific monetary rules will differ depending on the nature of the shock countries face. A move towards a fully-fledged monetary union has to take into account these differences in order to ensure that a single monetary policy rule is designed to benefit all countries.

The rest of the chapter is structured as follows: section 3.2 presents the theoretical model which captures the key elements for the monetary policy transmission mechanism in the CMA. The empirical results and simulations are in section 3.3 and 3.4 respectively. Section 3.5 presents the macro volatility analysis under the two different monetary policy rules. Section 3.6 provides the conclusion.

3.2 Theoretical Model

This model is a simple structural macroeconomic model that adequately allows consideration of key features of the economy that are essential for monetary policy analysis. According to Berg, Karam and Laxton (2006), models of this type,

with some variations, are being used by a number of central banks today, especially those pursuing inflation targeting. These models tend to be consistent with the way policymakers view the world, where there exists nominal and real rigidities. These rigidities result in aggregate demand affecting output in the short run. Expectations are viewed as crucial in output and inflation outcomes in the economy. Moreover, monetary authorities follow a specified monetary rule where the nominal interest rate is the instrument of policy. In some instances the results of these small macro-models are compared with results obtained from large macroeconomic models.

Currencies in the area are pegged one to one to the Rand. According to Masson and Pattillo (2004), monetary policy in the CMA is set by monetary authorities in the dominant larger partner, based primarily on that economy's objectives. This makes the arrangement asymmetric. Hence, the model captures the asymmetric nature of the arrangement by augmenting equations of the smaller countries with variables of the larger country. The equations for the larger country do not feature variables of smaller members.

The model consists of equations for aggregate demand, Phillips curve, the exchange rate, and a monetary policy rule. These relations govern the time paths of the endogenous variables; output, the price level, the exchange rate, and the nominal interest rate. Berg, Karam and Laxton (2006) argue that emphasis must be placed on the need for monetary policy to present an anchor for inflation and inflation expectations. They further acknowledge that due to nominal and real rigidities that exist in economies, aggregate demand will only affect output in the short run. As noted by Ball (1997), this class of models emphasizes that there are lags in the effects of policy as well as inertia in inflation. The equations of the model are as follows:

$$\Delta p_t = \phi \Delta p^e_{t+1} + (1-\phi)\Delta p_{t-1} + \beta y_{t-1} + \theta \Delta e_{t-1} + z_t \qquad (1)$$

$$\Delta p^{e}_{t+1} = (1-\mu)\Delta p_{t-1} + \mu\Delta p^{*} \quad (2)$$

$$\Delta p_{t} = \phi\mu\Delta p^{*} + (1-\phi\mu)\Delta p_{t-1} + \beta y_{t-1} + \theta\Delta e_{t-1} + z_{t} \quad (3)$$

$$\Delta p_{tj} = \phi_{j}\mu_{j}\Delta p^{*}{}_{j} + (1-\phi_{j}\mu_{j})\Delta p_{j\,t-1} + \beta_{j} y_{jt-1} + \theta_{j}\Delta p_{t-1} + q_{t} \quad (4)$$

Eq. (1) specifies the open economy Phillips curve for the larger country and eq. (4) for each of the smaller countries denoted by j. In eqs. (1), (3) and (4) y_t is the output gap at year t, Δe_t is the change in the (log) real exchange rate which captures the import cost effect, p_t is the (log) price level, Δp_t is the inflation rate, Δp^{*} is the inflation target, ϕ measures firms who are forward looking in their inflation forecasts and μ measures credibility of the target rate of inflation. Both μ and ϕ are $\in [0,1]$, β and θ are positive and z_t and q_t represent cost push shocks, for example, oil price shocks.

As in Fisher and Whitley (2000), eq. (1) allows for price stickiness attributable to contractual obligations and regulations among firms, employers and employees. In eq. (1) inflation is related to inflation shocks, past and expected inflation, output gap, and the lagged change in the exchange rate. Ball (1999) explains that the real exchange rate impacts inflation via import prices. Based on Laxton et al. (1998) and Fisher and Whitley (2000), expectations are formed based on past and target levels of inflation as specified in eq. (2). The coefficient on expected inflation must be positive to ensure that the monetary authorities cannot consistently fool the public.

Eq. (4) takes into account the imported inflation from the larger country captured by the last term in this equation. This term captures the impact of the heavy reliance of smaller countries on imports from the larger country. There is also no

exchange rate in this equation as it is set in the larger country and currencies are pegged one to one within the CMA.

Eq. (5) is the open economy IS specification for the larger country where i_t is the nominal interest rate, e_t is the real exchange rate gap and g_t is a demand shock which shifts the IS curve. The lagged output is used to support the existence of persistence in output due to habits or consumption determination. In eq. (5) output is serially correlated, increasing in the real exchange rate and decreasing in the real interest rate gap captured by the parameter σ. This IS specification, as in Senda (2005), has lags in order to make the demand shock to cause a trade-off between the variances of inflation and output.

$$y_t = \delta y_{t-1} - \sigma(i_{t-1} - \Delta p_{t-1}) + \alpha e_{t-1} + g_t \qquad (5)$$

The IS for each of the smaller countries is presented in eq. (6) and it includes the lagged output gap for South Africa which, captures demand emanating from the larger country. This term captures the impact of the heavy reliance of smaller countries on exports to the larger country. There is also no exchange rate in this equation because it is pegged one to one within the CMA.

$$y_{jt} = \delta_j y_{jt-1} - \sigma_j (i_{jt-1} - \Delta p_{Jt-1}) + \alpha_j y_{t-1} + g_t \qquad (6)$$

The exchange rate adjustment mechanism for the large country is described in eq. (7), where e_t is the real exchange rate gap, $i_t^{\,f}$ is the US nominal interest rate, i_t is the domestic (dominant partner) nominal interest rate and ε_t represents shocks in the foreign exchange market.

$$e_t = \gamma[(i_t^{\,f} - i_t) - (\Delta p_t^{\,f} - \Delta p_t) - e_{t+1}^{\,e}] + \varepsilon_t \qquad (7)$$

For the larger country, the exchange rate is a function of the real interest rate differentials, between the larger country

and the US as well as the expected exchange rate. Based on Berg, Karam and Laxton (2006), expectations of the exchange rate will be formulated by agents based on a target exchange rate e_t^* and what the exchange rate was the previous period as shown in eq. (8). Given that the exchange rate is fixed and it is the monetary authorities in the larger country that protect the rand against other currencies, the smaller countries in the CMA only follow eq. (10). They manipulate their interest rate in order to ensure that the parity is maintained. Here v_t is a shock that captures temporary deviations from the parity due to domestic factors.

$$e_{t+1}^{\ e} = \lambda e_{t-1} \tag{8}$$

$$e_t = \gamma[(i_t^{\ f} - i_t) - (\Delta p_t^{\ f} - \Delta p_t) - \lambda e_{t-1})] + \varepsilon_t \tag{9}$$

$$i_{j_t} = i_t + v_t \tag{10}$$

$$i_t = \varphi_i i_{t-1} + \varphi_p(\Delta p_{t-1} - \Delta p^*) + \varphi_y y_{t-1} + \varphi_e \Delta e_{t-1} + \xi_t \tag{11}$$

Eq. (11) specifies the monetary policy rule that is applicable to both the large and the small countries. The nominal interest rate (i_t), depends positively on its lag i_{t-1}, to allow for interest rate smoothing, deviation of inflation from target, output gap, and the exchange rate. In this equation $\varphi_p > 0$, $\varphi_y > 0$ and $\varphi_e > 0$.

The small countriesô central banks will manipulate their nominal interest rate to the extent that they have deviations of their interest rates from that of the larger country due to domestic factors. This is shown by eq. (10) where v_t captures the domestic factors. Clarida et al. (1999) argue that since the nominal interest rate is the instrument of policy, it is not necessary to specify the condition for money market equilibrium, the LM curve. Svensson (2000) points out that the reaction

function for an open economy will also include foreign variables such as, foreign inflation, output, and interest rates, because these impact on the domestic economy. Senda (2005) argues that the shock in eq. (11), ξ_t can be interpreted as a monetary policy mistake such that if the central bank makes no policy mistakes then ξ_t =0.

3.3 Empirical Analysis

3.3.1 Data description and properties

The data I use in this chapter, as shown in table 17, is annual data from 1975-2006. It is mainly sourced from the World Development Indicators (WDI) and International Financial Statistics (IFS). Some of the variables are expressed in gap terms using the HP filter to approximate the potential variables. I have left Namibia out of the analysis due to data inadequacy. The data for lending and treasury bill interest rates in Lesotho start from 1980 when the central bank was set up. For the period 1975-1979 I have therefore used interest rates for South Africa. This is justified since, the central bank of Lesotho commenced operations in 1980, hence prior to that monetary policy in Lesotho was carried out by South Africa.

Table 17 Data and variables description

Sample period	Source	Variables	Description
1975-2006	WDI and IFS	Nominal interest rate (i_t)	Lending rate
		Real Interest rate (r_t)	Lending interest rate adjusted for inflation using GDP deflator.
		Inflation (Δp_t)	GDP deflator (base years vary)
		Output gap (y_t)	GDP (constant 2000 US $) detrended using HP filter.
		Real exchange rate (e_t)	Real exchange rate(LCU per US$)

Following Rudebusch (2002), Svensson (2000) and Ball (1999), I estimate the model recursively using OLS. I then simulate the model by subjecting countries to a variety of monetary shocks under different monetary policy rules. The generated impulse response functions show how macro-variables in the area adjust following a shock instituted by South Africa. This is useful as it gives an indication of how well a uniform monetary policy is likely to function. The impulse response functions produced from the model simulations will be compared with those generated using a VAR in the next chapter.

Following standard procedure in the literature unit root tests are conducted for the variables in the model as specified in table 17.

Table 18 Unit Root Tests

Variables	ADF Test Statistic	Test Critical values
South Africa		
Inflation	-4.34	-3.57
Output gap	-4.18	-1.95
Real interest rate	-4.66	-2.97
Real exchange rate	-3.73	-2.96
Swaziland		
Inflation	-7.63	-2.97
Output gap	-3.59	-2.99
Real interest rate	-4.61	-2.97
Real exchange rate	-5.09	-2.97
Lesotho		
Inflation	-7.35	-3.59
Output gap	-3.28	-2.96
Real interest rate	-5.25	-2.97
Real exchange rate	-3.86	-2.96

Note: ADF= Augmented Dickey-Fuller

These test results are presented in table 18. At the 5% level of significance the null hypothesis is rejected for all variables.

3.3. 2 Analysis of results

Table 19 shows correlations of lending rates, inflation rates, and the output gaps in the CMA. Both Lending and inflation rates of the smaller members and South Africa are highly correlated. These indicate monetary convergence and how closely integrated the financial sectors are in the area, as the smaller countries tend to follow closely monetary developments in South Africa. The high correlation of inflation rates could be attributable to the inflation targeting pursued by South Africa which, in reality applies to the whole area. Monetary convergence in the area is one indication that the countries are more likely to be suitable candidates for a monetary union.

The output gaps for South Africa and Swaziland display low correlation. For Lesotho and South Africa, the output gaps are negatively correlated. These observed output correlations could be attributable to differences in size, structure, trade flows, and levels of economic development among the countries. Due to these differences, it is more likely that these countries will have asymmetric business cycles. Since countries will likely face idiosyncratic shocks, the implementation of a single monetary policy would be inappropriate. This could be solved by setting up other adjustment mechanisms to assist countries deal with their country specific shocks.

Table 19 Correlations

Lending rates

	Lesotho	South Africa	Swaziland
Lesotho	1		
South Africa	0.90	1	
Swaziland	0.68	0.85	1

Output gaps

Lesotho	1		
South Africa	-0.05	1	
Swaziland	-0.09	0.21	1

Inflation rates

Lesotho	1		
South Africa	0.99	1	
Swaziland	0.99	0.99	1

Table 20 Macroeconomic model empirical results

Phillips curve				IS curve				Monetary policy rule			
	Les	S A	SD		Les	S A	SD		Les	SA	SD
ϕ		0.611** (0.248)		∂	0.524** * (0.106)	0.516*** (0.117)	0.470*** (0.114)	φ_i	0.972*** (0.039)	0.851*** (0.058)	0.844 (0.071)
μ		0.392** (0.169)		σ	-0.054* (0.0957)	- 0.0031*** (0.001)	- 0.214*** (0.071)	φ_p	0.05 (0.053)	0.210* (0.081)	0.241 (0.095)
Δp^*		0.106*** (0.017)		α		0.046** (0.021)		φ_y	0.0005 (0.00070	0.005*** (0.002)	0.003 (0.001)
β	0.186 (0.180)	0.004** (0.002)	0.00006 (0.002)	α_j	-0.097* (0.230)		- 0.452*** (0.147)	φ_e		0.004 (0.005)	
θ		-0.064* (0.0347)									
θ_j	0.858*** (0.053)		0.831*** (0.062)								
AR(1)	-0.377 (0.201)		0.413 (0.201)	AR(1)	0.672 (0.270)		0.950*** (0.185)				
R^2	0.814	0.852	0.504	R^2	0.832	0.731	0.858	R^2	0.735	0.772	0.742
S.E.	0.029	0.017	0.037	S.E.	2.317	1.194	1.523	S.E.	0.018	0.02	0.018
LM	1.666	0.084	3.752	LM	6.070	0	8.673	LM	2.086	1.059	2.315
HR	9.028	2.507	3.986	HR	7.691	3.665	9.762	HR	3.887	3.249	9.331
NL	0.312	0.762	1.317	NL	2.342	0.954	1.343	NL	0.846	0.436	1.946

Note: Les=Lesotho, SA=South Africa and SD= Swaziland. Standard errors are in parenthesis. LM=LM Test Statistic, HR=Heteroscedasticity, and NL=Normality

From table 20 the Phillips curve results for South Africa show that the parameter for forward looking behaviour when forming expectations 0.61. The credibility parameter for the monetary authority, the SARB, is 0.39 and is likely to be a result of the inflation targeting framework being pursued by the bank. This credibility estimate is reasonable, and compares well with other studies, such as Berg et al. (2006). The inflation targeting framework stipulates a target of 3% to 6% and the bank communicates with the public regularly regarding monetary policy stance. This is likely to make the process transparent, which would facilitate to coordinate inflation expectations towards desired outcomes.

The output gap and real exchange rate coefficients in the South African inflation equation are significant though very low. This suggests that domestic sources of inflation play a lesser role in the countryôs inflation process. Furthermore, the pass-through effect of foreign prices on the South African economy is also found to be low. The negative sign on the real exchange rate suggests that inflation will rise as the exchange rate appreciates. However, the usual belief is the opposite but most recently studies, especially on China, have shown that if investors expect a high probability of continued appreciation, capital inflows could force monetary authorities to accumulate reserves. If these are not sterilised, this could lead to an increase in inflation.

In Lesotho and Swaziland, price setting behaviour appears to be following a different pattern. This is because the results obtained when using the same specification used for the larger country did not make economic sense. For instance, the rigidity and credibility parameters I found were above 1. Following usual practice in the literature, I then restricted these parameters to take the values of 1. However, this did not improve the results and surprisingly South African inflation was found to be insignificant in the inflation processes of the smaller countries. Given that the smaller countries import about 90% from South Africa plus the existent pegged exchange rates in the area, inflation

developments in South Africa are expected to play a pivotal role. This is also supported by the high correlations in inflation rates in the area alluded to earlier.

I then estimate equations where the inflation process in each of the smaller countries depends on their output gaps and the inflation in South Africa. The coefficients for the South African inflation in both Lesotho and Swaziland are over 0.8 and significant. This confirms that inflation in the smaller countries is driven mainly by that of South Africa. The smaller countriesô output gap coefficients carry the right signs but show that domestic factors are insignificant in their inflation processes.

From the aggregate demand results, the real interest rate coefficient is highly significant for South Africa and Swaziland. It is insignificant in Lesotho. The habit persistence coefficient is higher for South Africa, 0.52 followed by that of Swaziland, 0.47 and lower, negative, and insignificant for Lesotho at -0.15. Based on Bank of Israel (2007) and Berg et al. (2006), in most economies monetary policy gradually affects the output gap as reflected by a positive coefficient, usually found to be around 0.5 for the output gap lag. The lower and negative coefficient for Lesotho suggests that monetary policy has no effect on output. This could be related to a number of factors, including the underdeveloped nature of the financial system in the country. South Africaôs output gap has a negative effect on aggregate demand in Swaziland and Lesotho. This could be related to the nature of trade in the area. Lesotho exports very little to South Africa and Swaziland exports about 60% which is likely to explain the larger negative effect. This could mean that demand for the goods that Swaziland exports to South Africa falls as incomes rise. This is to be expected given the nature of goods that Swaziland exports, viz; soft drink concentrates, sugar, wood pulp, citrus, and canned fruit. Furthermore, South Africa trades mainly with Europe, which accounts for almost half of the countryôs trade, UK, and Germany

Assuming that monetary policy for the entire area is de facto set in South Africa, I estimate a monetary policy rule for South Africa which, in effect applies to the whole area. The instrument of monetary policy is adjusted based on its past value, deviation of inflation from target, the output gap, and the exchange rate. The parameter on the lagged policy instrument is high at 0.85 reflecting high persistence, which is in line with the literature. According to Clarida et al. (1999) and (2000) most central banks will engage in interest rate smoothing to prevent unexpected reactions by the financial sector. Smoothing can also induce history dependence in monetary policy process, which assists monetary authorities to infer economic agentsô inflation expectations.

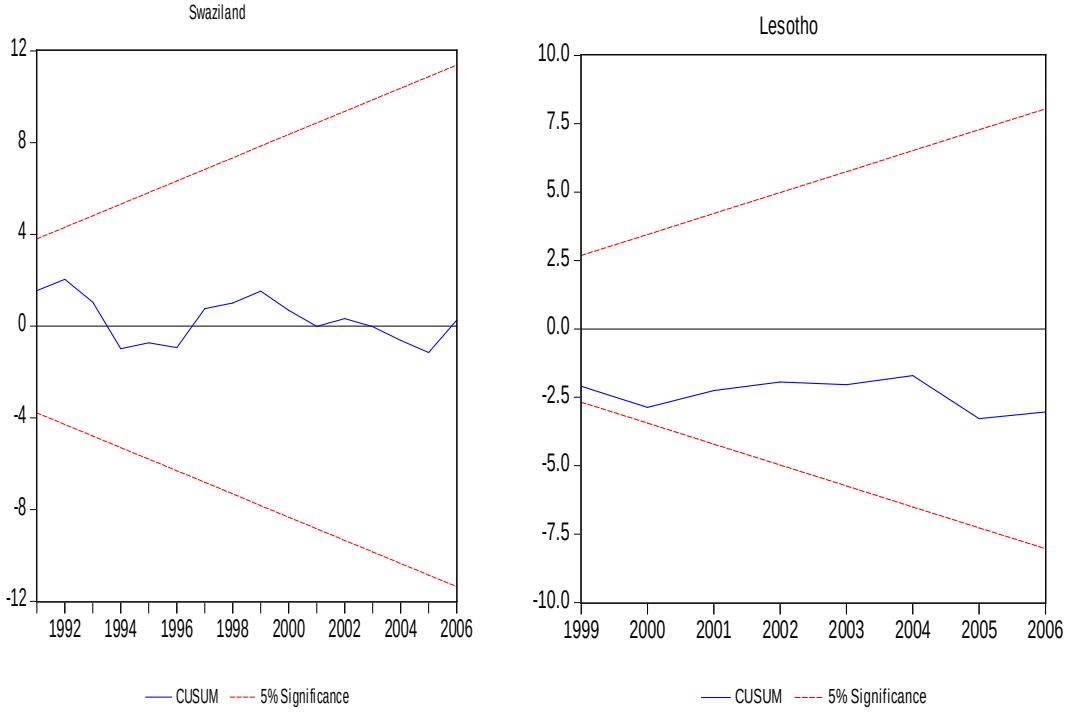
The coefficient on the deviation of inflation from target is as expected greater than the output gap coefficient. This supports the South African Reserve Bankôs inflation targeting framework. The real exchange rate is meant to capture the openness of the economy but is found to be insignificant. However, Ball (1999), Taylor (2001), Svensson (2002), and Berg et al. (2006), found that adding the exchange rate in the monetary rule usually makes little difference. They believe that it does not add any new information not already captured by the other variables. I use the model results to carry out simulations.

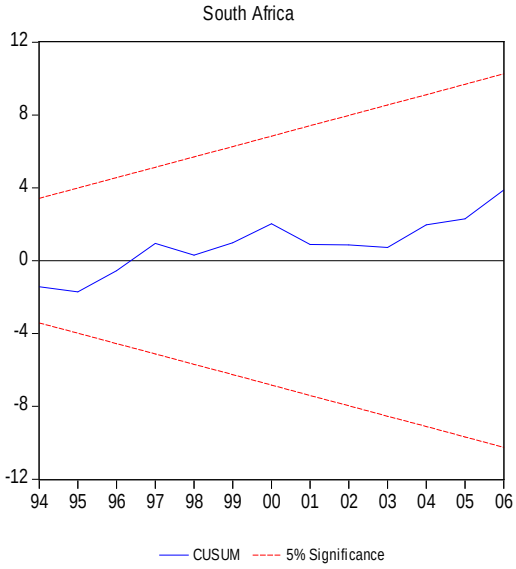
I also estimate specific monetary policy rules for the smaller countries based on their own variables. This is useful in assessing which of the rules would induce higher volatility. Lesotho displays even higher inflation inertia as it has a higher coefficient for the interest rate smoothing parameter. That of Swaziland is very close to that of South Africa. This could be explained by the fact that Swaziland tends to react much faster to interest rate adjustments in South Africa compared to Lesotho as indicated in their various central bank monetary policy statements. The coefficients for the output gap and the deviation of domestic inflation from the target rate are insignificant in both countries. This supports the results found for price setting behaviour in each of the smaller countries.

I examine if the parameters of the model are stable across a variety of sub-samples of the data using the CUSUM test. This test plots the cumulative sum of the recursive residuals together with the 5% critical lines. Parameter instability is likely to exist if the cumulative sum is outside the two critical lines. Figures display the tests for the three equations. Overall the results show that there is parameter stability for all the equations, except for the Swaziland inflation equation. For this equation the cumulative sum goes outside the critical lines at some point but it falls back within these lines again. It is more likely that the parameter instability is not serious.

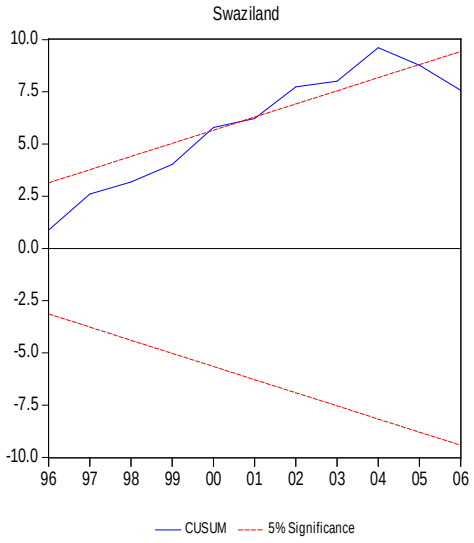
Figure 8 CUSUM Stability Tests

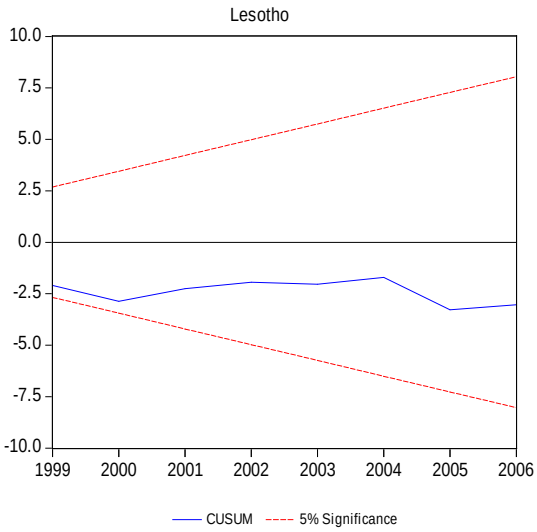
IS Curve equations



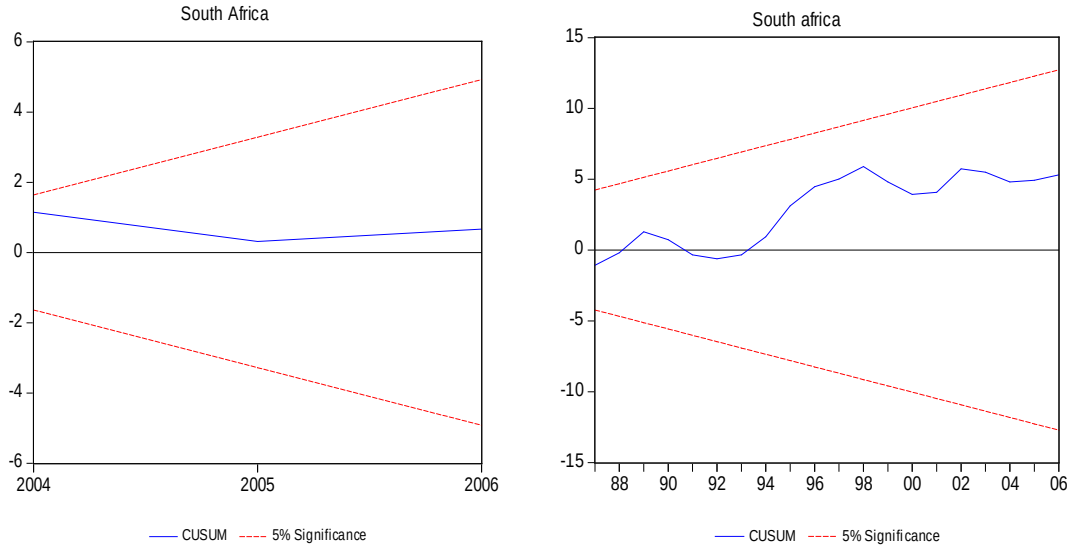


Inflation equations





Monetary rule equation



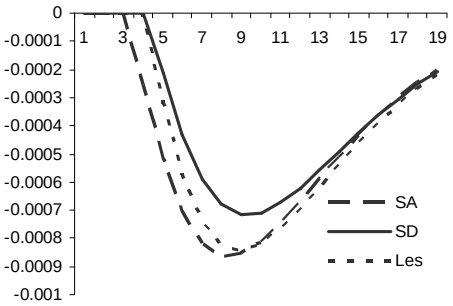
3.4 Simulation of results

3.4.1 Simulations under a single monetary policy rule

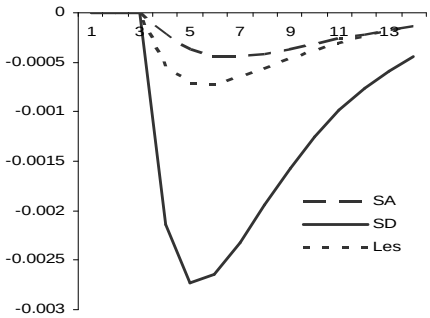
I simulate the model under two different scenarios in order to judge whether countries perform better under one monetary policy rule set by South Africa or when they set country specific monetary rules. In the model, CMA countries are linked through the goods market, price setting, and the interest rate equations. I simulate the model by subjecting it to positive 1% shocks, instituted by South Africa, to interest rate, and output.

Figure 9 Responses to a positive interest rate shock.

Inflation



Output



SA exchange rate

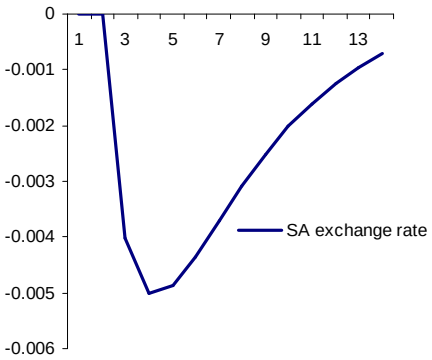


Figure 10 Responses to a positive output shock.

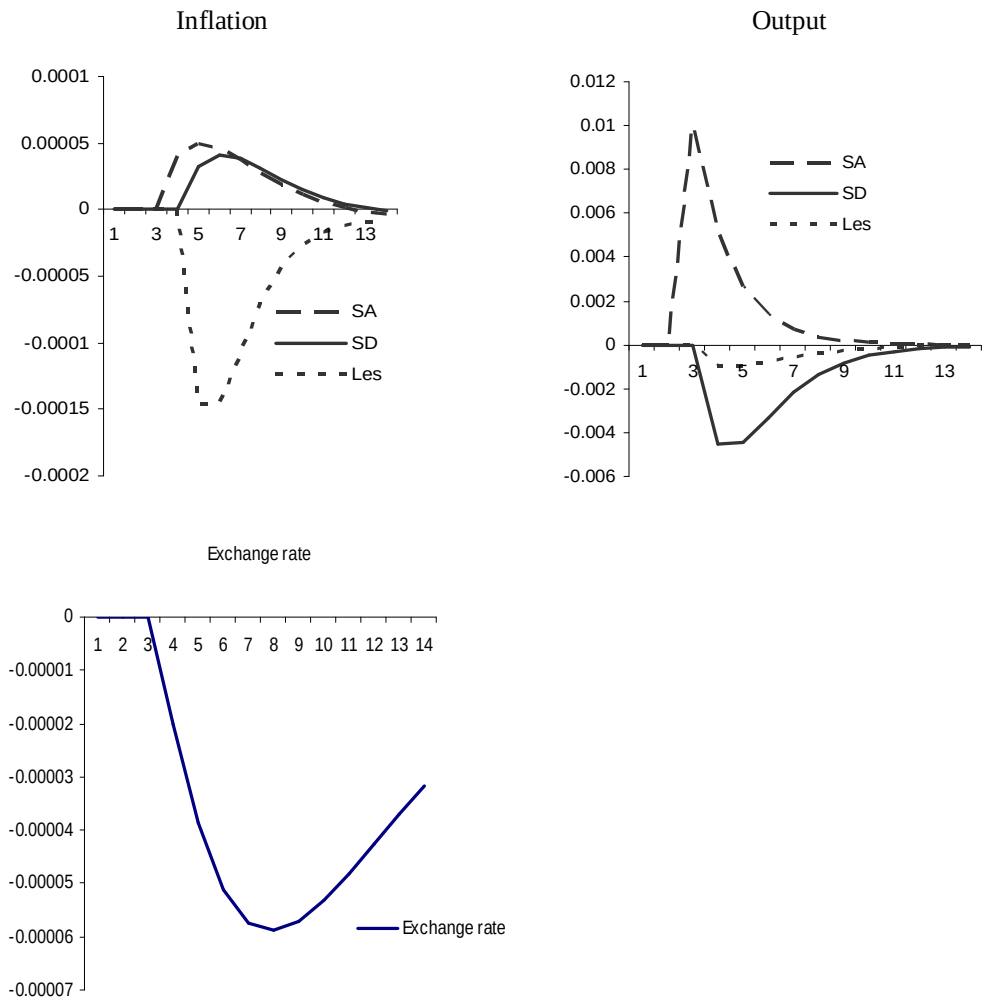


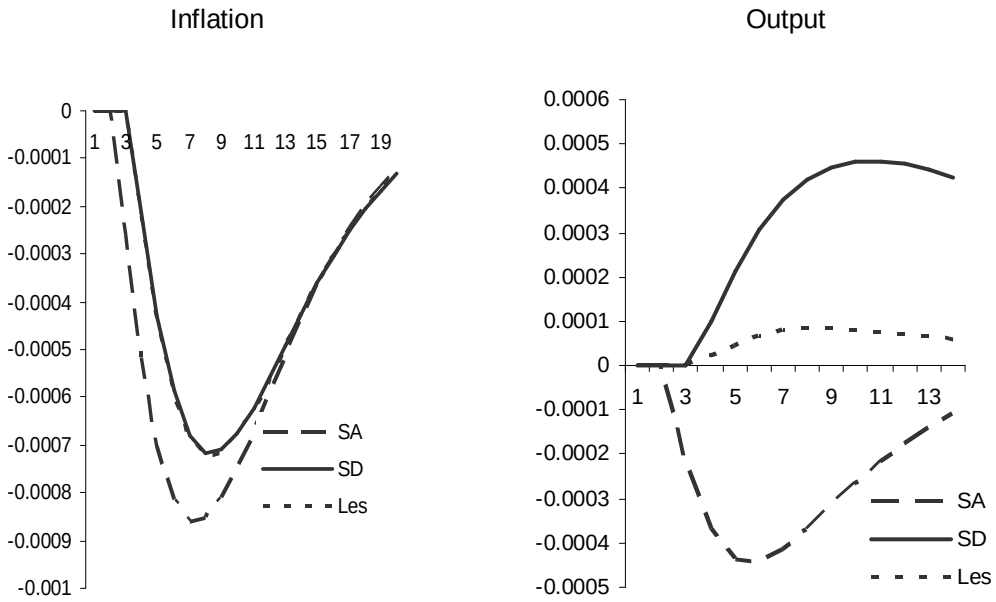
Figure 12 demonstrates how macroeconomic variables respond to a percentage shock to the nominal interest rate instituted by South Africa under the single monetary rule. In this case, the exchange rate is fixed among the countries and the interest rates are the same. Following the shock as theory predicts, both output and inflation fall in all the countries with Swaziland showing the largest drop in output. Additionally, on impact, the exchange rate appreciates then it depreciates gradually.

Figure 13 shows that following a percentage shock to output in South Africa, inflation in Swaziland and South Africa rises while it falls in Lesotho. This is supported by the bigger fall in output for Swaziland compared to that for Lesotho.

3.4.2 Simulations under different monetary policy rules

In this scenario, each country sets its own monetary policy based on domestic factors. The nominal interest rate is no longer the same in these countries, thus the exchange rate is allowed to vary across countries.

Figure 11 Responses to a positive interest rate shock



Exchange rate

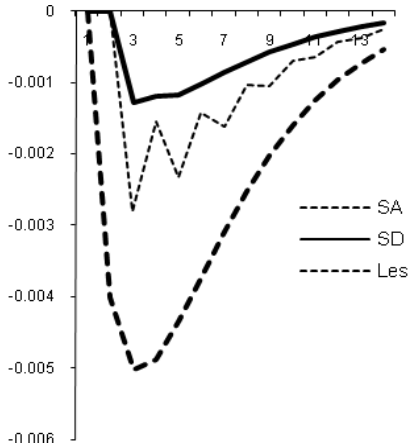
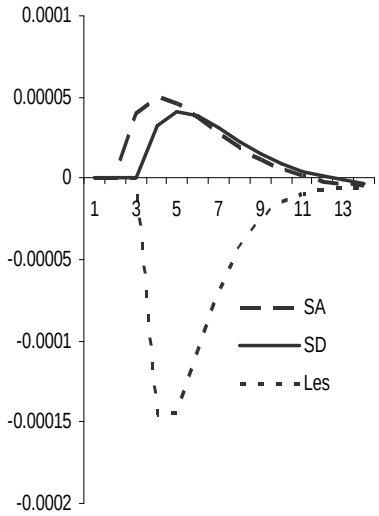
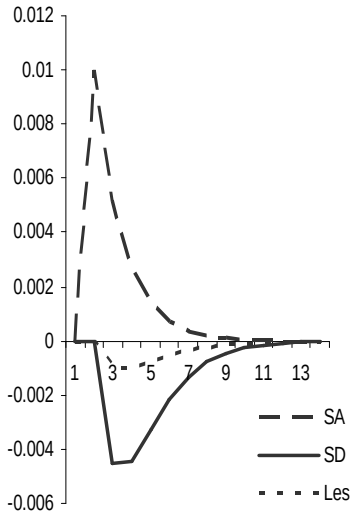


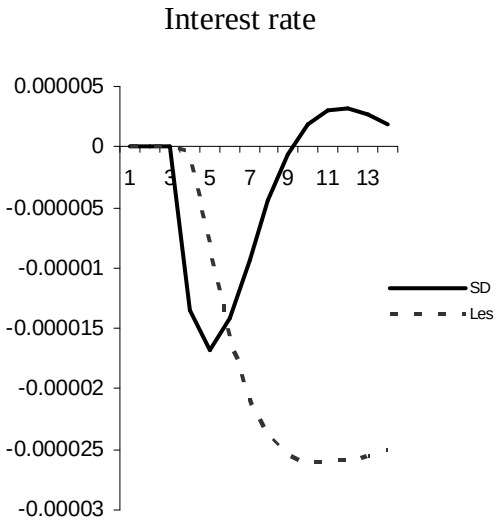
Figure 12 Responses to a positive output shock

Inflation



Output





Under the different monetary policy rules, figure 14 shows that a positive percentage shock to the nominal interest rate in South Africa induces a fall in inflation in all countries. Compared to the simulation under a single rule, inflation for the smaller countries moves very close together. The interest rate falls in the smaller countries and output rises in the smaller countries while it falls in South Africa. Under a single rule output falls for all countries. The exchange rate appreciates at first then it depreciates back to original level overtime. Lesotho early on shows some fluctuations in the exchange rate. It is important to note that output in Swaziland takes time to converge back. This could be attributable to the fact that Swaziland exports over 60% to South Africa, whereas Lesotho exports much less. Swaziland is likely to be hit harder by the contractionary monetary policy and may take a longer to adjust.

Figure 15 shows that under country specific rules a positive output shock is followed by a fall in inflation in Lesotho and a rise in Swaziland and South Africa. Interest rates rise in South Africa while in Swaziland it falls and only rises overtime. In Lesotho it falls for a longer period before it begins to rise towards its equilibrium value. This could be explained by the fact noted earlier that interest rates in Lesotho are adjusted slowly compared to Swaziland as a way to try and protect the economy from the negative effects that could arise from changes in

the interest rate. To judge the appropriateness of each rule I compute macro-volatilities from the simulation results.

3.5 Macro-volatility under different monetary policy rules

In order to assess if smaller countries perform better under a single or country specific monetary rules I compute volatilities for the macroeconomic variables in the model by taking the standard deviation of the variables. I employ the following formula:

$$\sigma^2 = \sqrt{1/n\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad (12)$$

Where: n is the sample size, x is the macroeconomic variable.

I then compute volatility ratios based on the volatilities computed using eq.(12). I take volatilities under one rule divided by volatilities under different rules. If the ratio is greater than 1, it means that using one monetary policy rule relatively, produces more volatility in macroeconomic variables as opposed to countries facing different country specific monetary rules. If the ratio is below 1, it means that country specific rules would produce more volatility.

Table 21 Macro volatility ratios under different policy rules

Variables	Years	Volatility ratios		
		Lesotho	South Africa	Swaziland
Interest shock				
Output	5	13.7	1	12.8
	10	7.8	1	5.6
Inflation	5	1.25	1	1
	10	1.17	1	1
Exchange	5	2.5	1	5
	10	2.1	1	4.4

Output shock				
Output	5	0.66	1	0.68
	10	0.65	1	0.67
Inflation	5	0.68	1	0.63
	10	0.68	1	0.58

Note: Volatility ratio=volatility under same rule/ volatility under country specific rules

Table 21 shows volatilities of macro-variables following a positive percentage shock to the nominal interest rate, and output. From the results, the volatility ratios following an interest rate shock show that using the same rule induces more volatility especially on output. This is indication that the smaller members are likely to face costs associated with the use of one monetary policy. However, following an output shock the volatility ratios show that country specific rules are likely to induce relatively more volatility.

Based on the foregoing, a move by the CMA to form a fully-fledged monetary union has to be designed in such a way that could reduce the costs usually associated with the loss of monetary policy autonomy particularly for the smaller countries. The move could give the smaller members a say in the formation of monetary policy in the area so that the likely asymmetric shocks are recognised. This is because in a monetary union, there would be an independent central bank which would form monetary policy with a focus on the whole area. Over and above that in a monetary union some adjustment mechanisms are put in place to cushion countries against asymmetric shocks. These could be in the form of fiscal transfers to bail out affected countries and flexibility in labour markets to allow free movement of labour in the area.

3.6 Conclusion

In this chapter I used a macroeconomic model to capture the transmission of monetary policy shocks in the CMA. The model consists of four equations namely: the Phillips curve, IS curve, exchange rate and a monetary policy rule.

To assess the transmission of monetary shocks I linked the countries via the goods market, price setting, and the monetary policy instrument. I specified a monetary policy rule, which describes monetary policy in the area. To gauge if this monetary rule is appropriate for the whole area, I estimated country specific rules for the smaller countries. Comparing simulations of the model under the two sets of rules helped to evaluate the volatilities under the two sets of rules.

Empirical evidence from the model confirmed that inflation processes are different in the area with that of the smaller countries largely driven by that of South Africa. Output in the smaller countries is negatively related to that of South Africa. I found that including the exchange rate in the monetary policy rule makes very little difference to the equation parameters, a result that is found by other similar studies such as Ball (1999), Taylor (2001), and Svensson (2002). Simulations of the model under the two monetary policy rules showed that the appropriateness of a single rule depends on the nature of shocks. This means that a move towards a fully-fledged monetary union must take into account the likely presence of some asymmetric shocks in the CMA. The existence of these shocks suggests the need to put in place alternative adjustment mechanisms to assist countries and also ensure the continued existence of the monetary union. These could include fiscal transfers and capital and labour market flexibilities.

In the recent past, the smaller members have been pushing the dominant partner to modify the CMA in an effort to enable them to have an input in monetary policy setting. Members have also continued to discuss the possibility of transforming the current arrangement to become a fully-fledged monetary union. The empirical evidence shows that the costs of such a move are unlikely to be large

Chapter 4

Monetary Policy Shocks in the CMA: A Structural VAR Approach

4.1. Introduction

In this chapter I present a widely used technique to analyse monetary policy impact on an economy, the structural VAR approach. This technique allows transformation of the reduced-form VAR model into a system of structural equations using economic theory. Further, the impulse responses and variance decompositions derived from this technique are given structural interpretations. Stock and Watson (2001) point out that the structural VAR uses economic theory to sort out the contemporaneous links among variables.

The VAR is useful in determining how well the theoretical model fits the data for the countries in the CMA. It indicates if the restrictions implied by the model are valid. It is also helpful in determining if there are other channels through which the economies are linked that are not captured by the model. The model links the countries via the aggregate demand, inflation and the interest rate equations.

Initially the VAR approach was developed by Sims (1980) and has been widely used and modified. Interest in this approach among economists grew because there was continued disagreement on the true nature of structures of economies versus what was implied in the atheoretical VAR analysis. Many believed this approach could bring out some crucial dynamic characteristics of the economy without imposing any restrictions implied by certain economic theory.

This led to the development of the structural VAR approach by Blanchard and Watson (1984), Bernanke (1986) and Sousa and Zaghini (2006), among others. They identify two advantages of using this approach. One is that it can be used to model non-recursive structures of the economy with a parsimonious set of

variables. It also enables the interpretation of the contemporaneous correlations among disturbances. Bernanke (1986) argues that the structural VAR differs from the standard VAR by Sims (1980), in that it orthogonalizes the estimated VAR residuals into the true underlying structural disturbances. The standard VAR uses the standard Choleski decomposition to obtain the residuals which, he argues, implies a certain specific underlying structure of the economy

According to Bernanke et al. (2004), structural VARs though widely used to analyse monetary policy actions on the economy, encounter some problems due to the limited information they use. Measurement of policy innovations is tainted when there appears to be information known to policymakers and private agents, but not incorporated in the VAR. It has been argued in the literature that the use of limited information is responsible for the observed price and exchange rate puzzles in the analysis of monetary policy effects on the economy. Further, only impulse responses for included variables are observed, yet policymakers, private agents and researchers are interested in a whole spectrum of variables not captured in VAR analysis.

Moreover they point out that different identification of monetary policy shocks lead to different inferences regarding the shape and timing of variable responses. According to Kuttner and Mosser (2002), the VAR approach deals with unanticipated changes in monetary policy and not anticipated changes yet these in the literature are found to be important. It is due to these shortcomings that this study will only use VAR as a robust check on how well the data fits the model specified earlier.

Regardless of its shortcomings the VAR approach remains very useful. I use it to ascertain the fit of the theoretical model. The VAR system I use contains the following variables: inflation rate, output gap, nominal interest rate and the exchange rate. It is informed by the theoretical model which provides a simplified description of the economy which captures the essential variables for the

analysis of monetary policy. The identification restrictions are also informed by the theoretical model developed earlier. The impact of unanticipated policy shocks on other economic variables is analyzed using impulse response functions.

The principal finding is that a contractionary monetary policy shock results in a fall in output and an appreciation of the exchange rate on impact. Contrary to economic theory, inflation in South Africa and Lesotho rises on impact. This price puzzle has been found in a number of studies including Sims (1992), Leeper et al. (1996) and Christiano et al. (1998). Various ways have been used to correct for this such as, including current and lagged commodity prices, exchange rates, import price index and monetary aggregates in the VAR system. Such variables capture information about future inflation which is known to monetary authorities. Ravenna and Walsh (2004) put forward that the price puzzle can be explained using the cost channel of monetary policy transmission. In this study I included the exchange rate but the results did not change much. However, the price puzzle is not so pronounced and prolonged which is in line with previous studies.

The remainder of the chapter is organised as follows: Section 4.2 describes the specification of the VAR followed by section 4.3, which details the identification scheme for the VAR. Section 4.4 presents the results and section 4 concludes.

4.2 Specification of the VAR approach

4.2.1 Generalities about VAR

A VAR is often used for forecasting systems of interconnected time series and examine the dynamic impact of unsystematic disturbances on the system of variables. According to Sims (1980), Blanchard and Watson (1984), Bernanke (1986) and Boivin and Giannoni (2002) formally a reduced form VAR is a system of equations that can be represented in matrix form as follows:

$$Y_t = a + A_1 Y_{t-1} + ... + A_k Y_{t-k} + u_t \quad (13)$$

In eq. (1) the vector Y_t as specified below in matrix form in this study consists of four variables. There are three macroeconomic variables namely output gap, exchange rate and the price level. These are the variables the study is focussed on. There is then the policy variable, the interest rate, which details the reaction function of the monetary authorities. All these are based on the equations specified earlier in the structural model. The vector of innovations or impulses u_t includes supply, and demand disturbances as well as shocks in monetary policy. The evolution of this vector Y_t depends on stochastic shocks denoted by u_t plus a systematic component denoted by $a + A_1 Y_{t-1} + ... + A_k Y_{t-k}$ which captures the propagation of shocks throughout the economy.

The vector of constants denoted by a and $A_1,...,A_k$ are matrices of coefficients that can be obtained by applying ordinary least squares (OLS) separately to each part of equation (1). They capture the propagation mechanism of the economy and are allowed to be different from zero to allow each of the structural disturbances to affect all the variables in Y_t. In other words this matrix, Blanchard and Watson (1984) argue, typify the contemporaneous relations between variables. u_t is a vector of shocks which Bernanke (1986) refers to as primitive exogenous forces because they do not have a common cause and are not directly observable by the analysts. As such these shocks are contemporaneously uncorrelated with mean zero. The variance-covariance matrix of this vector is given as:

$$\mathrm{E}(u_t u_t^{'}) = \sum_u \quad (14)$$

It is a diagonal matrix. The estimate of $\sum_u$ is the sample covariance matrix of the OLS residuals. Following Blanchard and Watson (1984) and Bernanke (1986) to attain identification restrictions are imposed on the vector $A_1,...,A_k$ using the theoretical model and the covariance matrix of the structural disturbances is presumed to be diagonal.

4.2.2 Specification of the VAR

I specify a structural VAR system in matrix form. I examine the behaviour of inflation, output, interest rate and the exchange rate in the CMA. The VAR specification is based on the macroeconomic model developed earlier, the economy is characterised by a set of four equations; a Phillips curve, aggregate demand, exchange rate and monetary rule. The VAR system presents a very basic account of the economy but it contains the necessary variables vital for the analysis of monetary policy. This is in line with most studies using the structural VAR approach such Blanchard and Watson (1984) and most studies done for the Euro area, such as Kim and Roubini (2000), Mojon and Peersman (2001), Peersman and Smets (2001), and a study on New Zealand by Buckle et al. (2003).

The system for the smaller countries is extended with variables from South Africa reflecting the dependence of the smaller members on developments in South Africa. The model on which this VAR is based links the countries via the aggregate demand, inflation and the interest rate equations. This is in line with Kakes et al. (1998)and Dungey and Fry (2000) who argue that small open economies are affected by developments from abroad hence their VAR systems ought to be augmented with foreign variables. A number of techniques are used to ensure that the VAR is identified. However, I use restrictions implied by the theoretical model to achieve identification.

$$\begin{bmatrix} \Delta p_t \\ y_t \\ i_t \\ e_t \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 & 4 & 0 & 0 & 0 \\ 1 & 2 & 3 & 4 & 0 & 0 & 0 \\ 1 & 2 & 3 & 4 & 0 & 0 & 0 \\ 1 & 2 & 3 & 4 & 0 & 0 & 0 \end{bmatrix} + \begin{bmatrix} \mu_{spt} \\ \mu_{syt} \\ \mu_{sit} \\ \mu_{set} \end{bmatrix} \quad (15)$$

$$\begin{bmatrix} \Delta p_{jt} \\ y_{jt} \\ i_{jt} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 5 & 6 & 7 \\ 0 & 2 & 0 & 0 & 5 & 6 & 7 \\ 0 & 0 & 3 & 0 & 5 & 6 & 7 \end{bmatrix} + \begin{bmatrix} \mu_{pjt} \\ \mu_{yjt} \\ \mu_{ijt} \end{bmatrix} \quad (16)$$

The subscript j and 5 to 7 refers to the block of variables for each of the smaller members. In the matrices 1 to 4 refers to the South African block of variables and the rest refers to variables for the smaller countries. The system contains four variables namely: Δp is the inflation rate, y is the output gap, i is the nominal interest rate and e is the real exchange rate. Each variable is explained by a structural equation that has an error term. The error terms, shown in the matrix, are labelled according to the structural equations from which they derive. The vector of shocks is denoted by μ_t. Bernanke (1986) refers to the shocks as primitive exogenous forces because they do not have a common cause and are not directly observable by analysts. As such these shocks are contemporaneously uncorrelated with mean zero. The variance-covariance matrix of this vector is given as:

$$\mathrm{E}(u_t u_t^{'}) = \sum_u \quad (17)$$

It is a diagonal matrix. The estimate of $\sum_u$ is the sample covariance matrix of the OLS residuals. Following Blanchard and Watson (1984), Bernanke (1986), and Blanchard (1989), to attain identification, restrictions are imposed using the theoretical model and the covariance matrix of the structural disturbances is presumed to be diagonal.

4.3 Identification Scheme

In the literature several standard identification schemes are used to analyse the impact of unanticipated changes in monetary policy on main macroeconomic variables. Sims (1980), Mojon and Peersman (2001), and Peersman and Smets (2001) among others, use the standard Cholesky decomposition to orthogonalize the reduced form disturbances. This approach to identification assumes that the true economic model is recursive. Other authors such as, Blanchard and Watson (1984) Bernanke (1986), suggested a generalised method, the structural VAR, with non-recursive contemporaneous restrictions. I follow the latter method to recover the parameters in the structural equations from the estimated reduced form equations.

The set of identifying restrictions I use are derived from the theoretical model specified earlier. Similar to Cushman and Zha (1997), Zha (1999), Mojon and Peersman (2001), and Bhuiyani (2008) for the smaller countries South African variables are taken as exogenous which follows from the small country versus large country assumption. These exogenous variables are allowed to have a contemporaneous impact on the endogenous variables in the VAR system. The inflation rate in South Africa has an influence on that of the smaller countries. Also, output in South Africa influences output in the smaller countries. This is because of the strong trade links among CMA countries, as the smaller countries import over 80% from South Africa and Swaziland even exports about 60% to South Africa. Furthermore, the exchange rate is fixed within the CMA as currencies of the smaller countries are at par with the rand. The monetary rule pursued by South Africa is assumed to apply to the whole area.

Following recent literature I use the nominal interest rate as an instrument of monetary policy. This is also in line with the inflation targeting framework followed by the South African Reserve bank. The bank manipulates the nominal interest rate to achieve its target inflation range of 3-6%. The framework de facto applies

to the entire CMA due to the fact that currencies of the smaller countries are at par with the rand. I set out the monetary policy rule as a function of the lag of the nominal interest rate to allow for interest rate smoothing, deviation of inflation from target, output gap, and the exchange rate. According to Kim and Roubini (2000), the exchange rate in the monetary policy feedback rule captures the fact that some countries will be concerned about the consequences of their currency depreciation on their inflation rates.

4.4. VAR Estimation Results

This section presents the data I use in the VAR system. I also present the estimated VAR model results as well as the impulse responses, which according to Blanchard (1989) show the dynamic reaction of the endogenous variables to structural shocks

4.4.1 Data description and properties

I use annual data from 1975-2006 sourced mainly from the WDI and IFS. Following Blanchard (1989) the variables in the system are specified in levels and first differences which is informed by the specification of the macroeconomic model. The variables in the system are stationary. According to Stock and Watson (2001) the lag length is usually determined using the Akaike information criteria or the Bayes information criteria in the literature. I use one lag due to the fact that I use annual data. These variables are: logarithm of the GDP deflator (first difference) Δp_t, output gap which is GDP (detrended using HP filter) y_t, the real exchange rate gap (expressed as LCU per US$) e_t, and i_t is the lending (nominal) interest rate.

Following standard practice in VAR analysis I run Granger causality tests, which according to Stock and Watson (2001), examine whether lagged values of one variable assist to predict another variable.

Table 22 Granger Causality tests

	Dependent Variables		
Regressors	Δp_t	y_t	i_t
South Africa			
SA Inflation			0.06
SA Interest rate	0.05	0.003	
Les Inflation	0.02		
SD Output	0.08		0.003
SD Interest rate	0.05	0.01	0.0002
Swaziland			
SA Output	0.04		
Les Inflation	0.07	0.09	
SA Inflation		0.03	
SA Exchange rate		0.06	
SA Interest rate			0.03
Lesotho			
SA Inflation	0.0007		
SA Output		0.004	0.06
SA Exchange rate			0.02
SA Interest rate			0.00
Les Output	0.07		
SD Output		0.04	
Les Interest rate		0.007	

Note: Les=Lesotho, SA=South Africa and SD= Swaziland. All variables were found to be insignificant in predicting the exchange rate hence; it is not reported in table 1.

In table 22 I present the Granger-causality results where I report p-values related to the F-statistics for testing whether the relevant sets of coefficients are zero. I present results for those variables found to be significant at the conventional significance levels. I find that the South African interest rate, Lesotho inflation, Swaziland output and interest rates help to predict inflation in South Africa. Inflation in South Africa as well as output in Lesotho assists in forecasting inflation in Lesotho. Lesotho inflation as well as output in South Africa is instrumental in predicting inflation in Swaziland. This finding supports the earlier

finding that inflation in South Africa drives inflation in the smaller countries of the CMA.

Interest rates in South Africa and Swaziland facilitate prediction of output in South Africa. Lagged values of Lesotho and South Africa inflation as well as the exchange rate help predict output in Swaziland. To forecast Lesotho output lagged values of South Africa output, Swaziland output and the interest rate in Lesotho are helpful. Lastly, I find that interest rate in South Africa is helpful in predicting interest rates in the smaller countries. This behaviour of interest rates as well as inflation in the area supports the nominal convergence established earlier for the CMA.

I also present variance decompositions in table 23. Stock and Watson (2001) point out that variance decomposition indicate the percentage of the variance of the error in forecasting the variables in the VAR system due to specific shocks. Using structural factorization, the results in table imply substantial interaction amongst the variables. The results show that roughly 33% and 67% of the error in the forecast of inflation in South Africa is attributed to shocks in the other variables in the structural VAR in period 2 and 10 respectively. Approximately 28% and 43% of the error in the inflation forecast in Lesotho is due to shocks in the rest of the variables in the system. This is similar to what obtains in the inflation forecast in Swaziland.

Table 23 Variance Decompositions

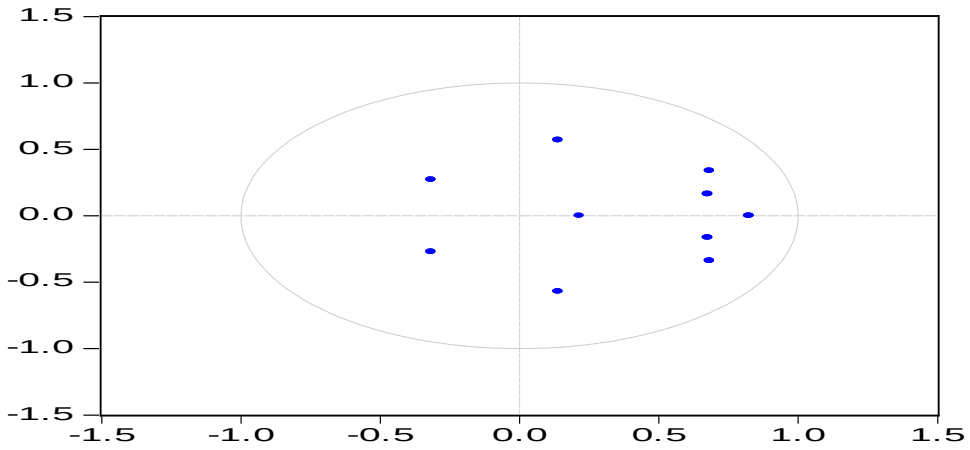
Forecast horizon	Standard error	Variance decomposition (percentage points)									
Shocks		1	2	3	4	5	6	7	8	9	10
South Africa											
Inflation											
1	0.027	100	0	0	0	0	0	0	0	0	0
5	0.042	44.3	2.8	12.7	1.9	12.2	1.3	3.5	0.4	5.1	15.9
10	0.049	33.4	9.5	14.6	2.3	9.1	1.2	3.4	0.3	6.0	20.2
Output											
1	1.499	0.7	99.3	0	0	0	0	0	0	0	0
5	2.690	6.9	47.2	1.5	17.2	2.7	1.5	0.3	0.9	6.0	15.8
10	2.874	9.2	44.8	2.1	15.7	3.9	1.4	0.5	0.9	6.1	15.4
Exchange rate											
1	0.859	9.7	1.7	88.6	0	0	0	0	0	0	0
5	1.393	3.8	10.8	59.1	0.1	2.2	0.5	3.8	0.2	0.2	19.2
10	1.551	3.1	11.5	50.7	0.1	2.2	1.2	4.7	0.3	0.2	25.8
Interest rate											
1	0.020	0.6	4.2	9.8	85.5	0	0	0	0	0	0
5	0 043	8.4	18.8	5.0	30.3	3.5	0.5	0.4	1.9	4.2	27.2
10	0.046	7.6	19.4	7.5	27.0	3.4	0.5	1.1	1.7	4.1	27.7
Lesotho											

Inflation											
1	0.052	30.5	0	0	0	69.5	0	0	0	0	0
5	0.072	19.9	2.5	2.1	0.2	60.4	3.2	1.5	0.2	0.9	9.0
10	0.075	18.8	3.7	2.9	0.3	56.9	3.1	1.6	0.2	1.0	11.4
Output											
1	3.556	3.9	5.4	0	0	7.3	83.4	0	0	0	0
5	5.605	12.9	18.0	1.1	1.5	7.7	37.4	3.9	1.4	8.9	7.1
10	6.156	12.3	18.2	3.2	4.1	7.4	31.4	3.4	1.3	11.7	7.2
Interest rate											
1	0.009	0.5	0	0.3	2.9	1.7	1.3	93.3	0	0	0
5	0.039	7.5	28.0	5.6	18.1	3.3	0.3	6.5	0.8	6.4	23.5
10	0.040	7.9	27.7	6.0	17.6	3.6	0.5	6.3	0.8	6.3	23.2
Swaziland											
Inflation											
1	0.043	2.4	0	0	0	0	0	0	97.6	0	0
5	0.059	2.4	1.6	0.8	2.8	23.4	1.0	1.6	57.0	3.5	5.7
10	0.060	2.8	1.9	0.9	2.9	23.3	1.1	1.6	56.1	3.8	5.7
Output											
1	2.601	0.1	36.0	0	0	0	0	0	2.4	61.5	0
5	4.206	4.3	18.3	9.7	0.2	10.3	0.8	0.9	2.4	46.5	6.7
10	4.321	4.4	18.4	11.5	0.2	9.9	0.8	0.9	2.3	44.8	6.6
Interest rate											

1	0.022	0.1	1.3	5.9	51.5	0	0	0	3.6	0.3	37.3
5	0.037	3.7	8.8	5.6	23.5	0.7	0.6	1.6	4.7	0.6	50.2
10	0.039	3.6	10.0	8.1	21.7	0.9	0.6	1.9	4.3	0.8	48.2

Finally, figure 13 shows the inverse roots of the characteristic AR polynomial. It shows that the estimated VAR is stable. This is because all the roots have modulus below one and lie inside the unit circle.

Figure 13 AR Roots



The number of roots is given by the number of endogenous variables multiplied by the largest lag. This means that there are ten roots as there are ten endogenous variables and one lag. The stationarity of the VAR means that the estimated results, such as the impulse standard errors, are well-founded.
I have established that the estimated VAR results are appropriate. I now present the impulse response functions

4.4.2 Impulse responses

Impulse response functions provide the dynamic response of the endogenous variables to innovations in the structural disturbances. Each figure provides point estimates and one standard deviation bands. The confidence intervals for the impulse response functions are generated using various methods in the literature such as the analytical and Monte Carlo, and bootstrap after bootstrap approaches. I use the analytic asymptotic method. I focus on how demand

shocks and interest rate shocks from South Africa affect variables of the smaller countries.

From figure 14, following a one-standard-deviation contractionary interest rate shock, output falls immediately in South Africa and Swaziland. In Lesotho, output rises on impact and falls after sometime. Inflation in South Africa and Swaziland rises on impact until period 3 and then starts to fall. In Lesotho inflation falls marginally on impact. The exchange rate appreciates on impact and depreciates gradually back to its initial level.

Traditional theory predicts that a contractionary monetary policy shock leads to a fall in both output and inflation. However, figure 1 shows that inflation in South Africa and Swaziland increases initially and then falls following this shock. The rise in the price level following a contractionary monetary policy is referred to as the price puzzle in the literature. According to Sims (1992), Balke and Emery (1994) and Christiano et al. (1998), possible explanations for the price puzzle are that monetary authorities react to expected higher future inflation and supply shocks by increasing the policy interest rate. However, they assert that the interest rate increase falls short to offset the inflationary consequences. The VAR system, they claim, tends to lack information on future inflation which would be known to the policymakers.

Barth and Ramey (2001) and Ravenna and Walsh (2004) identify a cost channel of monetary policy transmission. This channel, they argue, is another possible explanation of the price puzzle. It exists if firmsô marginal costs depend on the nominal interest rate. Following a contractionary monetary policy shock the firmsô marginal costs rise and in the very short run leads to increased prices which eventually falls as aggregate demand decreases.

Figure 14: Impulse responses due to interest rate shock from South Africa

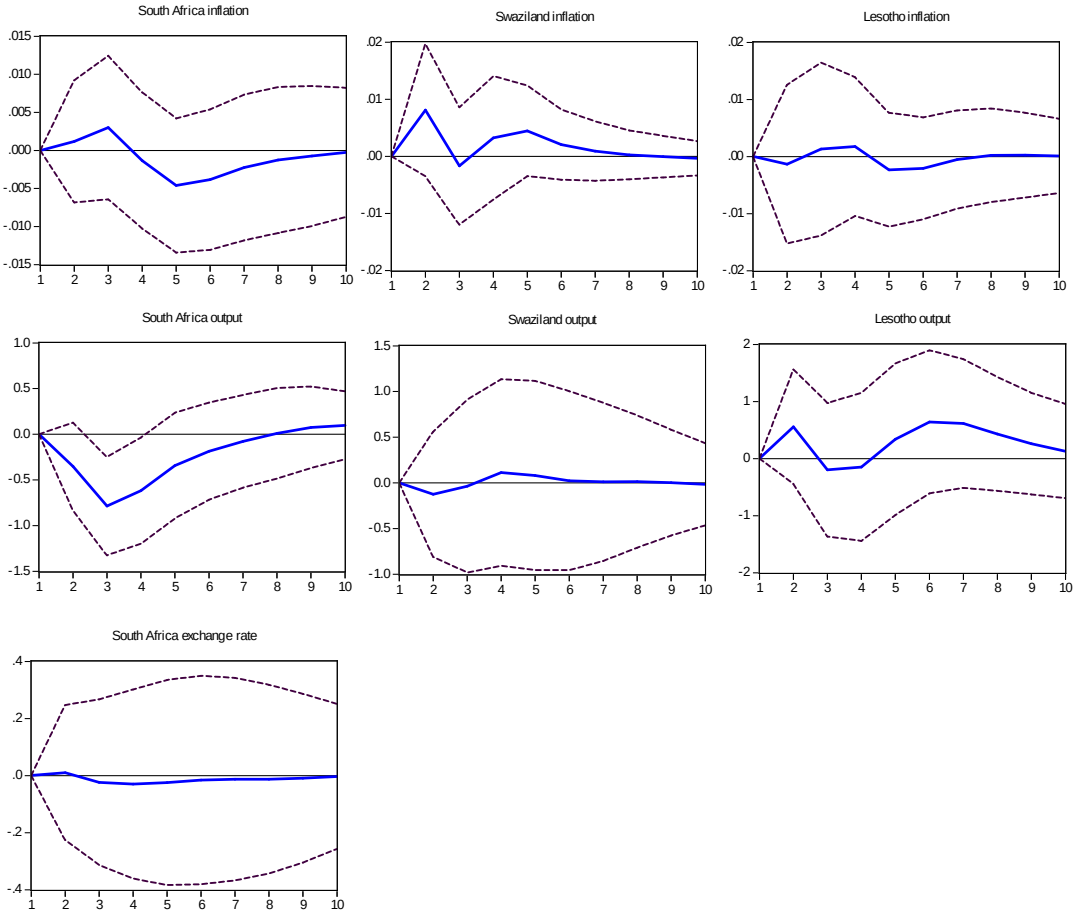
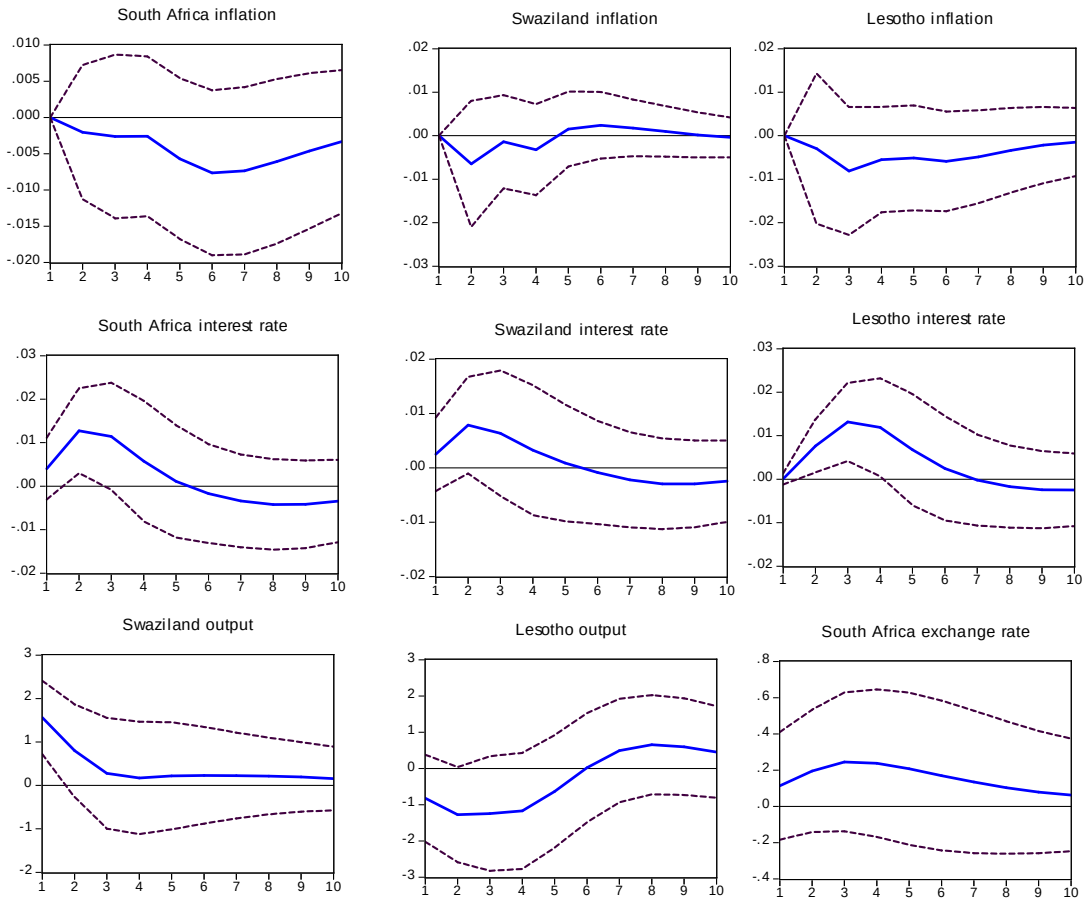


Figure 15 Impulse responses due to output shock from South Africa



Following an output shock, as shown in figure 15, inflation falls gradually in all countries on impact. Interest rate rises for all countries and output in the smaller countries decreases. Following Dungey and Fry (2000)ôs findings in their multi-country structural VAR model, the behaviour of output in the smaller countries can be explained by their trade relations. They found that Japan, the bigger country, imports a lot from Australia, the smaller country. This meant that a rise in Japan output would lead to a rise in Australian output. Swaziland and Lesotho rely heavily on South African imports. A rise in demand in South Africa is likely to lead to a fall in output of the smaller countries. The exchange rate depreciates on impact and appreciates gradually to initial level.

4.5 Conclusion

This chapter used a structural VAR approach to analyse the effects of monetary policy shocks on the economies of the CMA countries. The VAR system and the identification restrictions are informed by the theoretical model developed earlier. In the VAR system variables of the dominant partner, South Africa, influence those of the smaller countries and not the other way. I chose one lag structure for the VAR since I used the same annual data from the macro-model. The VAR results were useful in providing a robustness check on how well the theoretical model fits the data. I generated impulse response functions by subjecting the system to interest rate and output shocks.

The results from the VAR generally compare well with those from the theoretical model. However, the results show that contrary to traditional economic theory, a contractionary monetary policy leads to a rise in prices. Studies by Barth and Ramey (2001) and Ravenna and Walsh (2004) and others have proposed that most of the research on the transmission of monetary policy shocks have concentrated mainly on the demand side. This means that important supply-side or cost-side monetary policy effects have not been explored. These studies argue that the empirical puzzles usually observed in the transmission of monetary policy can possibly be explained by these supply side effects.

Chapter 5

Conclusion and Policy Recommendations

This study contributes to the discussions on monetary integration that has been at the forefront in economic policy discussion agendas mainly because of EMU the world over. In Africa one of the principles of NEPAD, the operational arm of the AU, is the acceleration of regional and continental integration so that Africa can act collectively in order to diminish marginalisation in the global economy. According to the Central Bank of Swaziland (2006) the AU has set a deadline that by 2025 Africa will have a common currency and central bank. This means that all existing regional economic communities must be enhanced so that they can act as springboards for the Africa wide integration. The CMA, the focus of this study, has been in existence for a long time and there has been some discussion changing it to a fully-fledged monetary union

The study examined the extent to which economies of the CMA are converging as well as the likelihood that they face asymmetric aggregate shocks. Macroeconomic convergence and asymmetric adjustments to shocks are critical issues as the CMA visualizes a move towards fully-fledged monetary union. Countries in the area show strong evidence of nominal convergence as shown by the behaviour of interest rates and inflation rates. This shows that the financial sectors in the area are integrated. Dispersions in per capita incomes have also been falling in the area overtime. This indicates that the smaller countries are somewhat trying to catch up with the larger dominant country, South Africa.

Based on presence of convergence in the area OCA literature indicate that countries are likely to derive more benefits from forming a fully-fledged monetary union. Empirical evidence supports the existence of asymmetric shocks in the area based on the low correlation of growth rates as well as the differences in the composition of exports. As business cycles will not be synchronised it would

mean that the use of a single monetary policy as a stabilisation tool would not be suitable for all countries as they will face different shocks. However, such a situation should not preclude CMA countries from forming a monetary union, but instead should indicate that there have to other adjustment mechanisms that will be used to bail out countries in the event they face dissimilar shocks. The differences in economic structures also require that other adjustment mechanisms are enacted because even similar shocks are likely to affect countries in differing ways. This could be in the form of fiscal transfers from a fund where all countries contribute or allowing labour and capital mobility in the area. Furthermore, it is indicated in some studies that countries may not meet the OCA criteria before they form a monetary union, but the criteria are endogenous and dynamic. This means that the benefits are likely to increase after forming the monetary union because economic, financial, legal, and institutional structures are likely to be augmented as the integration intensifies.

The economic structural augmentation and reform that could be enjoyed by member countries after forming the monetary union would be most beneficial for the smaller countries in the CMA whose economies face major challenges such as low economic activity. Success of the CMA monetary union would also be a stepping stone for the anticipated SADC wide monetary union. Empirical evidence from the study shows weak convergence and asynchronised business cycles in the SADC region. This has implications for the transmission of shocks in the region and should inform the formulation and implementation of a sustainable SADC wide monetary union.

The study formulated a macroeconomic model to capture the transmission of monetary policy shocks in the CMA using the four main equations namely; the Phillips curve, IS curve, exchange rate and a monetary policy rule. The VAR was estimated to check how well the theoretical model fitted the data. The results showed that volatilities due to the use of one rule as opposed to country specific rules were insignificant. This means that subjecting the countries to one

monetary policy rule would not be so costly especially for the smaller members so long as the presence of asymmetric shocks is acknowledged and provided for as alluded to above.

Based on the analysis the overall conclusion is that the monetary union is possible in the CMA. It is also likely, given the close relationships that these countries have had for a long time, that moving towards a fully-fledged monetary union would be less costly. However, the evident asymmetric shocks countries are likely to face suggest that the process needs to be phased in gradually. Firstly, there is a need to set clear convergence criteria that needs to be met and maintained by all members, especially on the fiscal policy side. Secondly, there is a need to introduce flexibility in the labour market in order to allow for alternative adjustment mechanisms to deal with asymmetric shocks. Thirdly, countries should consider setting up a common pool of reserves to assist those countries who might need assistance due to shocks that might have hit their economies. Lastly, there is a need to ensure political commitment and support for the process by all member countries in order to ensure sustainability of the monetary union.

The study did not apply the macroeconomic model to the SADC region in order to assess the transmission of monetary policy shocks in the region. This could indicate if a single monetary policy for the region would result in less or more economic volatilities. It could be useful to apply the model in SADC in order to inform discussions around the SADC wide monetary union. It can also be useful to find a precise way of enumerating the costs and benefits of being in the CMA, especially for the smaller members.

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Appendix 1

Table 22 Selected Average Economic Indicators for CMA Countries (2000-2009)

Indicators	Lesotho	Namibia	South Africa	Swaziland
Population (millions)	2.3	1.9	47	1.01
GDP, current prices (Billions US$)	1.2	6.5	211	2.2
GDP per capita. current prices (US$)	504.2	3285.1	4470.5	2185
GDP growth rate	3.3	4.5	3.6	2.3
Inflation, average consumer prices (% change)	7.3	7.4	6.1	7.6
Unemployment rate (as % of total labour force)	45	21	26	30

Source: World Economic Outlook, 2010 and World Development indicators 2010.