

On the feasibility of a monetary union in the Southern Africa Development Community

Terence D. Agbeyegbe*

Department of Economics
Hunter College and the Graduate Center, CUNY
695 Park Avenue,
New York, NY 10021
Email: tagbeyeg@hunter.cuny.edu

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Abstract

This paper investigates the feasibility of a monetary union in Southern Africa Development Community (SADC) by looking at evidence of nominal exchange rate and inflation convergence. Using a methodology based on estimating time varying parameters, the evidence suggests non-convergence. The non-convergence of nominal exchange rate and consumer price inflation suggests that presently, the chances of SADC member countries satisfying some form of Maastricht-type criteria is quite low.

Proposed running head: Inflation and Exchange Rate Convergence in SADC.

I. Introduction

The issue of currency union is attracting a lot of attention among economists and policy makers. Currency union arrangements typically take the form of a number of independent countries coming together to adopt a single currency. The attraction of joining currency union is supported by the claim that joining bring benefits such as lower transaction costs associated with trading goods and services between countries that use different currencies. Some recent examples of countries coming together to form currency union include the monetary unification of East and West Germany; the monetary unification of twelve countries in Europe that now use the euro and more soon to be, the declaration of six West African States-The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone to create a common currency, the eco, and a West African Monetary Zone (WAMZ). This research aims at assessing the feasibility of a monetary union in the Southern Africa Development Community (SADC). The SADC is a regional trade association which was created in 1979 by nine countries opposed to the regime in the Republic of South Africa.¹ In particular, it investigates to what extent a Maastricht-type convergence requirement can shed light on the feasibility of a monetary union in the SADC.

Although several papers have discussed regional integration issues in Africa in general and SADC in particular (see for example, the edited volume by Oyejide, Elbadawi and Collier (1997) and Iqbal and Khan (1998), only few papers discuss monetary integration issues in SADC.² Notable exception include Bayoumi and Ostry (1998), Guillaume and Stasavage (2000) and Sparks (2002). Using the general methodology in Bayoumi and Eichengreen (1994) which is based on analyzing both the size and correlation of real disturbances across countries and the level of intra-regional trade, Bayoumi and Ostry (1998) find little support for the creation of larger currency union in Southern Africa. Guillaume and Stasavage (2000) analyze the experience with monetary policy of countries that have participated in rule-based regional arrangements in Africa, namely: CFA Zone, East Africa Currency Board and for our purpose, Rand Monetary Area. They show that the African countries have generally lacked

¹There are currently fourteen members with the admission of South Africa and four other countries. The current members are Angola, Botswana, Democratic Republic of Congo (DRC), Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. A sub-group, Lesotho, Namibia, South Africa and Swaziland have a monetary union, the Common Monetary Area (CMA) also known as the Rand Zone.

²There are however papers dealing with economic issues relating directly to the Rand Monetary Area, see for example, Guma (1985).

the political institutions necessary for governments to commit credibly on an individual basis to financial stability. Given this, they argue that monetary unions can provide an alternative means of credible commitment to sound macroeconomic policies under certain conditions. Sparks (2002) deals directly with the issue of the future of monetary integration in Southern Africa. Using annual data covering mostly the 1995-1998 and focusing on six potential criteria that are essential for the feasibility of a monetary union, namely: currency exchange rate fluctuations, inflation rates, public debt as a percentage of GDP, foreign economic assistance per capita, foreign economic assistance as a percentage of GDP and trade, Sparks find evidence of convergence in at most two criteria. Based on this result Sparks concludes that unless there is more convergence, the chances for a successful monetary union are low.

Traditionally, the study of monetary integration suggests that members of regional associations should do an economic cost benefit analysis of the proposed action and favor forming a monetary union when the economic benefits outweigh the economic cost.³ As noted above, The benefits of joining a monetary union include a reduction in the transactions costs associated with trading goods and services between countries of the association with different monies. The primary costs entail the realization that members of a monetary union will forgo the possibility of dampening business cycle fluctuations through the use of a country specific counter-cyclic monetary policy.⁴

It is therefore not surprising that earlier empirical studies on the feasibility of monetary unions focused on results from the optimum currency area literature, since this is the area of international economics that addresses the benefit and cost of joining or forming a monetary union. Specifically they focused on four conditions of importance: (i) the extent of trade (ii) the similarity of shocks and business cycles (iii) the degree of labor mobility; and (iv) the system of fiscal transfers. The greater the international linkages using any of the four criteria, the more appropriate will be the move towards a single currency. Recent surveys of the literature are available in Bayoumi and Eichengreen (1994), De Grauwe (1997), Lafrance and St-Amant (1999) and Alesina, Barro and Tenreyro (2002).

³It is sometimes the case that political considerations dominate the economic ones. For example, German monetary union's objectives were purely political not economic. It is also important to point out that the traditional analysis as pioneered by Mundell (1961), McKinnon (1963) and Kenen (1969) focus attention on the cost side of the benefit cost analysis.

⁴Additionally, the benefits of a union, in particular the EU, was to first decrease the inflation of member countries and to reduce fluctuations in the exchange rates that are empirically shown to contribute negatively to growth and investment through the generation of uncertainty.

In some of the surveys, it is noted that the theory of optimum currency areas has come under criticism. On one hand, it is asserted that the traditional theory of optimum currency area tends to be too pessimistic about the possibility for countries to join a monetary union. On the other it is asserted that a naive examination of historical data provides a misleading indication of suitability of membership in an area, since some of the four criteria listed above are inter-related and endogenous. For more on this insight, see Frankel and Rose (1997, 1998). Despite this criticism, a consensus has developed suggesting that much of the traditional analysis still provide valuable insights into what constitutes an optimal currency area.

While consensus might have developed on the central ideas of what constitute an optimum currency area no such consensus emerges when the issue concerns the strategy to pursue when countries are moving towards a currency union. Two competing strategies are possible. One is based on the idea that transition to a monetary union should be gradual accompanied by convergence criteria and the other that it should be speedier without an accompanying convergence criterion. Recent examples of these are found in Europe with the gradual strategy of the European Union based on the Maastricht Treaty and the speedier strategy of German monetary unification of East and West Germany.

In this paper both strategies are discussed in the context of a monetary union for SADC. It suggests that less emphasis should be placed on Maastricht-type entry requirement and more on strengthening the future of economies of the region.

The paper is divided as follows. Section II presents an economic overview of the region. Section III presents a set of Maastricht-type convergence criteria followed by a feasibility analysis based on time-varying parameter estimation. Section IV deals with the conclusion of the paper.

II. An economic overview of the SADC Region

This section presents an economic overview of the countries that make up SADC, see also Hartzenberg and Maasdorp (1998) and Subramanian (2000). SADC has immense diversities in terms of economic size, per capital income, degree of urbanization and cultural background. Members of SADC include least developed, developing and relatively more developed

economies. One member South Africa, has over 75 percent of the real Gross Domestic Product (GDP) of the Community. Most of the countries experienced positive average growth during the 1989-1999 period, the exception being DRC (-1.8 percent). About half the countries experienced growth of between 1-2 percent, the others registering values slightly above 2 percent. Note also that on average, in 1999 SADC registered an average per capita income of US\$1804 (constant 1995 US\$), with Seychelles (US\$7215), Mauritius (US\$4135), Botswana (US\$3711) and South Africa (US\$3904) at the top. The lowest levels of per capita GDP during 1999 was for DRC (US\$132) and Malawi at (US\$156). Three members, South Africa, DRC and Tanzania, makeup more than 65 percent of the population of the Community.

The average GDP inflation rates for SADC from 1990 to 1999 was 359 percent. Much of this can be attributed to two countries, DRC with average inflation over 3000 percent and Angola with average inflation over 1000 percent. The four CMA countries have an average inflation rate of about 10% over the period. The lowest (1.8 percent) inflation rate being recorded is in Seychelles.

Over the years, Angola, DRC, South Africa and Zimbabwe have reported surpluses on their total net trade in goods and services-average over the period. Lesotho, Malawi, Mauritius, Mozambique, Namibia and Tanzania consistently report deficit for each of the year covering 1989-1990. Angola and South Africa reported surpluses in each of those years. SADC countries are mostly reliant on the exports of primary commodities to earn foreign exchange.

Despite these differences, emphasis on monetary union continues to be made. According to the reports of SADC (2001) the launching of the implementation of SADC Protocol on Trade on 1st September 2001, which envisages the establishment of a SADC Free Trade area by 2008, represents a pivotal step towards the shared vision of creating a single economic space in Southern Africa. The implementation of the Protocol is seen as being catalytic to deeper economic integration since it is expected to promote free movement of factors of production and will encourage investment and higher economic growth.

III. Evaluating feasibility based on convergence criteria

This section evaluates the feasibility of each individual country joining a monetary union. As noted earlier there are two possible paths to a monetary union. Given the desirability of

a monetary union one can proceed quickly without any type of Maastricht-type convergence requirement or gradually by requiring potential members to satisfy certain requirements. It so happens that the theory of optimum currency areas does not provide guidance on specific convergence requirements. The theory, however, stresses the importance of labor market flexibility and labor mobility. For the present study, it will be assumed that a gradual approach is desired and as a consequence one needs to examine convergence of economic variables among the countries. In pursuant of this, a set of requirement will be proposed. It is proposed that a set of macroeconomic convergence (inflation, exchange rate and public debt) requirements will be established. The requirements can be rationalized as an attempt to induce South Africa to participate in the union. To see why South Africa needs to be induced, notice that when a monetary union is formed a common central bank will need to be established. The establishment of this bank however does not guarantee that South Africa will be able to continue her policy of anti-inflationary bias. So as an inducement for South Africa in particular or the CMA in general to join the new monetary union a set of macroeconomic conditions aimed at reducing inflationary bias in the union will be required by the CMA countries. All this follow from the Barro and Gordon (1983) model where it can be easily established that a low inflation country always reduces its welfare by forming a monetary union with a high inflation country.

The following might then represent a minimal set of requirements.⁵ A country can only join the union if:

- (a) its inflation rate is not more than 1.5 % higher than the average of the CMA countries.
- (b) its exchange rate is not more than 5 % higher or lower than that of the CMA countries.
- (c) its long-term interest rate is not more than 2% higher than the average observed in the CMA countries.
- (d) its government budget deficit is not higher than 3% of its GDP.
- (e) its government debt should not exceed 60% of GDP.

These conditions are similar to the Maastricht requirement for movement towards monetary union in Europe and their reasonableness have been examined by several authors, see for example De Grauwe (1997). Though the conditions above do not directly discuss debt burden conditions, this is not to suggest they are immaterial, since it should be obvious that

⁵These requirements differ from those given in Sparks (2002)

there is bound to be some linkages between interest rate criterion, exchange rate criterion and debt burden. The conditions above should be thought of as a minimal set of conditions needed for convergence.

A Time varying convergence

The purpose of this sub-section, is apply the methodology of time varying (Kalman Filter) analysis to study nine, non-CMA, member countries of SADC, and based on the analysis to determine whether the member country indicators point towards a direction of being able to join a new single Currency System. The rest of the paper, focuses on two of the five criteria, namely inflation and exchange rate criteria, partly because these are the variables that have received most attention and partly because of data availability, see for example, Hall, Robertson and Wickens (1992), Carporale and Pittis (1993), Thom (1995), Holmes (2002) and Mills and Holmes (1999).

The methodology adopted in this paper follows Hall, Robertson and Wickens (HRW) (1992) who in their study of measuring convergence of European Community countries, clarified the concept of convergence and by so doing introduced an approach based on time varying parameter analysis to establish economic convergence. Although the principle of convergence in mathematics and statistic would suggest that, for any two series, X and Y, convergence between the series can be defined as requiring $\lim_{t \rightarrow \infty} (X - Y) = \alpha$. This condition which can be interpreted as saying that the difference between two (or more) series should become arbitrarily small (or converge on some constant α) is not of much practical importance in economics. An extended definition, to cover stochastic economic variables is more useful and involves E the mathematical expectation operator. Specifically, convergence requires $E \lim_{t \rightarrow \infty} (X - Y) = \alpha$, so that the probability that two series differ by a given amount is required to be arbitrarily small. This notion of weak convergence can be extended to cover integrated processes, where the requirement would be that convergence between the processes should be interpreted as meaning that the difference between them should result in a process of a lower order of integration. So for example the difference of two I(1) processes would yield a stationary process. In addition to the above definitions one can extend the definition to cover economic systems/subsystems. Let X be a vector of economic variables, then the system X, is said to exhibit strong convergence if, for every i and j (say countries) $E \lim_{t \rightarrow \infty} (X_i - X_j) = \alpha_x$ holds for all X. The system X will exhibit

weak convergence, if $E\lim_{t \rightarrow \infty}(X_i - X_j) = \alpha_x$ for some X with the condition that the time series relationship between the remaining variables does not change. The basic idea is that whereas under strong system convergence every pair of variables in a system or subsystem has converged, in a weak system convergence framework all that is required is that some elements of the system have converged without the others showing any tendency to change behavior.

Given these definitions, it is not surprising that several tests exist for determining convergence. Namely, tests based on measures of dispersion, tests that are designed to assess the magnitudes of coefficients of similar parameters from different samples, tests of mean reversion, tests based on cointegration methodology and tests based on time varying parameter estimates. Detail examples together with relevant citations on these tests are provided in Hall, Robertson and Wickens (1992). While the particular test or measure adopted is usually associated with the type of data at hand and the economic issue under detect investigation, HRW argue persuasively for the use of the time varying parameter approach since convergence is a gradual and on-going process. They note that while it is sometime the case that testing for cointegration is a powerful way of assessing convergence, say for example in the case of non-stationary variables, the standard cointegration test assumes structural stability and will not correctly detect convergence if the process generating the convergence has changed; moving from a situation of non-convergence to one of convergence. HRW also provided justification for why some of the other alternative measures are unsatisfactory.

Two different specifications are employed in the empirical analysis based on time-varying parameter test of convergence and they are based on the methodology of HRW who build on the time varying work of Haldane and Hall (1991). To apply the methodology to study exchange rate convergence, the following equation is specified:

$$x_i(t) = \beta(t) + \gamma(t)y(t) + \epsilon(t) \tag{1}$$

where t is time, x_i is logarithm of the nominal rand-local currency of the i th non-CMA country exchange rate and y is the corresponding rand-U.S. dollar rate. The time varying coefficients, $\beta(t)$ and $\gamma(t)$ are estimated by applying Kalman Filter to equation (1). A technical description of the estimation methodology is in Haldane and Hall (1991). The degree of convergence between the rand and non-CMA currencies is measured by the magnitude of γ . Non-CMA currencies will converge to the rand if γ is zero.

To apply the methodology to study inflation convergence, an alternative equation is specified:

$$[Inf[\bar{CMA}] - Inf[\tilde{CMA}_i]](t) = \delta(t) + \phi(t)[Inf[\bar{CMA}] - Inf[USA]](t) + \zeta(t) \quad (2)$$

where $Inf[USA] = 100\Delta \log$ Consumer Price Index (CPI) for United States of America and it is a proxy for import price inflation, $Inf[\tilde{CMA}_i] = 100\Delta \log$ Consumer Price Index (CPI) for the i th non-CMA country and $Inf[\bar{CMA}] = 100\Delta \log$ Consumer Price Index (CPI) averaged over the CMA countries. The Δ represents first difference operator. The time varying coefficients, $\delta(t)$ and $\phi(t)$ are also estimated by applying Kalman Filter to equation (2). The degree of convergence on inflation between the average of the CMA countries and non-CMA countries is measured by the magnitude of ϕ . Non-CMA inflation rates will converge to the average CMA countries if ϕ is zero.

B. The Empirical Results

This section discusses the results based on time varying estimation. To assess feasibility we do not directly employ the Maastricht-type convergence requirement outlined earlier instead we estimate equations(1) and (2) and interpret failure in either the exchange rate or inflation rate of the non-CMA series to exhibit convergence with the average of the rates of the CMA as indicating potential difficulties with the creation of a monetary union.

Tables 1 and 2 show tests of unit root and cointegration between the non-CMA currencies and the South African rand. The data covering 1992:2- 2000:11 are monthly and come from the International Financial Statistics CD-ROM. ⁶ Test based on the augmented Dickey-Fuller (ADF) and the Elliott, Rothenberg and Stock (1996)(DF-GLS) optimal test generally confirm that the currencies are generally non-stationary. The lag parameters for both the ADF and DF-GLS tests are selected using the Akaike information criterion. The non-rejection of non-stationarity can now be used as a basis for cointegration (convergence) test. In one approach to assessing convergence, it is claimed that if the currencies have converged over a given period one should find that they are cointegrated over that period. As stated

⁶Data limitation problems meant Angola and DRC had to be dropped for the exchange rate study. We were also restricted in the direction of data span. The unit root and cointegration tests (option 3) are computed with E-Views software and time varying parameter estimation are computed with S. G. Hall's Reg-X software

earlier, this cointegration test is not designed for assessing movement from non-convergence to convergence. Rather the test is designed for assessing if convergence have occurred over the whole period. Table 2 presents an analysis of the number of cointegrating vector which exists for all 9 currencies that is used in this study. If all the currencies have converged, one should expect to find 8 cointegrating vectors. The results do not show this.

An alternate way of assessing convergence is to focus on the time path of the time varying parameter on the rand-dollar rate in eq. (1). Fig. 1 for each individual country and Fig. 2 for all countries simultaneously show the $\beta(t)$ coefficients for the time varying regression of the exchange rate differentials for the countries in the sample. The results suggest differing degree of (non) convergence among the non-CMA to the rand exchange rate. For all but one country, there is no evidence of movement towards the rand rate, the exception being Malawi's Kwacha.

Turning to inflation convergence. The data covering 1980:2- 2000:07 are monthly and come from the International Financial Statistics CD-ROM. Results (not reported) of the tests of Dickey-Fuller and ERS do not provide evidence in support of non-stationarity for both the individual inflation rates and the differential rates between each non-CMA country and the averages of the CMA countries. Fig. 3 for each individual country and Fig. 4 present the $\beta(t)$ coefficient for the time varying regression of the inflation rate differential between six non-CMA countries and the average of CMA countries against the differential between the average CMA inflation and US inflation.⁷ The results are broadly that inflation rates in the non-CMA countries do not converge to the average of the CMA countries.

IV. Conclusions

This paper has sought to investigate the feasibility of monetary union in SADC by looking at evidence of nominal exchange rate and inflation convergence. Using a methodology based on estimating time varying parameter estimates, we find evidence suggesting non-convergence among the SADC members examined. The non-convergence of exchange rate and inflation rate suggest that, presently, the chances of SADC member countries satisfying some form of Maastricht-type criteria is quite low.

⁷CMA CPI inflation average is based on the average of Namibia, South Africa and Swaziland; we could not obtain consistent data for Lesotho.

Table : 1. Integrability tests for Exchange Rates

Country	P	ADF Statistics	DF-GLS Statistics
Boswana	9	-1.89	-1.57
Malawi	8	-2.03	-1.36
Mauritius	6	-1.87	-1.86
Mozambique	6	-2.21	-1.80
Seychelles	7	-1.91	-1.60
Tanzania	3	-1.15	-1.30
South Africa	14	-3.56 [†]	-2.42
Zambia	13	-2.36	-1.71
Zimbabwe	1	-1.91	-1.70

Critical values for ADF: 10% : -3.14; 5% - 3.43; 1% : -4.00

Critical values for DF-GLS: 10% : -2.62; 5% - 2.92; 1% : -3.46

P is the order of autoregression. The test values with [†] indicate that the corresponding null model is significant at the 5% significance level. Source for ADF is: McKinnon (1996). Source for DF-GLS is: Elliott, Rothenberg and Stock (1996).

Table : 2. Test Statistics for the Number of Cointegrating Vectors

Number of Cointegrating Vectors	Value of Test Statistic	5% Critical Value	1% Critical Value
Botswana, Malawi, Mauritius, Mozambique, Seychelles, S. Africa, Tanzania, Zambia, Zimbabwe			
0	214.01 [†]	192.89	204.95
1	135.19	156.00	168.36
2	99.79	124.24	133.57
3	71.89	94.15	103.18
4	52.60	68.52	76.07
5	34.30	47.21	54.46
6	20.80	29.68	35.65
7	10.99	15.41	20.04
8	4.70	3.76	6.65

The 1% and 5% critical values are read from Osterwald-Lenum (1992). The test values with [†] indicate that the corresponding null model is significant at the 5% significance level.

Figure 1A
Rand-local Currency Differentials:
Rand-dollar Time-Varying Parameter:Slope. 1980.06 - 2000.07

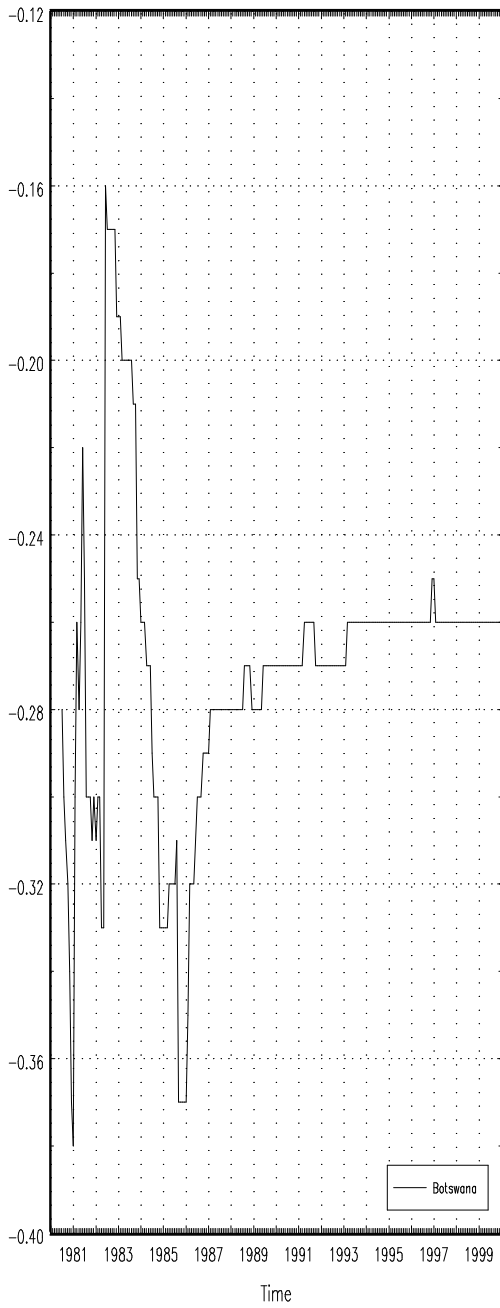


Figure 1B
Rand-local Currency Differentials:
Rand-dollar Time-Varying Parameter:Slope. 1980.06 - 2000.07

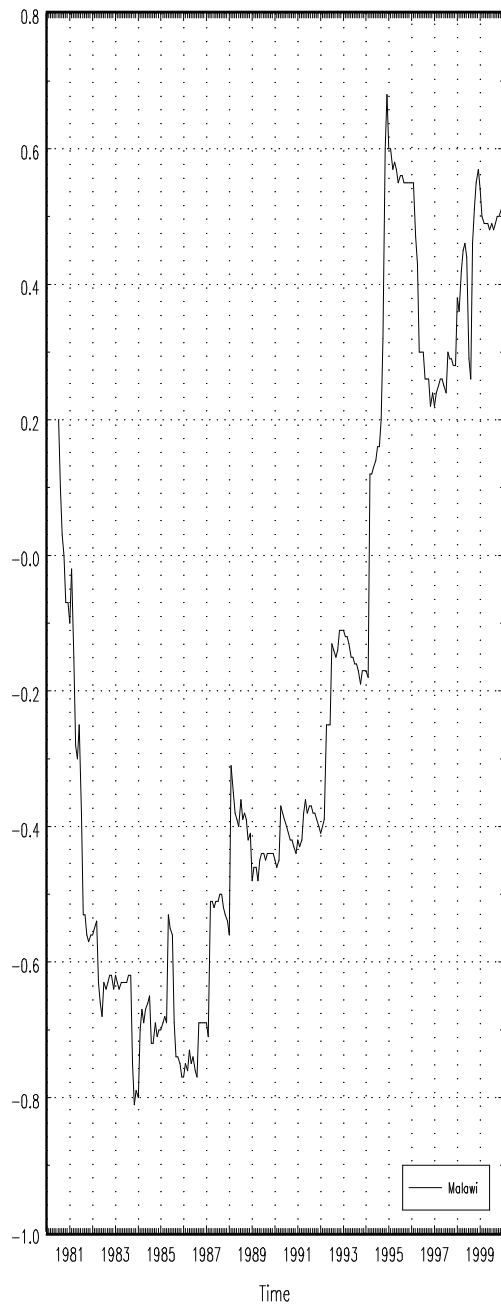


Figure 1C
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07

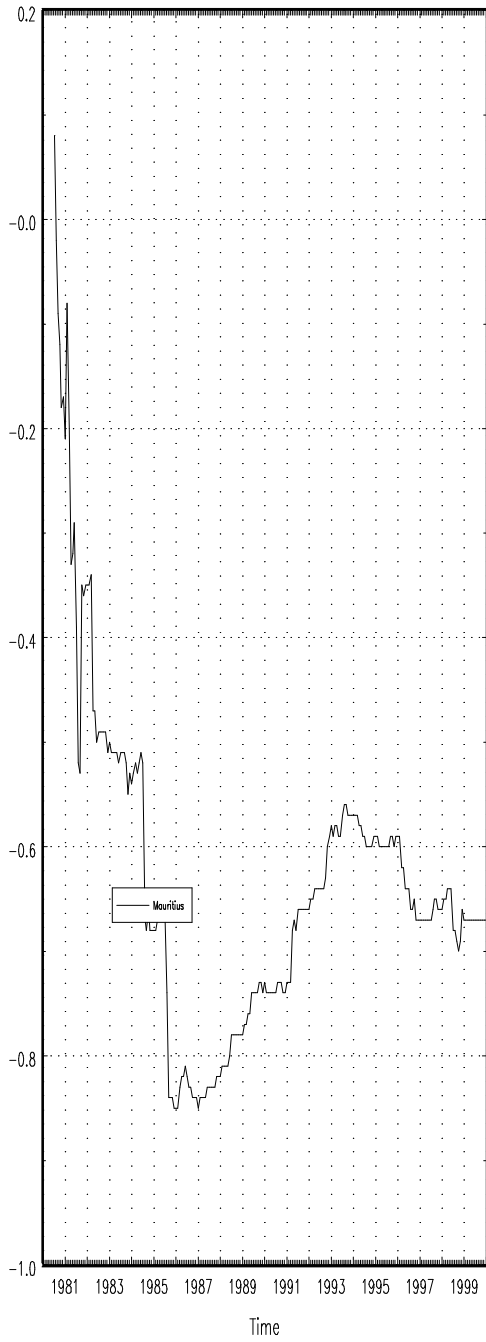


Figure 1D
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07

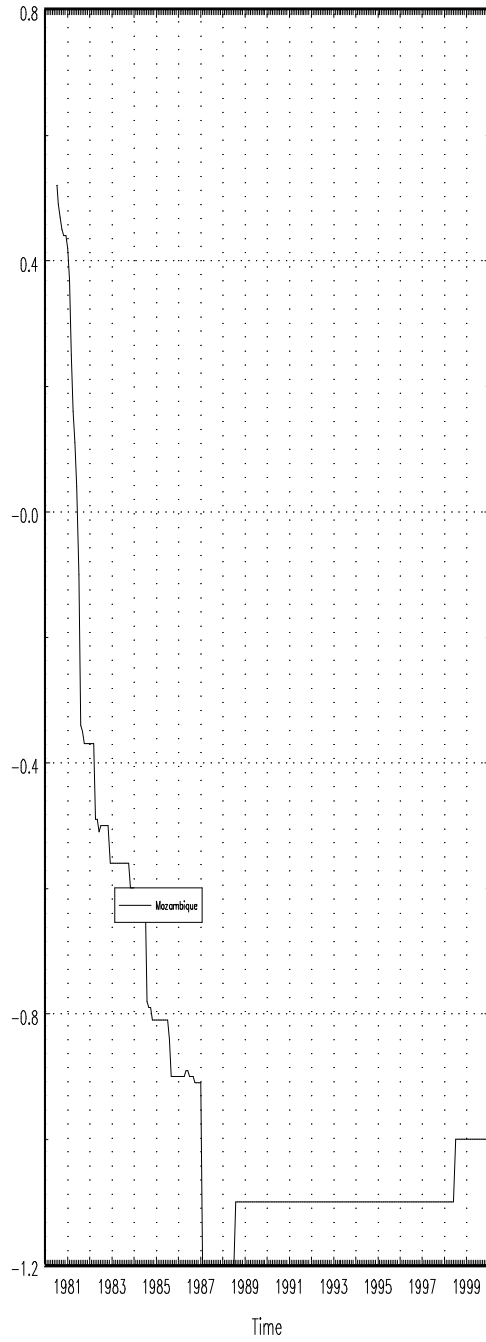


Figure 1E
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07

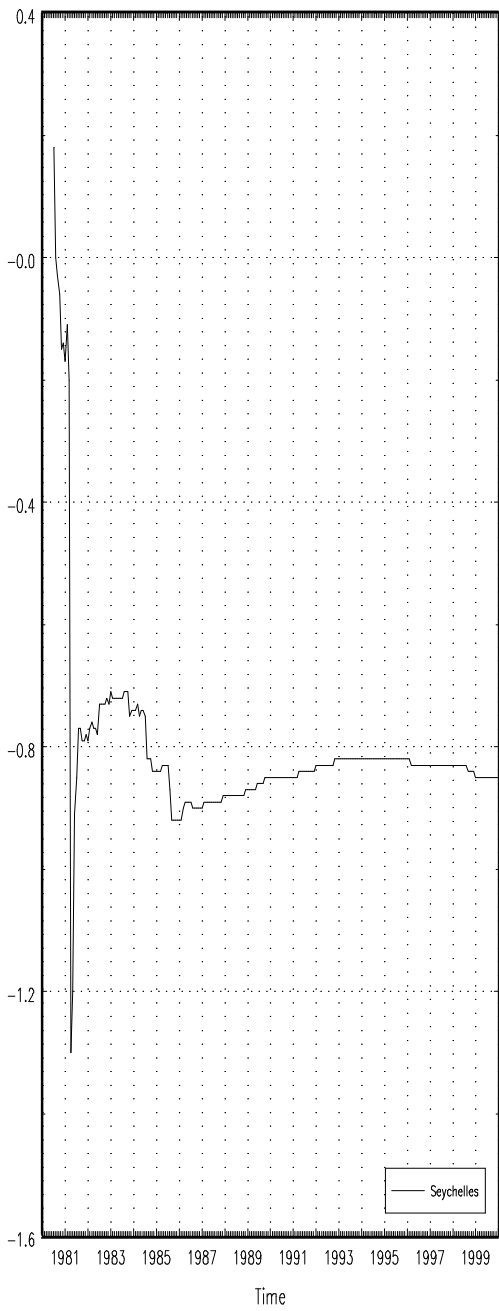


Figure 1F
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07

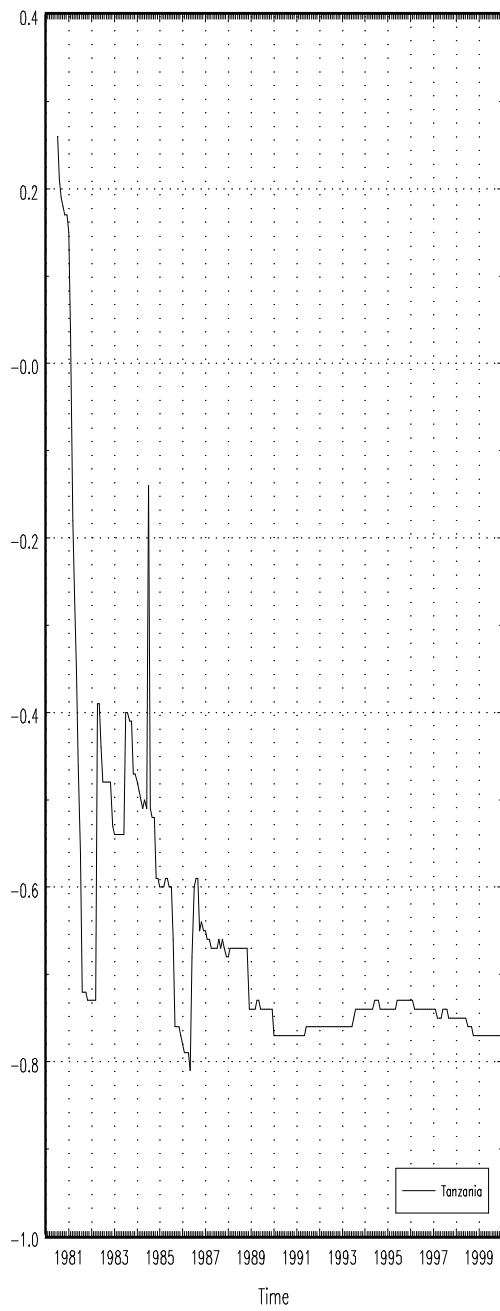


Figure 1G
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07

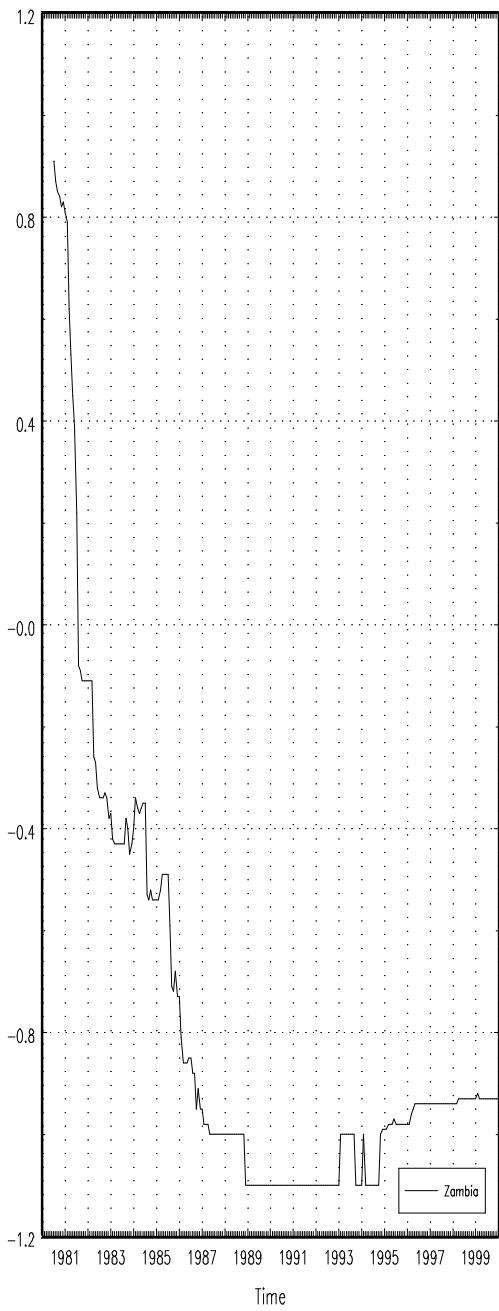
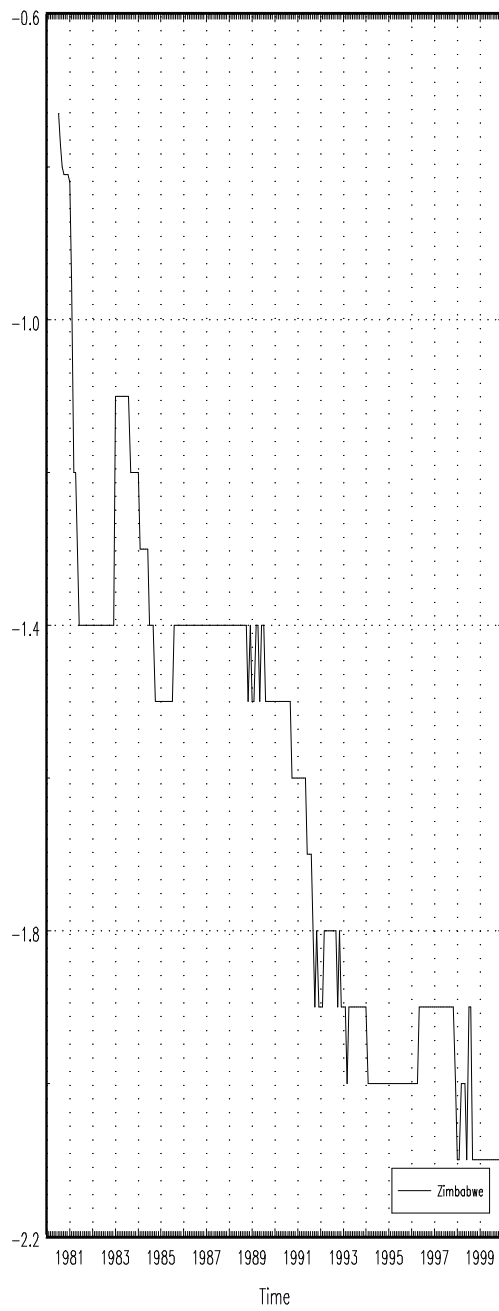


Figure 1H
 Rand-local Currency Differentials:
 Rand-dollar Time-Varying Parameter:Slope. 1980.06 – 2000.07



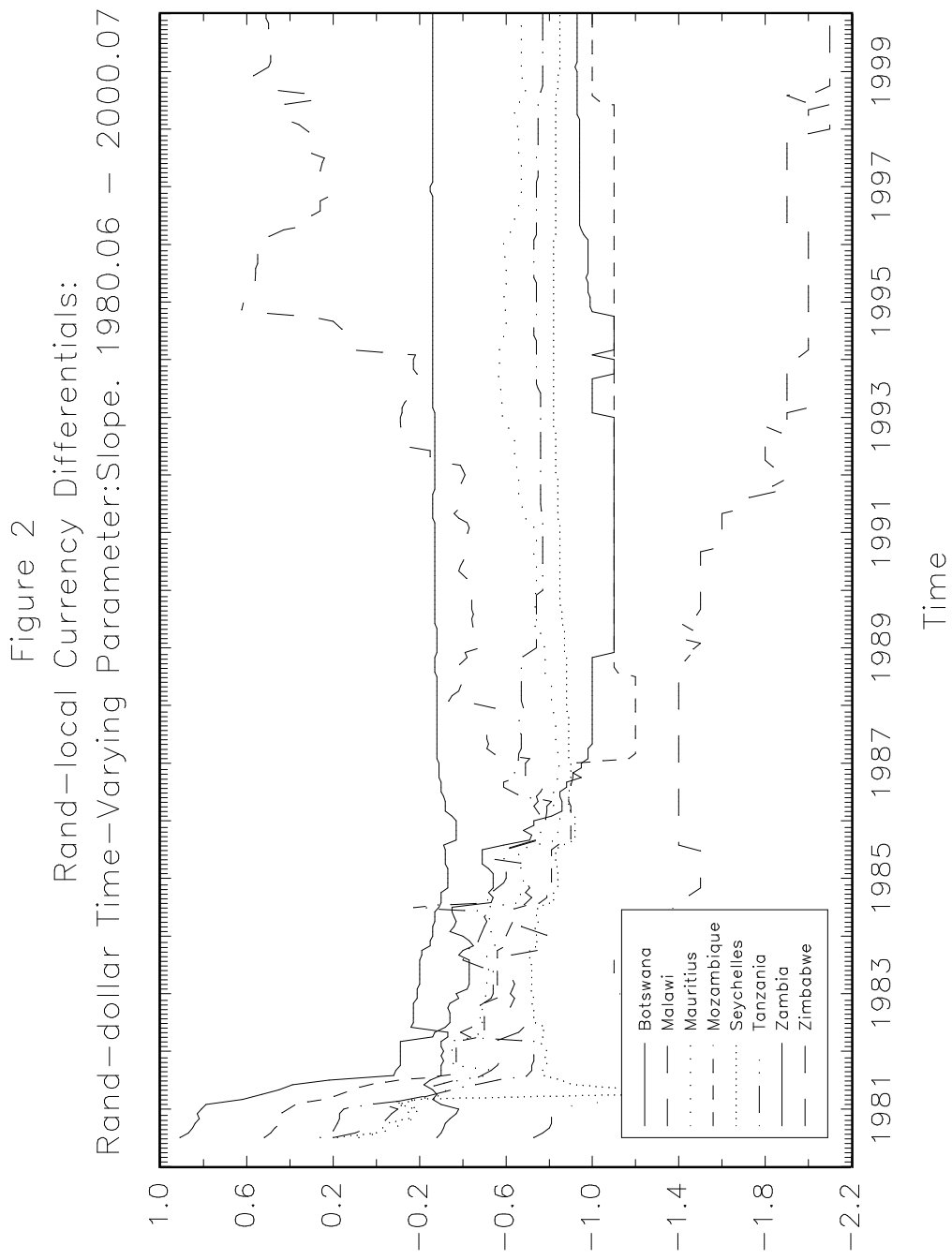


Figure 3A
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

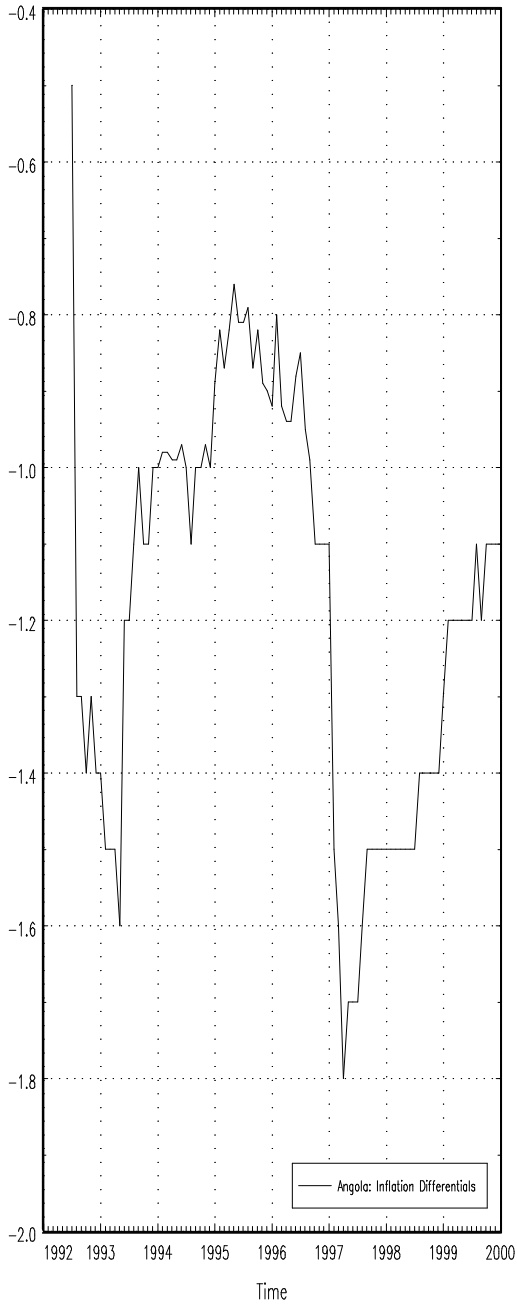


Figure 3B
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

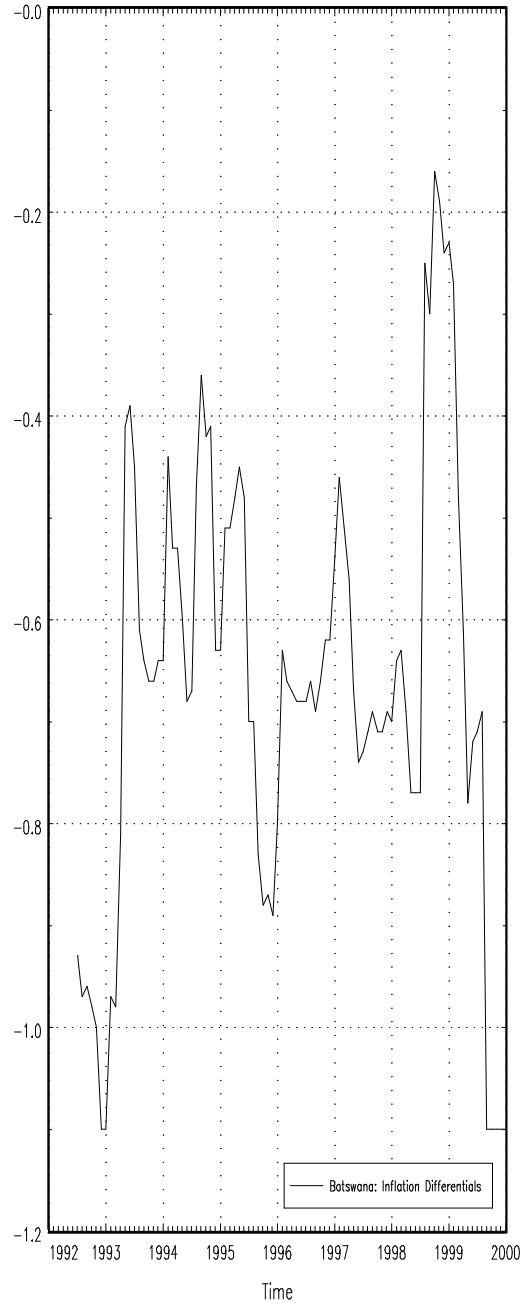


Figure 3C
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

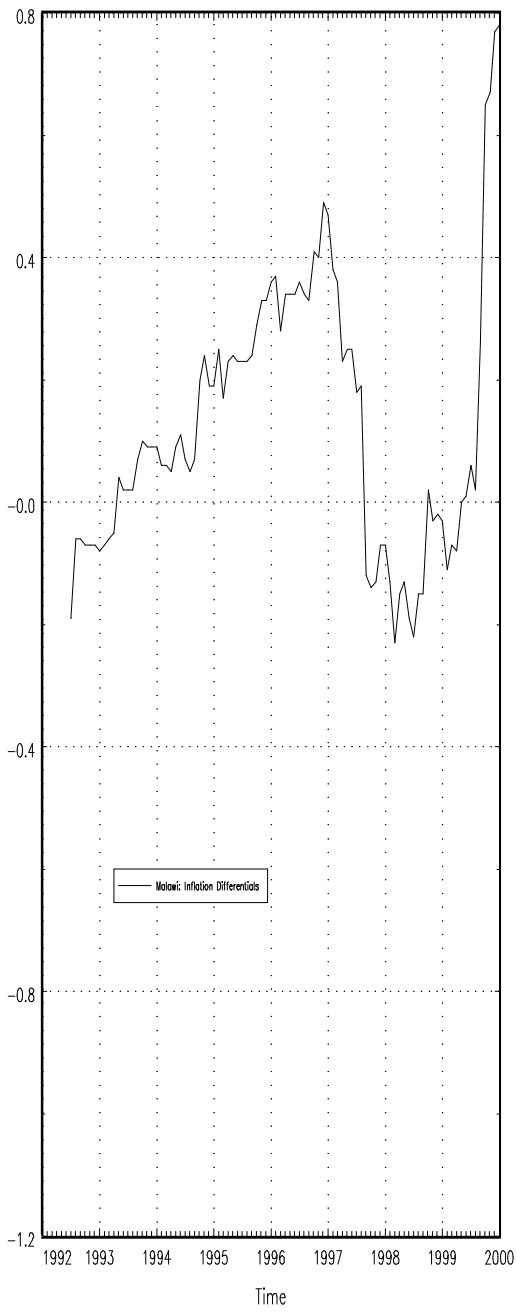


Figure 3D
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

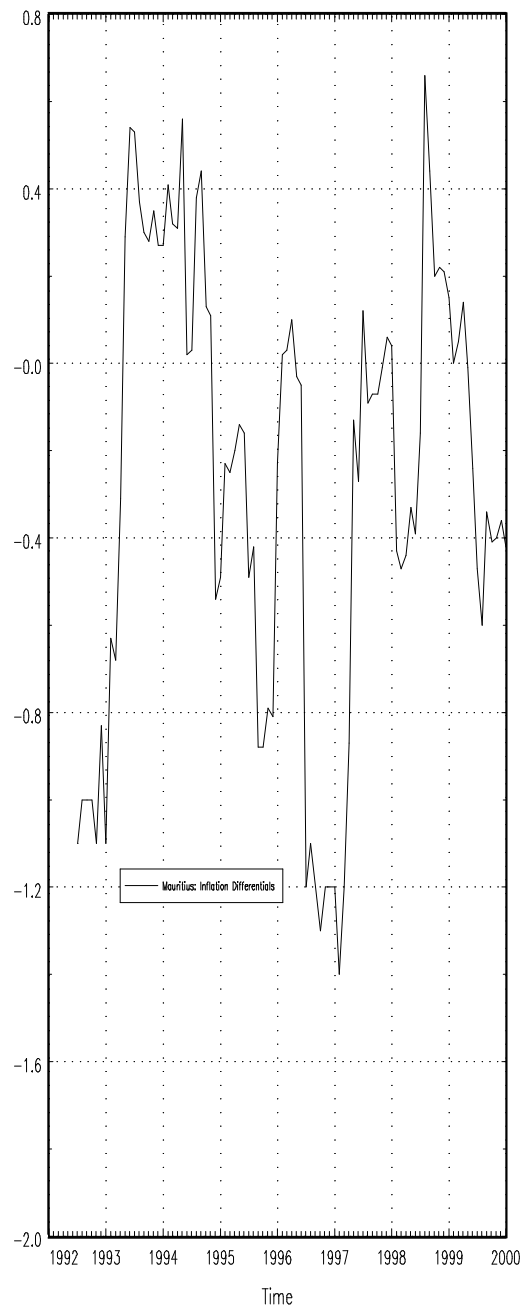


Figure 3E
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

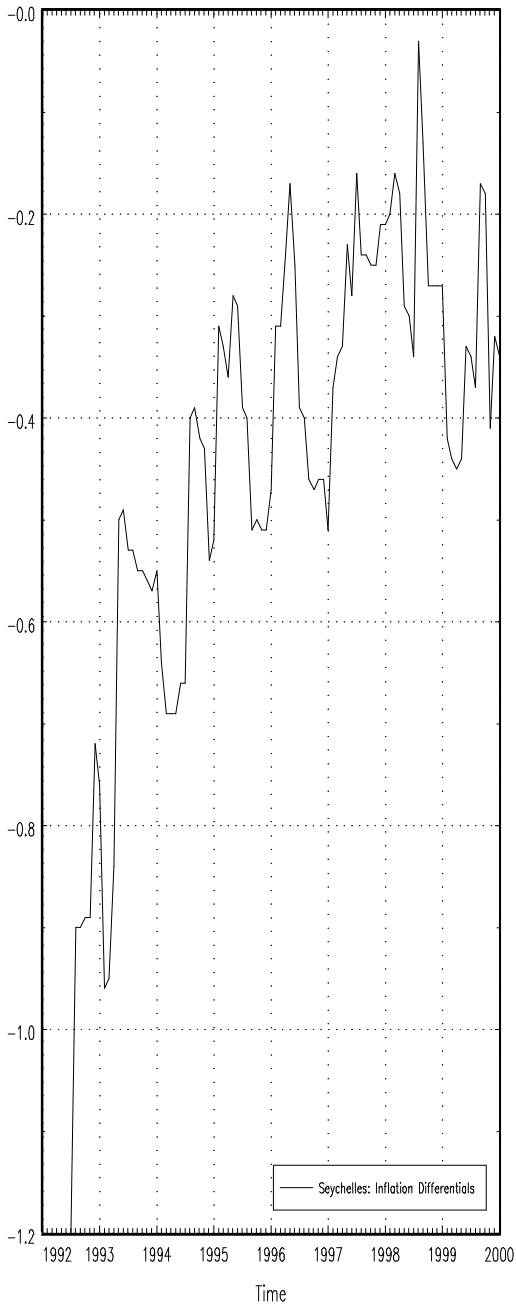


Figure 3F
Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 - 2000.11

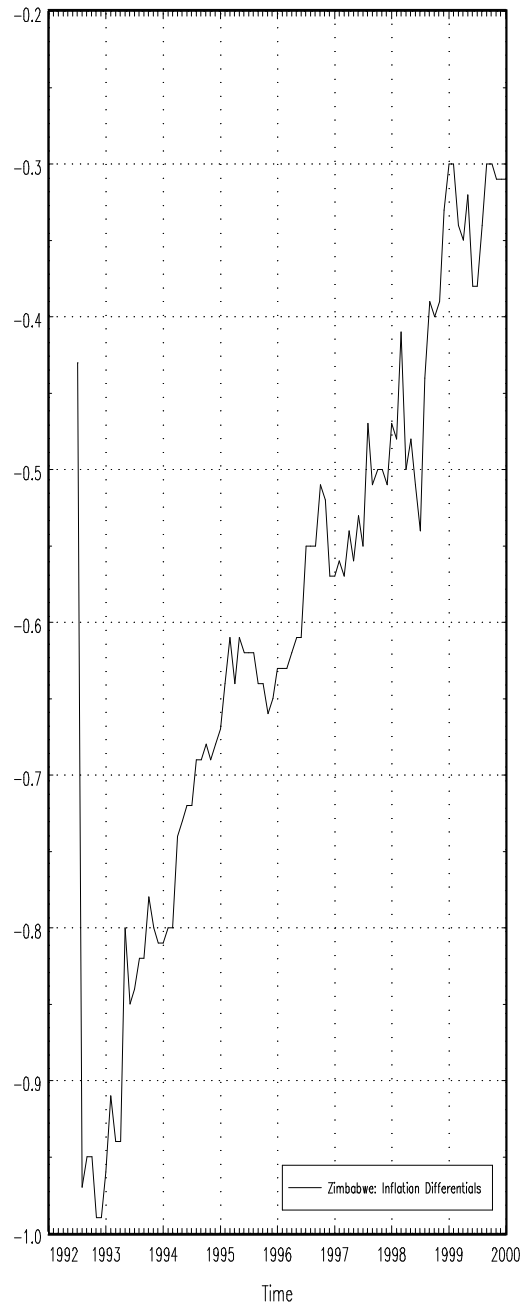
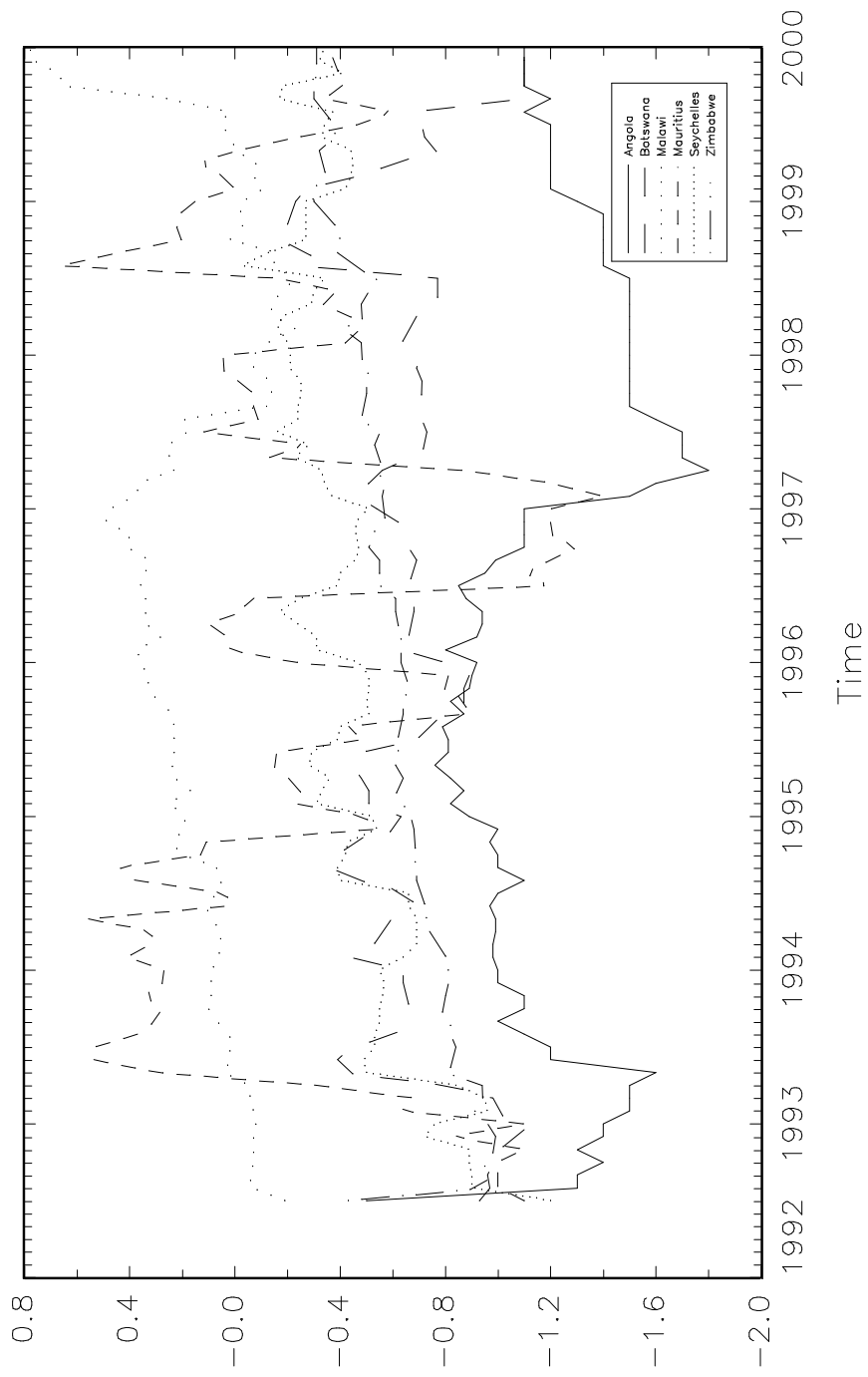


Figure 4
Inflation Differentials: Average of CMA vs. Import Inflation
Time-Varying Parameter:Slope. 1992.06 – 2000.11



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