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Contents

Coordination of Macroeconomic Policies in the Southern African Development Community Region[1]

T. L. Chankuluba and C. Chepete[2]

Abstract

This paper investigates macroeconomic policy coordination within the Southern African Development Community (SADC), the extent of macroeconomic convergence towards the agreed targets and the region's readiness for transition to monetary union. The analysis involves use of descriptive statistics and econometric tools to assess adherence to convergence timetable and criteria, with respect to inflation, exchange rate and fiscal indicators (budget balance and debt relative to GDP). In turn, developments in these criteria inform determination of macroeconomic policy coordination in the SADC region. It is found that relevant indicators, including inflation, debt and budget balance generally converge. However, evidence points to the fact that convergence occurs more as a result of independent pursuit of appropriate policies by individual countries and not so much in consideration of agreed regional targets and policy coordination. Even then, data limitations impede comprehensive analysis and robust conclusions.

1. Introduction

The Southern African Development Community (SADC)[3] was established in 1992 as a successor to the Southern African Development Coordination Conference (SADCC). Formed in 1980, the SADCC was constituted by five front-line states[4] to coordinate strategies and resources to alleviate economic dependence on South Africa, while also supporting measures towards democratic dispensation in the region. Subsequently, SADC membership grew to 15 and, with the advent of democracy in South Africa, the objectives of the organisation evolved towards addressing new challenges facing the region. Thus, SADC promotes deeper economic cooperation, integration and macroeconomic stability and at the same time addresses socio-economic development issues and factors impeding sustainable economic growth.

This study seeks to: (a) investigate whether there is macroeconomic policy coordination in SADC to drive and achieve the envisaged deeper economic integration; (b) establish whether the SADC countries have been converging towards the agreed targets outlined in the Regional Indicative Strategic Development Plan (RISDP); and (c) establish which countries, if any, are ready to move into a monetary union as outlined in the programme.

The paper is divided into 5 Sections. Section 2 traces the evolution of the SADC Regional Indicative Strategic Development Plan, while Section 3 covers relevant literature review. Section 4 explains the methodology used in the paper to test for macroeconomic convergence, and Section 5 discusses the results. The conclusion is covered in Section 6.

2. Evolution of the SADC Regional Indicative Strategic Development Plan

SADC Integration Agenda – The Regional Indicative Strategic Development Plan

The Regional Indicative Strategic Development Plan (RISDP) underpins the SADC economic integration agenda and charts the direction and priorities with respect to policies, projects, programmes and activities. As such, the RISDP outlines the path towards regional integration and attainment of development goals and encompasses quantitative and measurable targets with clear time lines (Tables 1 and 2 overleaf).

The SADC Secretariat has responsibility for facilitating and coordinating the implementation of the RISDP. At the same time, the RISDP encompasses a monitoring and evaluation mechanism with the following objectives:

(1) ensuring attainment of the planned integration milestones;

(2) anticipating and facilitating responses to possible lapses in meeting targets;

(3) providing regular information to stakeholders on progress of the RISDP and allowing for an informed basis for any reviews;

(4) facilitating a continuous sharpening and refocusing of strategies; and

(5) assist in the mobilisation of appropriate interventions.

Implementation of a significant part of the

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1 This paper was originally prepared for and presented to the SADC Committee of Central Bank Governors (CCBG) in September 2012, where Governors also approved its publication on the SADC Central Banks website.

2 Messrs Chankuluba and Chepete are Principal Economist and Principal Financial Stability Analyst, respectively, in the Monetary and Financial Stability Department. The views expressed in the paper are those of the authors and do not necessarily reflect those of the Bank of Botswana.

3 SADC comprises Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Seychelles, Swaziland, Tanzania, Zambia and Zimbabwe.

4 The Front-line States were Angola, Botswana, Mozambique, Tanzania and Zambia.

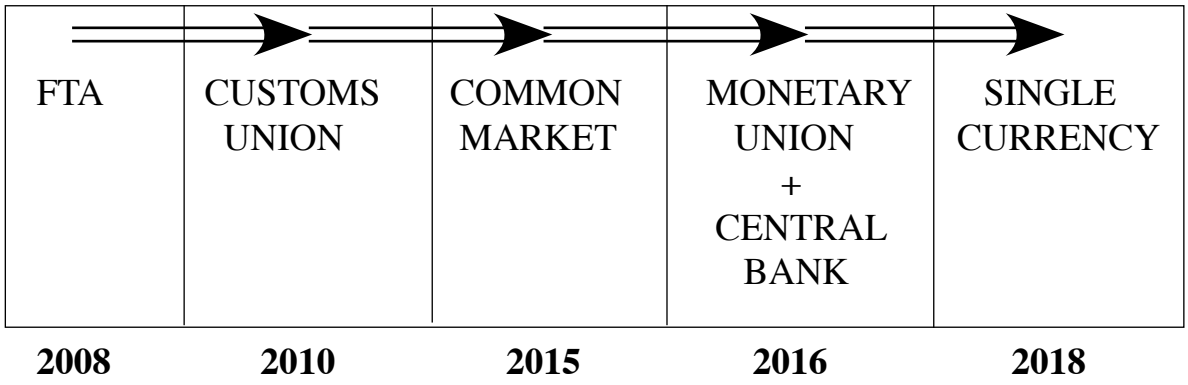
Table1: Trade, Economic Liberalisation and Development

		Year	Status/Comments
Target 1	Free Trade Area (FTA)	2008	Attained in 2008; Angola, DRC and Seychelles are still outside the FTA. FTA faces challenges such as trade policy reversals and rise in derogations from liberalisation schedule by some member states (MS).
Target 2	Completion of negotiations of the SADC Customs Union (CU)	2010	Not achieved. Graduation from FTA to CU met some challenges including: multiple membership to various regional economic communities by MS; concerns over revenue sharing; disparities in levels of development as well as industrialisation which may result in trade diversion and polarisation for less developed MS.
Target 3	Completion of negotiations of the SADC Customs Market	2015	Deadline will most probably be missed given the challenges undermining attainment of CU as outlined above.
Target 4	Diversification of industrial structure and exports with more emphasis on value addition across all economic sectors taking into account the following indicators:	2015	
	1. Diversify and sustain an export growth rate of at least 5 percent annually	Annually	Not achieved and not monitored
	2. Increase intra-regional trade to at least 35 percent	2008	Not achieved
	3. Increase manufacturing as a percentage of GDP to 25 percent	2015	Unlikely to be attained
Target 5	Macroeconomic Convergence on:		
	1. Inflation rate:		
	Single digit	2008	Attained
	5 percent	2012	Partially achieved
	3 percent	2018	Unlikely to be achieved
	2. Ratio of budget deficit to GDP:		
	Not exceeding 5 percent	2008	Mostly achieved
	Not exceeding 3 percent	2012-2018	Mostly achieved and likely to be sustained
	3. Nominal value of public and publicly guaranteed debt should be less than 60 percent of GDP	2008-2018	Largely achieved and may be sustained
Target 6	Other Financial Indicators		
	1. External reserves/import cover:		
	At least 3 months	2008	Largely achieved
	More than 6 months	2012	Partially achieved
	2. Central bank credit to government:		
	Less than 10 percent of previous year's tax revenue	2008	Partially achieved
	Less than 5 percent	2015	Most likely to be partially achieved
	3. Increase the level of savings to:		
	At least 25 percent of GDP	2008	Not achieved
	At least 30 percent of GDP	2012	Not achieved
	4. Increase domestic investment levels to at least 30 percent of GDP	2008	Achieved
	5. Gradual interconnection of payments and clearing system in SADC	2008	Achieved
	6. Achieve currency convertibility	2008	Partially achieved
	7. Finalise the legal and regulatory framework for dual and cross listing on the regional stock exchanges	2008	On going
	8. Liberalise exchange controls:		
	Current Account	2006	Mostly achieved

Target 6 (cont'd)	Capital Account 9. Increase the share of credit accessed by women and SMEs to at least 5 percent of total private sector credit	2010 2008	Partially achieved Not assessed
Target 7	Establishment of a SADC Monetary Union	2016	Deadline will most probably be missed. Preconditions for a monetary union are far from being achieved.
	Finalise preparations of institutional, administrative and legal framework for setting up a SADC Central Bank	2016	Deadline will most probably be missed
	Launch a regional currency for the SADC Monetary Union	2018	Deadline will most probably be missed

Note: Most of the progress so far made in achieving macroeconomic convergence targets under RISDP, has been largely driven by national prerogatives rather than deliberate efforts by MS aimed at achieving RISDP targets. Individual MS policies do not make any reference to the SADC RISDP, but are more driven by individual countries' national needs.
Source: RISDP (Para 4.10.5, Page 66)

Table 2: SADC Roadmap to Monetary Union



RISDP programme is assigned to the Committee of Central Bank Governors (CCBG) of SADC and entails progressive review of prospects for macroeconomic policy coordination and integration and evaluation of performance with respect to convergence criteria. The work is facilitated by regular review of economic and policy developments in SADC and associated research.

The SADC Peer Review Panel (PRP)[5], established under Article 7 of Annex 2 of the Finance and Investment Protocol (FIP), is at the apex of policy consideration and implementation and is constituted by Ministers responsible for Finance and Investment and central bank Governors. The Panel is responsible for monitoring, evaluation and surveillance to ensure that SADC member states adhere to, and implement, the agreed protocols. Furthermore, the PRP can determine specific targets, assess progress relative to those targets, and provide advice on corrective actions, as per the FIP.

In general, the SADC countries approve and pursue macroeconomic stability in line with the RISDP programme. However, given variations in national objectives and current levels of performance, member countries are not immediately aligned to the SADC convergence criteria; notably countries setting inflation targets that are above the 5 percent SADC target. Similarly, there is disparity in fiscal policy frameworks. Thus, present evidence suggests lack of macroeconomic policy coordination in SADC.

3. Literature Review

Prerequisites for Economic Integration

Economic cooperation and integration is usually assessed through three complementary dimensions of convergence:

(1) Business cycle congruity or symmetry and incidence of common shocks across the region which, in turn, implies scope for a harmonious response to such developments;

(2) Harmonised macroeconomic policies in order to

5 The SADC PRP met on May 18, 2013 in Mozambique, where it approved the SADC Macroeconomic Convergence Surveillance Mechanism (MCSM). The Framework is intended to facilitate the operationalisation of the Peer Review Panel.

deal with shocks and turns in the business cycle in a coordinated manner; and

(3) Convergence of per capita income (level of development) among the economies forming or intending to form a regional economic community (REC).

However, this paper only assesses macroeconomic policy coordination within the SADC region, while the other two dimensions for assessing convergence within a REC could be a subject for future work.

Types of Regional Integration

Assessed at the level of economic activity, integration defines the extent of trade relationships and factor mobility across the region, while deliberate efforts towards integration entail common institutions and policies and shared infrastructure. Ultimately, formalised economic integration and common policies can result in significant loss of sovereignty to a supranational entity. The transition to integration normally involves the following stages:

(1) Preferential Trade Agreement (PTA): cooperating parties agree to reduce custom duties on goods traded between member states, relative to those applied for trade with non-member countries.

(2) Free Trade Area (FTA): tariffs and quotas on trade between member countries are removed. However, members retain full control over own trade restrictions with non-member countries. Due to different rules applying to trade with non-members, an effective system of rules of origin is usually necessary.

(3) Custom Union (CU): as in the FTA, tariffs and quotas on trade between members are removed but, unlike under an FTA, cooperating members also apply a common external tariff (CET) on trade with non-members. Hence, the rules of origin are not necessary.

(4) Common Market (CM): in addition to the provisions of the CU, under CM, there is also free movement of factors of production, while common restrictions apply for movement of factors involving non-CM countries.

(5) Economic/Monetary Union (MU): in addition to the provisions of the common market, MU requires that major economic policies should be coordinated.

SADC adopted a gradual transition that started with the launch of the Free Trade Area in 2008 and followed by a customs union in 2010. It is envisaged that the Common Market and Monetary Union will be in place in 2015 and 2016, respectively, culminating with adoption of a single currency in 2018.

Regional Economic Integration in Africa

Regional economic integration has a long history in Africa and was initially motivated by aspirations of African unity. Subsequently, economic considerations associated with deficiencies of import substitution industrialisation policies prevailing in many countries played a part in seeking economic cooperation. Constraints of inward looking regional strategies include factors such as persistence of small national markets, high costs of inputs and growing inefficiency of local producers resulting from trade protection, which ultimately affects productivity and competitiveness.

Thus, several countries shifted from import substitution to outward looking strategy in the 1980s and Sub-Saharan Africa got attracted to openness and regional integration with commitments by both governments and the private sector. Currently, there are seven regional economic groupings in Africa with virtually the same goals, namely SADC, the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West Africa State (ECOWAS), the Economic Community of Central African States (ECCAS), Arab Maghreb Union (AMU), East African Community (EAC) and the Community of Sahel-Saharan States (CEN-SAD) (Appendix Table 1). On central banking issues, the Association of African Central Banks (AACB) operates through five Regional Economic Communities (RECs) or sub-regions used as building blocks for integration (Table 3).

The AACB is also pursuing the African Monetary Cooperation Program (AMCP), with regional programmes for economic and monetary union such as SADC's RISDP feeding into the continental programme.

Preconditions for a Monetary Union

Literature identifies preconditions for monetary union as indicated below.

TABLE 3: AACB SUB-REGIONS

Eastern Africa	Southern Africa	Northern Africa	Central Africa	Western Africa
Burundi	Angola	Algeria	DR Congo, and	BCEAO
Kenya	Botswana	Egypt	BEAC	Cape Verde
Mauritius	Lesotho	Libya	Sao Tome and Principe	Gambia
Rwanda	Madagascar	Mauritania		Ghana
Seychelles	Malawi	Sudan		Guinea
Uganda	Mozambique	Tunisia		Nigeria
Djibouti	Namibia			Sierra Leone
Comoros	South Africa			Liberia
Ethiopia	Swaziland			
Somalia	Zambia			
Tanzania	Zimbabwe			

Single Monetary Authority

Monetary policy is delegated to a single supranational institution with restrictions on autonomous policy choices by individual countries. When complete, monetary union entails a single currency and a regional central bank with authority over interest rates, issuance of currency and management of the common external exchange rate. Given that national governments effectively relinquish important policy choices, the supranational institution has to be representative (inclusive enough) and accountable to citizens of the region by taking into account divergent interests in decision making.

Numerical Convergence Criteria (Macroeconomic Policy Coordination)

Monetary union is normally preceded by a prequalification period to enable the constituent countries to work towards satisfying convergence criteria or numerical targets. The convergence criteria serve as a benchmark for assessing progress towards deeper integration and weed out countries that are less likely to commit to prudent macroeconomic policies, thus imposing economic costs on other member states. Targets for convergence cover interest rates, inflation, exchange rates, as well as public debt and budget balance. The requirement for interest rates and inflation to converge to the target levels prior to the formation of a monetary union is meant to avoid large real exchange rate changes once nominal exchange rates are locked irreversibly through the adoption of a single currency. Fiscal deficit and public debt criteria are intended to ensure that countries bring their finances to sustainable levels, and mitigate adverse spillovers of fiscal imbalances between members through undue pressure to relax monetary policy or bailouts.

Monetary Policy Transparency

Countries joining a MU need to have had a history of transparent monetary policy implementation. Such transparency helps central banks make credible commitments and improve the time-inconsistency problem and potentially improve policy effectiveness. Furthermore, transparency promotes central bank accountability as it is required to defend and justify its actions to the public.

Common Transmission Mechanism

There is need for market determined interest rates and identical monetary policy transmission channels in the period preceding the formation of a monetary union. Therefore, similarity of the financial structure across countries is needed to allow for uniform policy transmission.

Macroeconomic Policy Coordination

The coordination of macroeconomic policies is paramount and a pre-requisite for regional integration and monetary union (Kamar and Naceur, 2007). As indicated by Begg et al (2003, Page 66), coordination needs to be backed by rules; thus, "a set of supranational rules or norms which are agreed by all member states, which leave primary responsibility for the policy area with national authorities but set limits on the direction. Action to enforce the rules or at least to assure conformity with the spirit of shared policy aims will be triggered if there is a failure to keep within the parameters set by the legislation".

Macroeconomic policy coordination in a regional setting is intended to address potential disparities given that policymakers in individual countries normally take action aligned to welfare issues in their own jurisdiction. However, in a regional economic community, the policy decisions of one country may generate adverse externalities. In response to such externalities, the affected countries may institute countering policies which could give rise to policy conflicts and inefficient outcomes for the region. Moccero (2005) identified four key areas for potential macroeconomic policy coordination in the Mercosur region as being: coordination of public finance, mitigation of financial instability, coordination of exchange rate policy and joint enforcement mechanisms.

In SADC, the RISDP policy coordination mechanism is indicated by specification of (numeric) macroeconomic convergence targets, identification of relevant policy areas and variables (fiscal and monetary variables), forums for policy discussion and coordination, and the Peer Review Panel. This approach helps address the potential for unsustainable policies, and thus mitigate possible contagion effects. However, despite its importance in integration, exchange rate policy coordination does not explicitly form part of the policy convergence criteria in the RISDP. Maintenance of exchange rate value at a level that reflects fundamentals (economic performance, trade relationships and balance of payments) is paramount to macroeconomic stability and in providing the right incentives and signals for desirable economic performance. Therefore, coordination of exchange rate policy is, similarly, critical to reducing the risks of unrestrained divergence of currencies of countries desiring to establish a monetary union.

Empirical Literature Review

Empirical literature covers studies that use descriptive approaches and those that employ econometric methods to assess policy coordination and convergence, as well as ascertaining conditions for an optimal currency area (OCA). As highlighted above, common nominal convergence variables include the inflation rate and public debt and budget balance ratios to GDP, while desirable convergence of real variables is with respect to business cycle synchronicity, commonality of shocks, per capita income and intra-regional trade. Thus, at a rudimentary level, the test for degree of convergence entails descriptive analysis using the standard deviation to measure volatility of each target or criterion and establishing the divergence from the regional average. Examples of a more rigorous approach include Brada et al (2002) use of a rolling

cointegration approach to measure the convergence of base money, M2, consumer price index and industrial output between Germany and France (as reference countries) and new European Union members. The study found that cointegration for the transition economies were comparable for M2 and prices but no so much for monetary policy and industrial output.

Similarly, Meister (2002) used cointegration technique to test the degree of convergence achieved by the economies of the Central Eastern European Countries towards the economies of the European Monetary Union. The variables used were inflation, exchange rate, and the long-term interest rate. The study concluded that most of the countries in the first group which entered the EU had achieved considerable degree of convergence on most variables, while those that entered the EU later were slow to converge.

Mentz and Sebastian (2003) employed the Johansen test for cointegration to examine the extent of inflation rates convergence in the Euro area following the introduction of the Euro. Using this technique, they compared two periods of 1993 – 1998 and 1993 – 2002 and concluded that there was only partial convergence for 1993 – 1998 and no convergence over a longer period of 1993 – 2003.
More recently, Rofael et al (2011) used the Johansen cointegration approach to ascertain the degree of convergence in SADC, COMESA and ECOWAS. It was found that different sets of countries are candidates to constitute a Currency Union, particularly in SADC.

4. METHODOLOGY

Methods used in Testing the Degree of Convergence

Both the descriptive and econometric approaches are used to establish monetary policy and fiscal policy developments and outcomes. The descriptive statistics are generated to determine convergence and involve plots of charts (to observe trends), calculation of mean (to assess collective or group behaviour), derivation of standard deviation (to measure dispersion between the countries) and an examination of tails or outliers where necessary.

The cointegration test for convergence employs the Augmented Dickey-Fuller test to identify the order of integration. Cointegration analysis requires that all variables included must be integrated of Order I (1). When two variables are non-stationary, but their linear combination is stationary, they are said to be cointegrated. For more than two variables, there can be more than one cointegrating equation. For n non-stationary variables, the maximum number of cointegrating equations is equal to n-1, in which case they share one common stochastic trend and, hence, indicates complete convergence. Any number of cointegrating equations that is less than n-1 indicates partial convergence. The number of cointegrating equations is, therefore, a measure of the degree of convergence (Rofael et al, 2011).

The common methods used to test for cointegration are the Engle and Granger (1987), which is an OLS-based approach, and the Johansen Test (1991) being a Vector Auto Regression based approach. The Engle and Granger Test test the null hypothesis of "no cointegration" against the alternative of the presence thereof. The test, however, does not identify nor spell out the number of cointegrating equations. Alternatively, the Johansen approach, which is used in this paper, tests the null hypothesis of "k cointegrating vectors" against the alternative hypothesis of "more than k cointegrating vectors". The exercise involves running a sequence of tests from k = 0 to k = n-1 and gives the number of cointegrating equations.

Macroeconomic Tools for Convergence

In terms of outcomes and performance, monetary and fiscal policy convergence could be assessed through trends in nominal variables such as interest rates, monetary aggregates, exchange rates, budget balance and debt to GDP ratios and business cycle congruity. However, inflation performance (including variability and dispersion) is the most common measure of monetary policy convergence, which in this study is augmented by analysis of exchange rate movements. To ascertain fiscal policy convergence, the study uses the budget balance (cash surplus or deficit) as a percentage of GDP, as well as the ratio of public debt plus publicly guaranteed debt to GDP. In essence, descriptive statistics are used to investigate whether there has been monetary policy and fiscal policy coordination among the SADC member countries. It has to be acknowledged, however, that although focusing on economic indicators, there are other dimensions of convergence, such as political, institutional and socio-economic convergence that could also influence performance of macroeconomic variables.

5. EMPIRICAL RESULTS AND ANALYSIS

5.1 Descriptive Tests for Convergence

A. Monetary Policy

5.1.1 Inflation Rate

To investigate convergence in the coordination of monetary policy, monthly inflation data from 1992, when SADC was established, to the end of 2011 was analysed. Average inflation for SADC countries has been falling over time from a peak of 35 percent in 1993 to being lower than 6 percent in 2004 (Chart 1 (b)). The data were grouped into 5-year periods and used to derive respective descriptive statistics (Table 4).

The results indicate a clear decline in the mean during the review period, with a faster deceleration at the earlier period. The standard deviation also

Table 4: Descriptive Statistics Measuring the Degree of Economic Convergence in SADC - Average Annual Inflation

Period	Mean	Std. Dev.
1992 - 1996[1]	24.17	7.55
1997 - 2002[2]	14.70	3.57
2002 - 2006[3]	10.69	6.25
2007 - 2011[3]	9.96	3.19

Notes:

1. Excluding Angola, DRC, Lesotho, Mozambique and Tanzania

2. Excluding Angola, DRC, Lesotho and Tanzania

3. Excluding Angola and Zimbabwe

indicates a decreasing variation of inflation among the SADC countries; Chart 1 (a). Thus, data suggests that SADC countries are not only converging but converging towards the set targets.

CHART 1 (a): Degree of Convergence: Inflation Rate (Group Periods)

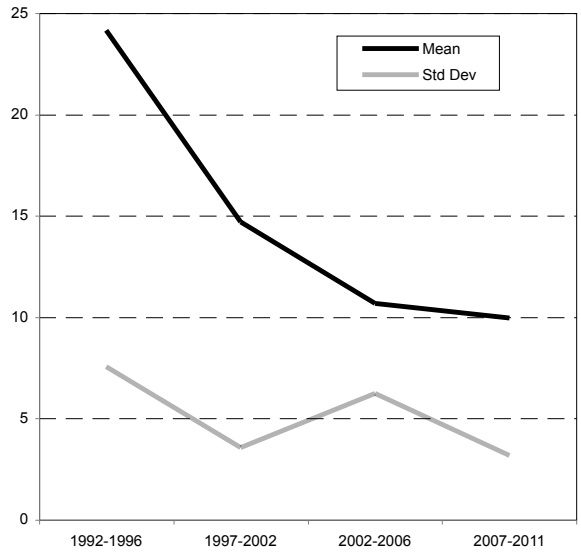
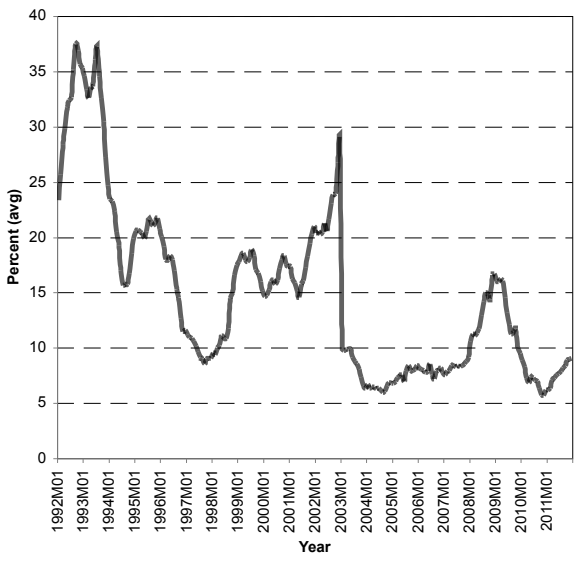


CHART 1 (b): Degree of Convergence in SADC - Inflation Rate (1992–2011)



B. Fiscal Policy

5.1.2 Budget Balance/GDP

The study uses the cash surplus/deficit as a ratio of GDP measure fiscal policy coordination and convergence in SADC. Fiscal data are similarly grouped into four 5-year periods (owing to the unavailability of more recent data, which end before 2009 for most countries, data for two years prior to the formation of SADC are added; therefore the data set starts from 1990 to 2009). Unlike the inflation data series, which were easily available, obtaining the budget (surplus/deficit)/GDP data was a challenge for most countries. Data were not available for Angola, Malawi, Mozambique, Swaziland and Zimbabwe. Of the remaining nine countries where data were obtained, the data series for DRC was rejected by the analysis as containing fatal errors, while that of Namibia was found to be integrated of order I (1). The data series for Zambia was only available up to 1999 and, hence, Zambia was left out of the analysis. Therefore, data for only six countries was used for analysis during the first three 5-year periods, being Botswana, Lesotho, Mauritius, Seychelles, RSA and Tanzania. Moreover, the tail end of the last group (2004 – 2009) comprised only four countries, as the data series for both Tanzania and Seychelles ended in 2005. The results are shown in Table 5 and Charts 2(a) and 2(b).

The mean of the budget balance/GDP ratio rises from -1.18 for the period 1990 – 1994 to 1.68 during 1995 to 1999 and subsequently declines. The standard deviation indicates a reduction in variation of budget performance, therefore progress towards convergence. Overall, there has been transition from budget deficit to surplus position for the countries included in the analysis. The deterioration in the latter period and increased variation could be attributed to the impact of the 2002 – 2008 economic crisis.

Table 5: Descriptive Statistics Measuring the Degree of Economic Convergence in SADC – Public Surplus/ Deficit as a Percentage of GDP

Period	Mean	Std. Dev.
1990 - 1994	-1.18	1.74
1995 - 1999	1.68	1.76
2000 - 2004	1.01	1.38
2005 - 2009[1]	1.08	4.40

Note:1. The last 5-year period group comprises only 4 countries due to lack of data.

5.1.3 Public Debt/GDP

Analysis of public debt/GDP ratio uses annual data from 1992 to 2011 and includes eight countries for which data were available, namely: Botswana, Lesotho, Malawi, Namibia, RSA, Tanzania, Zambia and Zimbabwe. As indicated in Charts 3(a), 3(b) and Table 6, the debt ratio was highest in the mid-1990s but fell sharply thereafter, before declining towards the set criteria. Thus, countries have been taking measures to reduce debt, including through support by development partners and multilateral agencies. However, variability of debt/GDP data is substantial (low degree of convergence) as shown by large standard deviation.

CHART 2 (A): DEGREE OF CONVERGENCE –BUDGET BALANCE AS PERCENTAGE OF GDP (GROUP PERIODS)

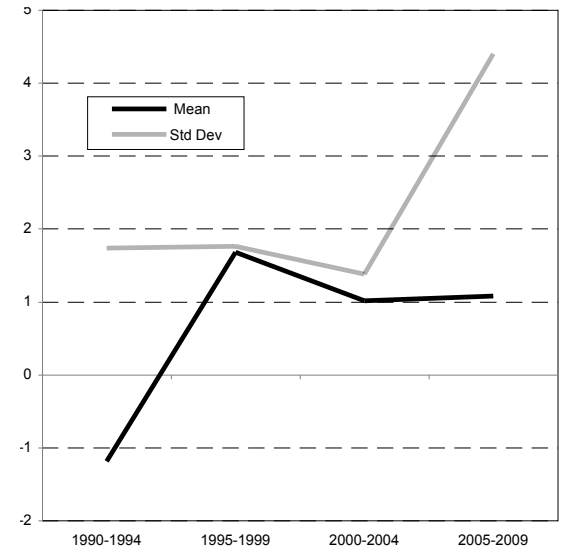


CHART 3 (A): DEGREE OF CONVERGENCE IN SADC – DEBT AS A PERCENTAGE OF GDP (GROUP PERIODS)

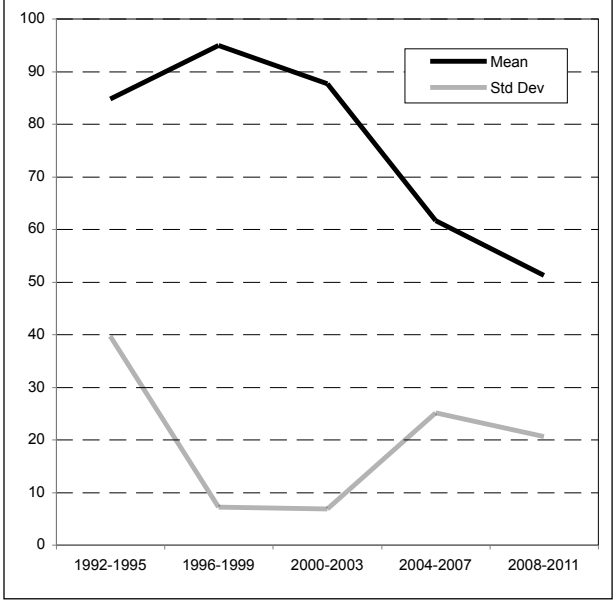


CHART 2 (B): DEGREE OF CONVERGENCE IN SADC: BUDGET BALANCE AS PERCENTAGE OF GDP (1990 – 2009)

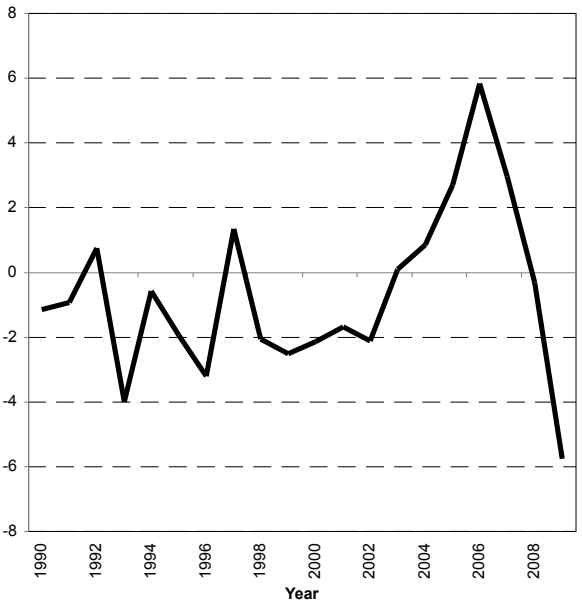


CHART 3 (B): DEGREE OF CONVERGENCE – DEBT AS A PERCENTAGE OF GDP (1992 – 2009)

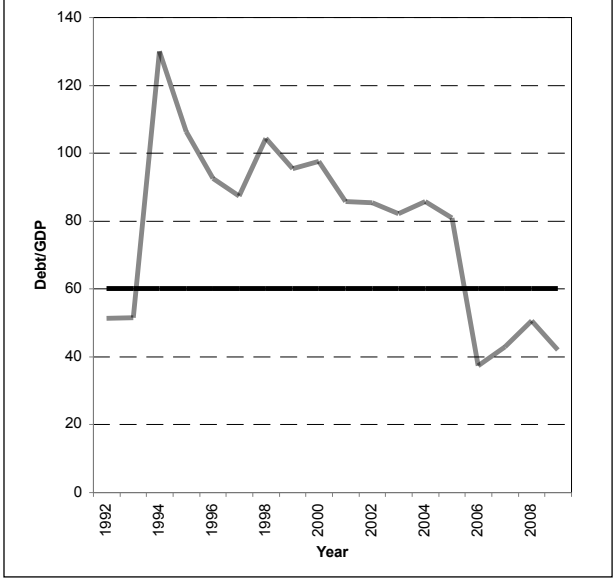


TABLE 6: DESCRIPTIVE STATISTICS MEASURING THE DEGREE OF CONVERGENCE – PUBLIC DEBT AS A PERCENTAGE OF GDP

	All	
Period	Mean	Standard Dev.
1992 - 1995	84.75	39.70
1996 - 1999	94.88	7.16
2000 - 2003	87.68	6.81
2004 - 2007	61.65	25.12
2008 - 2011	51.23	20.54
Overall	73.96	28.17

5.2 Econometric Tests for Convergence

The Augmented Dickey-Fuller (ADF) test is used to determine the order of integration (unit root test).

TABLE 7 – UNIT ROOT TEST FOR INFLATION

		ADF Statistics		
	Lags Criterion (Log Likelihood)	Level (with Intercept)	Level (with Intercept & Trend)	First Difference (with Intercept)
Botswana	12	-3.459	-3.999	-7.700
Lesotho	2	-3.494	-4.048	-6.290
Malawi	1	-3.458	-3.997	-7.154
Mauritius	1	-3.458	-3.997	-12.588
Mozambique	2	-3.461	-4.002	-6.593
Namibia	12	-3.459	-3.999	-8.083
RSA	13	-3.459	-3.999	-6.531
Seychelles	12	-3.459	-3.999	-5.555
Swaziland	0	-3.458	-3.997	-13.886
Tanzania	1	-3.493	-4.048	-7.576

Table 8: Johansen Cointegration Results for Inflation Rate

Countries	No of Countries (1)	Lags (2)	No of CE[1] (3)	No of Common Trends (1-3)	Degree of Convergence
All	10	4	10	0	None
Excl. Botswana	9	4	9	0	None
Excl. Lesotho	9	4	9	0	None
Excl. Malawi	9	4	8	1	Complete
Excl. Mauritius	9	4	8	1	Complete
Excl. Mozambique	9	4	9	0	None
Excl. Namibia	9	4	8	1	Complete
Excl. RSA	9	4	8	1	Complete
Excl. Seychelles	9	4	7	2	Partial
Excl. Swaziland	9	4	8	1	Complete
Excl. Tanzania	9	4	9	0	None

Note: 1. CE stands for cointegrating equations.

The test is run twice in the level: with a constant and with a constant and a trend. If the test rejects the null hypothesis of unit root in the level, the test is replicated for the first difference.

A. Monetary Policy

5.2.1 Inflation Rate

(a) Unit Root Test

As indicated above, cointegration analysis requires the included variables to be integrated of order I(1), otherwise they are excluded from the analysis. Table 7 presents the results of unit root test for inflation rate. However, there is limited data for the respective countries which detracts from a fuller analysis. In particular, Angola is excluded due to lack of data; data for Lesotho and Tanzania only starts in January 2003, and for Mozambique, in January 2004. DRC data from 1992-2002 is suspect and is excluded, while the data for Zimbabwe is included only up to 2006 since after that period, the series was found to be integrated of order I (0). DRC and Zambia were left out for the same reason of being I(0).

(b) Cointegration Test

Table 8 shows the Johansen cointegration test for convergence and includes countries that had inflation data series integrated of order I (1).

When all ten countries are included in the analysis, no cointegration is evident given that there are ten cointegration equations and hence no common trend. This means, therefore, that some countries diverge from the policies of the rest of the region. The same results of no cointegration are obtained when Botswana, Lesotho, Mozambique or Tanzania are excluded from the series at different times (1 country at a time). This suggests that the four countries drive convergence in SADC. As observed from the lags, the analysis yields four different possibilities of complete convergence for the same time periods.

5.2.2 Exchange Rate

(a) Unit Root Test

Table 9 below tabulates the results of the unit root test for countries with data series that are integrated of I (1).

(b) Cointegration Test

Only seven countries are ultimately used in the analysis as the common monetary area (CMA) countries effectively use the same currency. These are Botswana, Malawi, Mauritius, Mozambique, South Africa, Seychelles and Tanzania. The test involves determining convergence by testing cointegration using data for all the sample countries (Table 10(A) overleaf) and, alternatively by consecutive exclusion of countries (Table 10(B)). The results do not indicate a similar trend, suggesting divergence for

Table 9: Unit Root Test for Exchange Rate

		ADF Statistics		
	Lags Criterion (Log Likelihood)	Level (with Intercept)	Level (with Intercept & Trend)	First Difference (with Intercept)
Botswana	0	–3.458	–3.997	–14.675
Lesotho	1	–3.458	–3.997	–10.522
Malawi	1	–3.458	–3.997	–9.410
Mauritius	3	–3.458	–3.998	–6.290
Mozambique	1	–3.458	–3.997	–10.609
Namibia	1	–3.458	–3.997	–10.522
RSA	1	–3.458	–3.997	–10.522
Seychelles	1	–3.458	–3.997	–12.461
Swaziland	1	–3.458	–3.997	–10.522
Tanzania	4	–3.459	–3.999	–10.910

TABLE 10(A) – COINTEGRATION TEST (EXCHANGE RATE)

	No. of Countries	Lags	No. of CE	No. of Trend (1-2)	Degree of Convergence
All	7	4	2	5	–
Excl. Botswana	7	4	1	6	–
Excl. Malawi	7	4	2	5	–
Excl. Mauritius	7	4	0	7	–
Excl. Mozambique	7	4	2	5	–
Excl. RSA	7	4	1	6	–
Excl. Seychelles	7	4	0	7	–
Excl. Tanzania	7	4	0	7	–

TABLE 10(B)

	No. of Countries	Lags	No. of CE	No. of Trend (1-2)	Degree of Convergence
All	–	–	–	–	–
Excl. Botswana	7	–	1	6	–
Excl. Botswana & Malawi	5	–	1	4	–
Excl. Botswana, Malawi & Mauritius	4	–	0	4	–

both the alternative tests. This finding is not counter intuitive given that the SADC countries did not set the exchange rate as one of the convergence targets. It is desirable, however, for countries intending to form an optimal currency union to at least stabilise their exchange rates around a chosen anchor currency.

6. CONCLUSION

It is clear that SADC has a clear framework for macroeconomic policy coordination, outlined in the RISDP and the commitments are monitored by the SADC Peer Review Panel, which comprises central bank Governors and Ministers responsible for finance and development. Empirical analysis indicates that SADC countries have generally been converging over time, especially with respect to inflation and public debt.

However, with respect to exchange rate, convergence is ambiguous as there is no clear-cut trend and behaviour. The results are not surprising given that exchange rate convergence is not one of the targets or convergence indicators set by SADC. Even then, the exchange rate should be considered as an important instrument for countries intending to form a monetary union.

The outcome of debt/GDP, a fiscal policy variable monitored by SADC, indicates convergence of the policy. Although the indicator rose around 1994, it has been falling towards the target (60 percent) and has remained within the set level from 2006 as most SADC countries converged. However, the variation, although moderating, has remained high. The outcome with respect to the budget balance as a percentage of GDP is inconclusive, although the relevant indicators have been fluctuating around the set target.

Overall, it is evident that SADC has a framework for macroeconomic policy coordination, implementation and monitoring. However, it is also clear that policy coordination is deficient as idiosyncratic development and policy priorities are the major influences on performance for individual countries. It is expected that expediting the oversight function of the SADC Peer Review Panel, as envisaged in the RISDP would promote increased focus on coordination and endeavor to achieve the set target across a wider range of countries. The Panel should be able to enhance information sharing, collective monitoring of economic performance against the set targets and joint surveillance.

Finally, it is also crucial that consideration of a SADC monetary Union should involve convergence criteria for exchange rates and coordination of relevant policies. Stable alignment of exchange rate would facilitate orderly and lasting transition to a single currency.

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The Pass-Through of World Oil Prices to Botswana Inflation

Lerato V. James[1]

Abstract

This paper investigates the influence of changes in world oil prices on Botswana inflation. Specifically, the paper seeks to verify the stylised fact that the cause and effect relationship between oil prices and inflation, which was observed across countries in the 1970s (i.e., the earlier episodes of oil price crises) has generally diminished over time. The paper employs a Phillips Curve model to estimate the pass-through of changes in world oil prices to domestic inflation using quarterly data spanning 2001 to 2012. The paper finds that the short-run (incomplete) and long-run (complete) pass-through of a rise in world oil prices to domestic inflation is 0.01 and 0.02, respectively, implying that a 10 percent increase in world oil prices contributes 0.1 and 0.2 percentage points to domestic inflation in the short-run and long-run, respectively.

1. Introduction

Very often, changes in inflation are attributable to supply and demand factors related to changes in world oil prices. Therefore, for the proper conduct of monetary policy, it is imperative for monetary authorities to understand this linkage as a key determinant of inflation. According to Klau et al. (2001), the importance of demand management policy is dwarfed by supply factors such as world oil price shocks. This complicates the conduct of monetary policy and introduces considerable uncertainty regarding its impact on prices. The role of monetary policy is more transparent and its impact is more effective when inflation is primarily driven by demand shocks and when demand changes can be accurately captured by indicators such as the output gap and monetary growth, among other demand indicators. Firms also need to understand the strength of this linkage as it often informs their pricing decisions. Although production processes indicate diminishing reliance on oil in production across countries, both as economies diversify away from heavy industry, and high oil prices discourage the use of oil intensive technologies, oil remains a key input in production and its price often has a bearing on overall production costs incurred by firms. When production costs increase, firms tend to attempt to protect their profit margins by passing on the costs to consumers by way of increasing prices of end products; and if the increases are generalised, inflation tends to increase.

This paper, therefore, investigates the influence of changes in world oil prices on Botswana inflation. Specifically, it tests the stylised fact that the cause and effect relationship between changes in oil prices and inflation, which was evident in the 1970s and 1980s (i.e., the oil price crises periods) has generally diminished across countries and over time. It is argued that world inflation tends to remain relatively stable and sometimes fall even when oil prices rise significantly, suggesting that the strong correlation between oil prices and inflation that was seen earlier has weakened significantly. This is not to say that the impact of oil prices on the macro economy is no longer existent. It is common knowledge that increases in oil prices still trigger concerns about increasing inflation across countries and such concerns may lead to expectations of higher inflation.

The paper employs a Phillips Curve model to estimate the pass-through of changes in world oil prices to domestic inflation using quarterly data spanning 2001 to 2012. Section 2 of this paper focuses on analysis of some key economic relationships. Section 3 deals with literature review. Section 4 outlines the methodology and theoretical basis of the paper. Section 5 is dedicated to model estimation and analysis of results, while Section 6 concludes the paper.

2. Some Key Economic Relationships

This section employs standard graphical analysis to evaluate some key economic relationships in the determination of domestic oil prices and inflation in Botswana. The relationships involve variables such as inflation, world oil prices, the exchange rate and domestic retail fuel prices (Charts 1-6). There is evidence of a positive relationship between quarterly changes in world oil prices denominated in US dollars (DWOILP) and inflation in Botswana (Chart 1). However, it is clear from the chart that the influence of world oil prices on domestic inflation is not contemporaneous, suggesting that there may be forces at play that delay the impact of world oil prices on domestic inflation. The positive relationship is more pronounced when inflation and changes in world oil prices are denominated in the local currency (Pula) as opposed to the US dollar (Chart 2), which suggests that exchange rate developments are a key determinant of both domestic retail fuel prices and inflation. Meanwhile, Chart 3 confirms that an appreciation of the Pula against the US dollar means lower Pula prices of oil hence the Pula appreciation can help stabilise domestic fuel prices and vice versa. Chart 4 depicts a positive relationship between changes in domestic fuel retail prices and domestic inflation.

The extent to which international oil prices

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CHART 1: INFLATION (DCPI) AND CHANGE IN WORLD OIL PRICES IN USD (DWOILP)

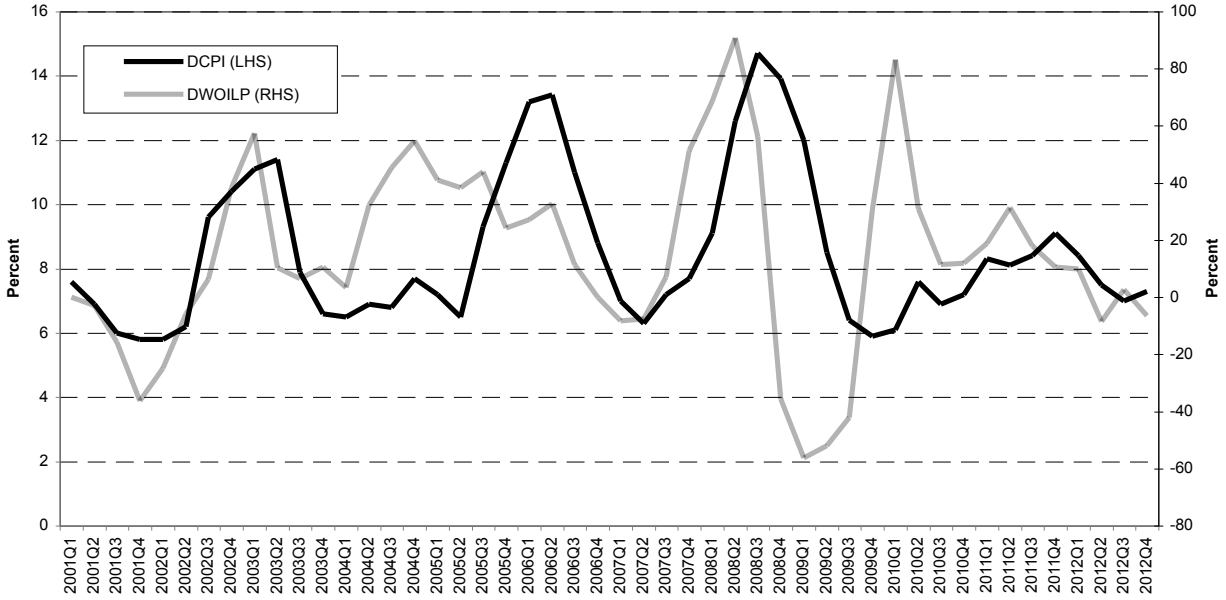


CHART 2: INFLATION AND CHANGE IN WORLD OIL PRICES IN PULA (DWOILPBWP)

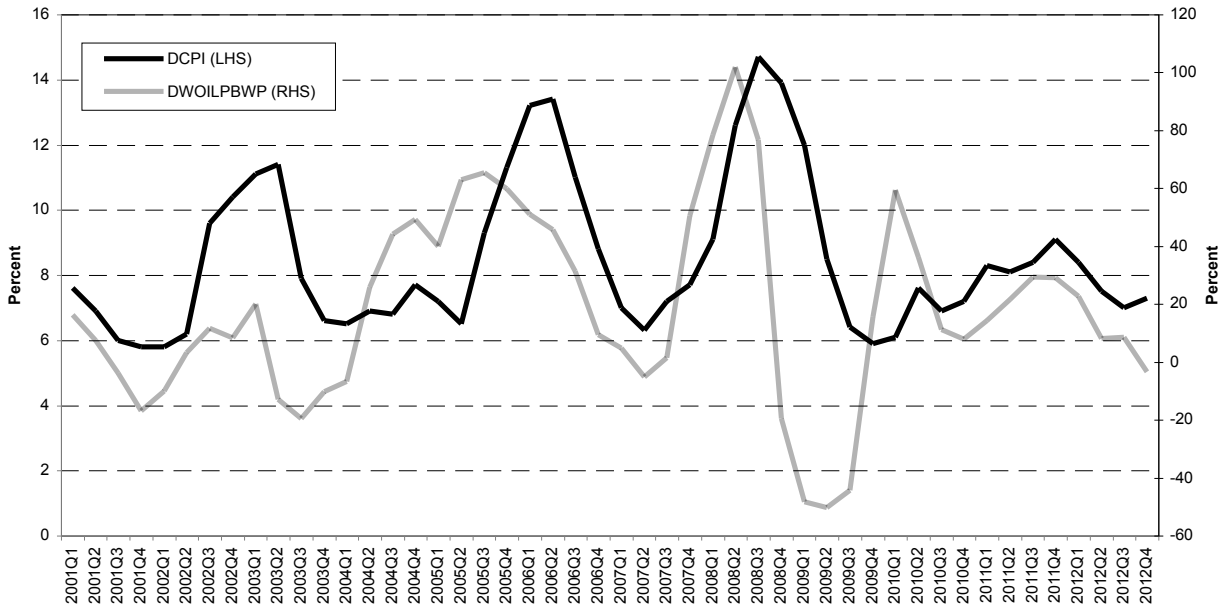


CHART 3: CHANGE IN WORLD OIL PRICES IN PULA AND CHANGE IN THE NOMINAL EXCHANGE RATE (DBWP)

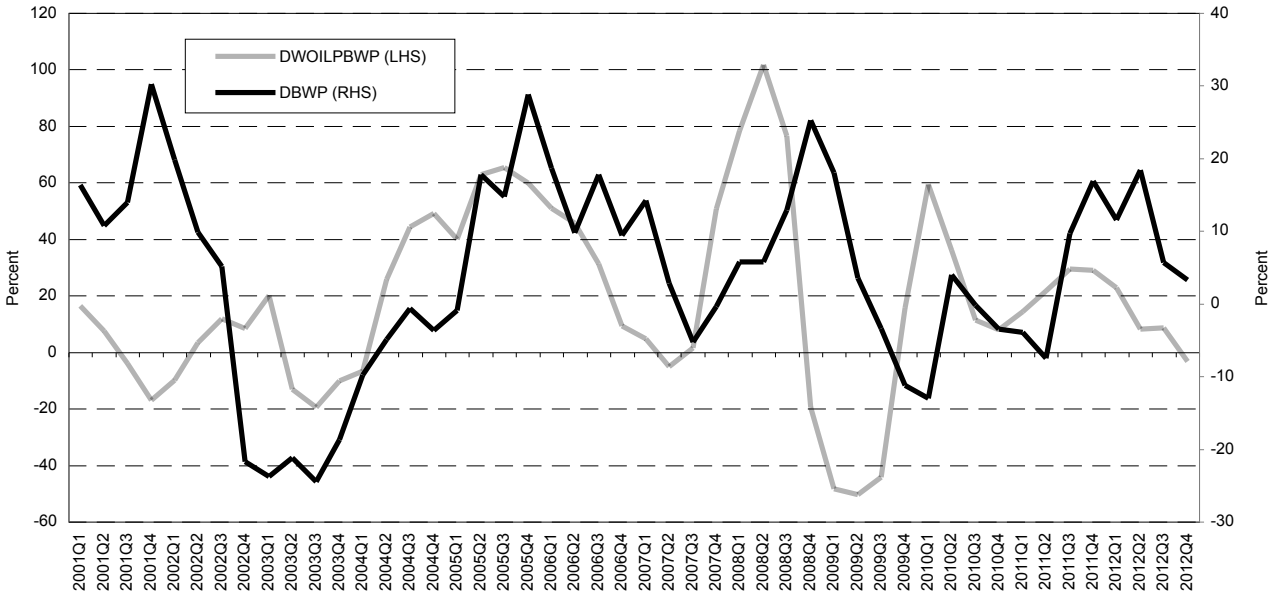


CHART 4 : CHANGES IN DOMESTIC FUEL RETAIL PRICES AND DOMESTIC INFLATION

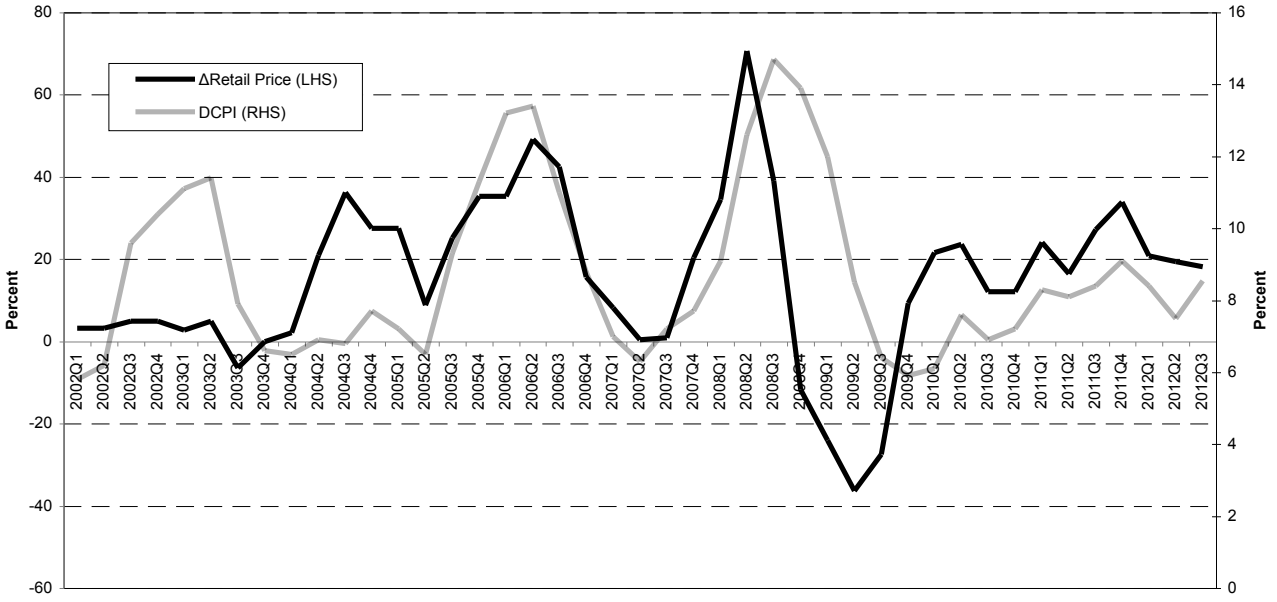


CHART 5: DOMESTIC RETAIL FUEL PRICES AND WORLD OIL PRICES

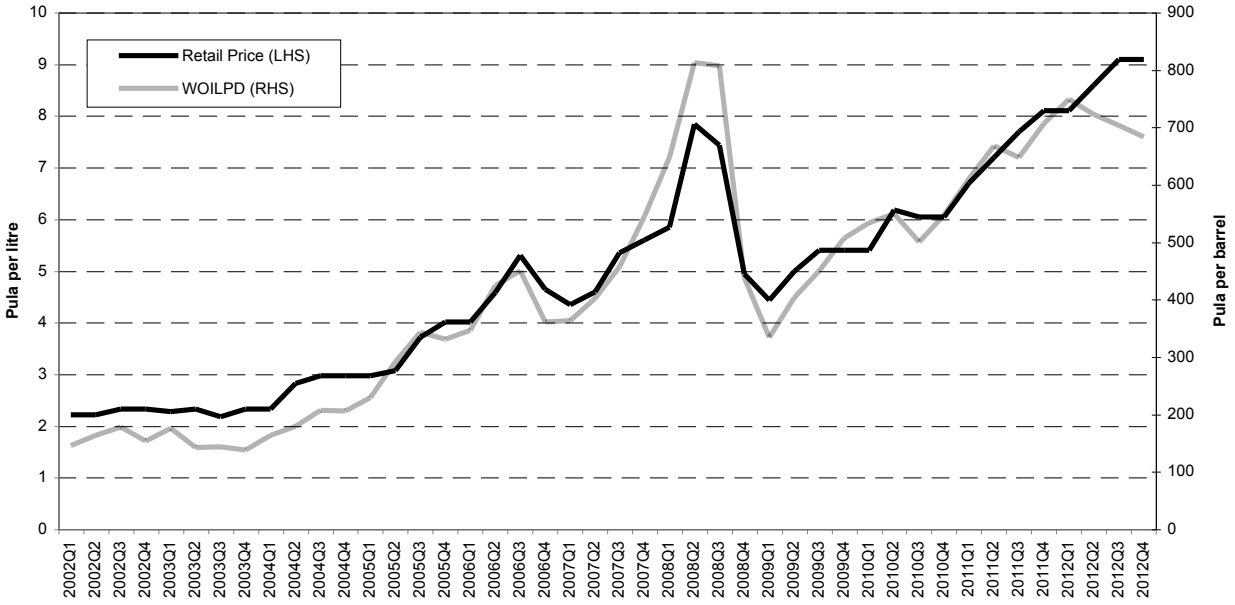
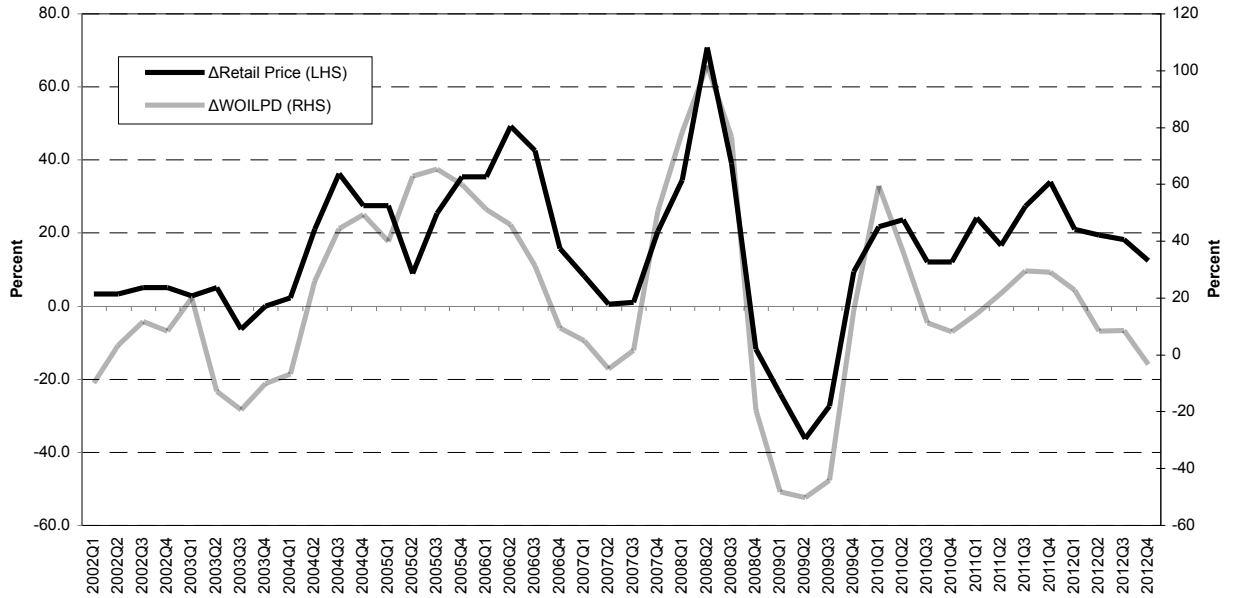


CHART 6 : CHANGES IN DOMESTIC RETAIL PRICES AND WORLD OIL PRICES



impact on domestic inflation is also influenced by administrative issues associated with adjustment of domestic retail fuel prices in response to changes in the price of oil internationally. Charts 4 and 5 illustrate the relationship between domestic retail fuel prices and world oil prices. According to the illustration, although the level of domestic retail fuel prices tracks the level of world oil prices in domestic currency very well (Chart 5), albeit with a lag, in terms of magnitude, the extent to which domestic retail fuel prices are adjusted following changes in world oil prices is smaller and this is evident in Chart 6, which plots changes in domestic retail fuel prices and world oil prices as opposed to levels.

3. EMPIRICAL LITERATURE

There is a wealth of literature on the importance of oil prices as a determinant of inflation. According to Trung et al. (2011), movements in oil prices receive considerable attention due to their presumed impact on macroeconomic variables. For example, higher oil prices may reduce economic growth, generate stock exchange panics and cause inflation, which may lead to monetary and financial instability. Among others, Kiptui (2009) investigated the oil price pass-through to inflation in Kenya and concluded that oil price changes contribute to changes in inflation in Kenya. The study found that oil price changes have short-run (incomplete) and long-run (complete) effects on inflation, with the incomplete pass-through estimated at 0.05 and the complete pass-through at 0.1, implying that a 10 percent increase in oil prices contributes 0.5 of a percentage point and 1 percentage point, respectively, to the rate of inflation in the short run and long run, respectively. The paper also found that inflation in Kenya is highly influenced by aggregate demand conditions as captured by the output gap.

In an almost similar study, Paiva (2010) sought to investigate the relationship between oil prices and inflation in Brazil from 1994 to 2008. The period covered two distinct periods of the country's monetary policy framework being Exchange Rate Targeting from 1994 to 1998 and Inflation Targeting (IT) since 1999. Therefore, in addition to providing an estimate of the overall impact of oil prices on inflation in Brazil, the paper also investigated whether the impact had changed after the adoption of IT. Graphical analysis and a VAR model were used as investigative tools. The study revealed that, although the pass-through of the cost of oil to domestic fuel prices had increased over the period of study, the impact on inflation had declined under IT. This development was attributed to the effect of forward looking behaviour in the formation of inflation expectations and in the credibility of monetary policy in reducing the inflationary impact of higher fuel prices.

Le Blanc and Chinn (2004) estimated the effect of oil price changes on inflation for the United States (US), United Kingdom (UK), France, Germany and Japan using the Phillips Curve framework. They found that oil price increases had only a modest impact on inflation expectations in those countries. Their statistical estimates indicated that oil price increases of as much as 10 percent were expected to add between 0.1 and 0.8 percentage points to inflation. They attributed these findings to a number of factors, including: reduction in the oil intensity in production, reduction of formal and informal backward-looking wage indexing arrangements (which might, in turn, reflect declining power of trade unions), which removed the mechanism that passed energy price increases quickly through the economy in past oil shocks, the strengthening of competition in product markets which slowed down or limited the extent to which oil prices and induced wage effects could be passed on to consumers. Most importantly, greater importance attached to price stability as a goal of monetary policy has also prevented oil-induced wage-price spirals.

The study by Klau et al. (2001), which sought to establish the determinants of inflation in emerging market economies found that, despite the fact that conventional determinants of inflation, such as the output gap, monetary growth and wages have a significant influence on inflation; supply factors also affected inflation in a large number of countries. In particular, food prices emerge as the most common inflation determinant in almost all emerging market economies, followed by the exchange rate. In contrast, the study concluded that inflation and oil price shocks are only weakly associated. The paper further notes that the size of the overall price impact, even if the shock is temporary, depends on how important the sector in question is for overall consumer inflation. For example, food accounts for a relatively large share of the consumer price index basket in emerging market economies compared to industrialised countries.

It is important to note that sharp increases in food and energy items do not only raise short-run inflation by virtue of their weight in the consumer basket, but also, they can cause a sustained rise in the inflation rate through higher inflation expectations and through second round effects such as the impact of fuel on transport costs. However, Le Blanc and Chinn (2004) argue that the importance of oil in production and consumption across countries may be offset by differences in inflationary transmission mechanisms with respect to wage setting institutions. For example, countries with stronger labour unions may be more prone to wage-price spirals than those with weaker unions, irrespective of energy intensities in production. The study argues that, since labour unions are more powerful in Europe than in the United States, they are more likely to extract higher wage concessions in response to rising consumer prices for energy related goods and services. Secondly, since product market competition is less intense in Europe, producers are more likely to trigger a wage-price spiral in Europe, whereas workers in the United States are more likely to absorb higher oil prices through higher retail fuel prices and increases in the prices of other energy intensive goods and services.

4. METHODOLOGY AND THEORETICAL BASIS

This paper employs a Phillips Curve model to estimate the effect of world oil prices on Botswana inflation. A detailed description and evaluation of the Phillips curve is given in the Appendix. The Phillips Curve has, over the years, gained credibility as a model of inflation among economists and policymakers alike. According to Humphrey (1985), at least three factors probably contributed to this level of confidence in the Phillips Curve. The first factor is the relative resilience of the Phillips Curve relationship. For example, it is said that the same Curve estimated for the pre-World War I period (i.e., 1861-1913) was able to fit the United Kingdom data for the post-World War II period (1948-1957) equally well, which is believed to be empirically uncommon in a two-variable relationship over such a long period of time. Second, the Phillips Curve is able to accommodate a wide variety of inflation theories. Theoretically, the Phillips Curve views inflation as resulting from excess demand that bids up wages and prices. It postulates that there is an inverse relationship between the rate of unemployment and inflation.

It is generally understood that excess demand can be a result of shifts in either demand or supply. Therefore, a demand-pull theorist could argue that excess demand-induced inflation emanates from excessively expansionary aggregate demand policies, while a cost-push theorist could, instead, claim that it results from trade union monopoly power and real shocks operating on labour supply. Therefore, economists belonging to rival schools of thought could accept the Phillips Curve as offering insights into the nature of the inflationary process even while disagreeing on the causes of and appropriate remedies for inflation. Finally, given the trade-off relationship between inflation and unemployment, the Phillips Curve appeals to policymakers because it provides a convincing rationale for apparent failure to achieve both zero unemployment and price stability at the same time. Many people tend to think that zero unemployment is equivalent to full employment. However, many economists define full employment as an acceptable level of unemployment somewhere above zero percent. The discrepancy from zero percent arises due to the existence of non-cyclical types of unemployment. Unemployment above zero percent is seen as necessary to control inflation i.e., to keep it from accelerating. This view is based on a theory centering on the concept of the Non-Accelerating Inflation Rate of Unemployment (NAIRU); the majority of economists mean NAIRU when speaking of "full" employment. The NAIRU is also known as the "natural" rate of unemployment. Therefore, the central bank has to choose between implementing a contractionary monetary policy to fight inflation and an expansionary policy to stimulate growth.

The Pass-through Equation

We estimate a Phillips Curve model as given in equation (1) below;

$$\Delta CPI_t = \alpha + \beta \Delta CPI_{t-1} + \gamma(y_{t-1} - \bar{y}_{t-1}) + \theta \Delta oilp_{t-1} + \lambda \Delta EXCH_{t-1} + \varphi \Delta SACPI_t + \tau dumoil + \varepsilon_t \quad (1)$$

Where ΔCPI is the annual change in the logarithm of the consumer price index (CPI), y and $\bar{y}$ are real Gross Domestic Product (GDP) and the Hodrick-Prescott filtered trend of real GDP, respectively. $\Delta oilp$ is the annual change in the logarithm of the price, in US dollars, of a barrel of oil, $\Delta EXCH$ is the annual change in the logarithm of the nominal exchange rate which is quoted as BWP per US dollar, $\Delta SACPI$ is the annual change in the logarithm of the South African consumer price index (CPI). The variable $DUMOIL$ is a dummy variable representing the oil price spike experienced in the second quarter of 2008, while ε_t represents a shock to inflation or off-model effects.

The short-run pass-through, also referred to as the incomplete pass-through, is given by the estimated coefficient of the oil price variable θ, while the complete or long-run pass-through of a change in the oil price to inflation usually defined as the ratio of the oil price inflation to general inflation is obtained through equation (2) below. θ and β are coefficients for the oil price change and domestic inflation, respectively, as given in equation (1).

$$\Omega = \frac{\theta}{1-\beta} \quad (2)$$

5. MODEL ESTIMATION AND RESULTS

Model Estimation

The process of estimating the model starts with subjecting the constituent variables to a stationarity test using the Augmented Dickey Fuller (ADF) and Phillips Perron tests. The variables include the log of CPI, log of the world oil prices (WOILP), log of the nominal exchange rate (BWP/USD), log of the South African CPI (SACPI) and log of the non-mining output gap (YGap). All the variables, except YGap, were found to have unit roots implying that they are not stationary (Table 1 overleaf). They, therefore, have to be differenced once to make them stationary prior to estimation.

The estimated model was also subjected to diagnostic tests for normality, serial correlation, heteroscedasticity and stability. The diagnostic tests (Table 2 overleaf) indicate that the errors of the estimated equation are normally distributed and that there is no serial correlation at the five percent level. Similarly, there is no presence of heteroscedasticity in the estimated equation, while its parameters are stable.

Results

This study finds that world oil prices and domestic inflation have a positive relationship, which is also statistically significant at the five percent confidence

TABLE 1: UNIT ROOT TESTS

Variable	Augmented Dickey Fuller	Phillips Perron	Stationarity
Log of CPI	–2.82 (0.19)	–2.53 (0.31)	No
Δ log of CPI	–4.24 (0.00)	–4.77 (0.00)	Yes
Log of WOILP	–3.29 (0.08)	–2.38 (0.38)	No
Δ log of WOILP	–5.98 (0.00)	–6.54 (0.00)	Yes
Log of SACPI	–2.66 (0.25)	–1.71 (0.73)	No
Δ log of SACPI	–2.45 (0.34)	–4.31 (0.00)	Yes
Log of BWP/USD	–1.02 (0.73)	–1.21 (0.66)	No
Δ log of BWP/USD	–5.43 (0.00)	–5.40 (0.00)	Yes
YGap	–4.59 (0.00)	–4.54 (0.00)	Yes

Note: Values in parentheses are probabilities. The null hypothesis for the ADF and PP tests are that the series is non–stationary. We reject the null hypothesis when the probability is lower than 0.05 or 5 percent. Conversely, we fail to reject the null hypothesis when the probability is greater than 5 percent. Log of SACPI is non–stationary even after the first difference in the case of the Augmented Dickey Fuller test but it is stationary in the case of the Phillips Perron test.

TABLE 2: DIAGNOSTIC TESTS

Diagnostic Test	Test Statistic	Probability	Conclusion
Normality	JB = 1.493	0.474	Passed
Serial Correlation	LM = 1.200	0.313	Passed
Heteroscedasticity	ARCH = 0.192	0.663	Passed
Stability	Ramsey RESET = 2.921	0.096	Passed

Note: The null hypothesis for Normality is that the model residuals are normally distributed, for Serial Correlation is that there is no serial correlation, for Heteroscedasticity is that there is no heteroscedasticity and, lastly, for Stability is that the coefficients of the model are stable. In each case, we fail to reject the null if the probability is greater than 0.05 or 5 percent.

interval. However, world oil prices influence domestic inflation with a lag. Other variables such as South African inflation, the nominal exchange rate, the non-mining output gap and the dummy variable have, as expected, positive and statistically significant relationships with domestic inflation (Table 3). However, although inflation persistence, as captured by lagged inflation also has a positive relationship with inflation, the relationship is statistically insignificant. The positive coefficients suggest that domestic inflation increases following a rise in South African inflation and world oil prices. In addition, inflation inertia (effects of lagged inflation) and an increase in aggregate demand, as captured by the output gap, also contribute to a rise in inflation.

The pass-through of a rise in world oil prices to domestic inflation is estimated at 0.01 and 0.02 in the short and long run, respectively. This implies that a 10 percent increase in world oil prices adds 0.1 and 0.2 percentage points to overall inflation in the short and long run, respectively. Although this is a relatively low pass-through compared to, for example that found by Kiptui (2009) for Kenya which is 0.5 of a percentage point and 1 percentage point in the short run and long run, respectively. Le Blanc and Chinn (2004) estimated the pass-through for the US, UK, France, Germany and Japan between 0.1 and 0.8 percentage points.

TABLE 3: REGRESSION RESULTS

Variable	Coefficient	Standard Error	t-statistic	Probability
Constant (C)	0.0104	0.0025	4.1135	0.0002
Δ log of CPI (-1)	0.1626	0.1018	1.5970	0.1183
Δ Log of WOILP (-1)	0.0146	0.0067	2.1789	0.0354
Δ Log of SACPI	0.4329	0.0898	4.8223	0.0000
Δ Log of BWP/USD	0.0355	0.0175	2.0345	0.0487
DUMOIL	0.0178	0.0074	2.4133	0.0206
YGap	0.0794	0.0355	2.2379	0.0310

The relatively low pass-through in Botswana relative to Kenya could be attributed to the fact that Kenya's output production is more energy intensive (oil constitutes a larger proportion of energy resources) compared to that in Botswana (Table 4). This is despite the fact that Botswana is highly dependent on diamond mining, an energy-intensive industry. This notwithstanding, the high value of diamond exports relative to the energy needed to extract them as well as the relatively limited industrial development are some of the reasons making the country one of the least energy-intensive economies globally. Energy intensity refers to the energy efficiency of a country's economy. It is calculated as units of energy per unit of GDP. High energy intensities indicate a high price or cost of converting energy into GDP while low energy intensities indicate the opposite. It is important not to confuse it with energy use. Many factors can influence an economy's overall energy intensity. Energy intensity may reflect requirements for general standards of living and weather conditions in an economy. It is not, therefore, atypical for particularly cold or hot climates to require greater energy consumption in homes and workplaces for heating (furnaces, or electric heaters) or cooling (air conditioning, fans, refrigeration).

TABLE 4: LIST OF SELECTED COUNTRIES BY ENERGY INTENSITY (I.E., UNITS OF ENERGY PER UNIT OF GDP)

Country	Energy Intensity
Namibia	102.0
Botswana	120.3
Italy	122.8
United Kingdom	141.2
Spain	142.5
Germany	163.9
France	170.5
United States	221.7
South Africa	265.1
Angola	322.6
Zimbabwe	374.6
Mozambique	409.0
Kenya	467.6
Zambia	729.4

Source: 2003 World Resources Institute Annual Report

Energy efficiency of appliances and buildings (i.e., building materials, design and insulation), fuel economy of vehicles, vehicular distances travelled (frequency of travel or larger geographical distances), better methods and patterns of transportation, energy rationing or conservation efforts, 'off-grid' energy

sources, and stochastic economic shocks such as disruptions of energy due to natural disasters, wars, massive power outages, unexpected new sources, efficient uses of energy or energy subsidies may also impact on the overall energy intensity of a nation. Thus, a nation that is highly economically productive, with mild and temperate weather, have demographic patterns of work places close to home, uses fuel efficient vehicles, and supports mass transportation and the use of bicycles, will have a far lower energy intensity than a nation that is economically unproductive, with extreme weather conditions requiring heating or cooling, long commutes, and extensive use of generally poor fuel economy vehicles. Furthermore, the low pass-through of world oil prices to inflation observed across countries could also be partly a result of the existence of the energy petroleum funds, which cushion consumers against volatile and huge increases in international oil prices.

6. Conclusion

Understanding the pass-through of world oil prices to inflation is crucial as it helps monetary authorities anticipate effects of oil shocks on inflation and, thus, informs implementation of monetary policy. The process of projecting inflation can benefit immensely from knowledge of the pass-through of world oil prices to inflation. To derive estimates of the oil price pass-through to inflation in Botswana, this paper employs a traditional Philips Curve model which was, however, augmented by addition of three variables namely; the world oil prices, the South African inflation and a dummy variable in the year 2008 to improve the model fit. World oil prices are added to ascertain their pass-through to domestic inflation, while South African inflation accounts for spill-overs to domestic inflation from price developments in South Africa. The dummy variable bridges the structural break caused by the oil price spike of 2008 and this improves the model fit.

Based on the model output, we conclude that world oil prices are a determinant of inflation in Botswana and the two have a positive and statistically significant relationship. The measure of oil price pass-through is estimated at 0.1 and 0.2 percentage points in the short and long run, respectively. This pass-through is low by international standards ((see Kiptui (2009) and Le Blanc and Chinn (2004)). However, the generally low pass-through of oil prices inflation to overall inflation is widely observed across countries.

The apparent decline in the pass-through from oil prices to inflation could be attributed to a number of factors. First, is the existence of a low-inflation environment relative to that prevailing during the period of the 1970s and 1980s oil price shocks. The low-inflation environment is a result of improved monetary policy formulation[2] and implementation, as well as the associated credibility gains. This inhibits the increase in oil prices from causing acceleration in inflation, as expectations of low inflation are already anchored and, as such, second round effects of oil price shocks are reduced. However, it can also be argued that inflation is able to remain low in some countries due to weak labour unions, which fail to bid-up wages. Second, countries have experienced a decline in oil intensity or the importance of oil as an input in production; and this tends to reduce the inflation and output impacts of oil price spikes. Third, as a result of the effects of earlier oil price shocks, in some instances domestic oil prices are regulated and this helps to buffer oil price shocks. Regulation may involve centralised price setting, establishment of stabilisation funds and/or strategic oil reserves. Finally, the increase in oil prices in the recent years has been largely caused by high demand[3] as opposed to supply shocks as in the earlier episodes. These factors may not all apply to Botswana but some of them are certainly relevant. Overall, the reduced oil price pass-through calls for a milder reaction to oil price increases by monetary policy, mainly focusing on second round effects of such developments.

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Statistics Botswana, Consumer Price Indices Release, various issues.

2 Central banks around the world have become increasingly independent, with a clear mandate for price stability and some have even adopted inflation targeting as a monetary policy framework.

3 An expansion in demand for all commodities, rather than just oil, generates an appreciation in the currencies of commodity-exporting countries, which offsets the impact of world oil prices in these countries and makes the shock milder in terms of domestic currency.

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Appendix: The Evolution of the Phillips Curve Analysis

The Phillips Curve is founded on the idea of a trade-off relationship between inflation and unemployment. The idea was first muted in the monetary doctrines of David Hume (1752) and Henry Thornton (1802). Irving Fisher (1926) also had this idea, but viewed causation as running from inflation to unemployment, rather than vice versa. Jan Tinbergen (1936), as well as Lawrence Klein and Arthur Goldberger (1955), formalised the idea into an econometric equation. The idea was graphed on a scatterplot chart by A. J. Brown (1955) and presented in the form of a diagrammatic curve by Paul Sultan (1957). Although a number of people made incremental developments to this idea of inflation-unemployment trade-off, it was not until 1958 that modern Phillips curve analysis can be said to have begun following the publication of Professor A. W. Phillips' famous article in which he fitted a statistical equation, w = f (U), to annual data on the percentage rates of change of money wages (w) and the unemployment rate (U) in the United Kingdom for the period 1861-1913. The relationship represented the response of wages to excess demand for labour as represented by the inverse of the unemployment rate. Plotting wages on the vertical axis and unemployment on the horizontal axis, the result was a negatively sloped graph where low unemployment represented high excess demand and thus upward pressure on wages. The greater the excess demand for labour the faster the rise in wages. Similarly, high unemployment represented negative excess demand (i.e., excess labour supply) that put deflationary pressure on wages. Since the rate of change of wages varied directly with excess demand which, in turn, varied inversely with unemployment, wage inflation would rise with decreasing unemployment and fall with increasing unemployment, as indicated by the negative slope of the curve. Finally, since increases in excess demand would likely run into diminishing marginal returns in reducing unemployment, it followed that the curve must be convex, implying that successive uniform decrements in unemployment would require progressively larger increments in excess demand (and thus wage inflation rates) to achieve them.

Source: Humphrey, T.M., 1985, available at http://www.scribd.com/doc/8420072/T-Humphrey-The-Evolution-and-Policy-Implications-of-Phillips-Curve-Analysis

Excess Liquidity and Monetary Policy Strategy in Botswana: An Overview of the Issues

Moemedi Phetwe[1]

Abstract

The paper discusses the challenging incidence of surplus liquidity in Botswana's financial system which occurred as a result of recurring surpluses in the country's balance of payments over the years. Clearly, this has important implications for Botswana's exchange rate and monetary policy objectives and operations. The strategy of foreign exchange reserve accumulation, resisting excessive nominal exchange rate appreciation and sterilisation of excess liquidity in the financial system has so far served the country well. The success of this strategy may be partially attributed to market imperfections, which allowed the authorities to set objectives for both the domestic monetary and exchange rate policies. Looking ahead, there is a possibility that the large liquidity surpluses that have been a feature in Botswana's financial system could disappear, and in such circumstances, BoBC's may cease to be issued and the Bank may assume the role similar to that of many other central banks of providing liquidity to the banking system. In addition, the Botswana market is likely to be more integrated with the global financial markets, and this may ultimately result in the need to resolve conflicts emerging from the pursuit of multiple objectives (crawling band exchange rate regime and the 3 – 6 percent medium term inflation objective). Therefore, there is need to continuously monitor developments, and, when appropriate, make necessary adjustments to the existing framework based on changing economic conditions, with a view to guarding against risks that may lead to any disorderly exits, or severe pressures on the current exchange rate arrangement.

1. Introduction

Monetary policy in Botswana aims at maintaining price stability as defined by a medium-term inflation objective of 3–6 percent. The formulation and implementation of monetary policy in Botswana is not without critics, with questions relating to its: (a) implementation given a fixed/crawling peg exchange rate regime and an open capital account; (b) effectiveness, where there is persistent structural surplus liquidity; and (c) sustainability of implementation, given the potential for large sterilisation costs. All these questions are interrelated; the purpose of this paper is to illuminate these challenges and prospects for tackling them.

The paper is structured as follows. Section 2 discusses the sources of structural surplus liquidity in Botswana, highlighting the government's concerns about exchange rate appreciation pressures that may be detrimental to the overall objective of economic diversification. Section 3 reviews the monetary policy strategy, discussing, in particular, the multiple policy objectives (crawling band exchange rate regime and the 3 – 6 percent medium-term inflation objective) and their implications for the policy formulation in an environment of free capital mobility and structural excess liquidity. Section 4 assesses the achievements under the policy framework. Section 5 examines the possible costs of implementing monetary policy; and finally, Section 6 makes some concluding remarks.

2. Excess Liquidity and its Source in Botswana

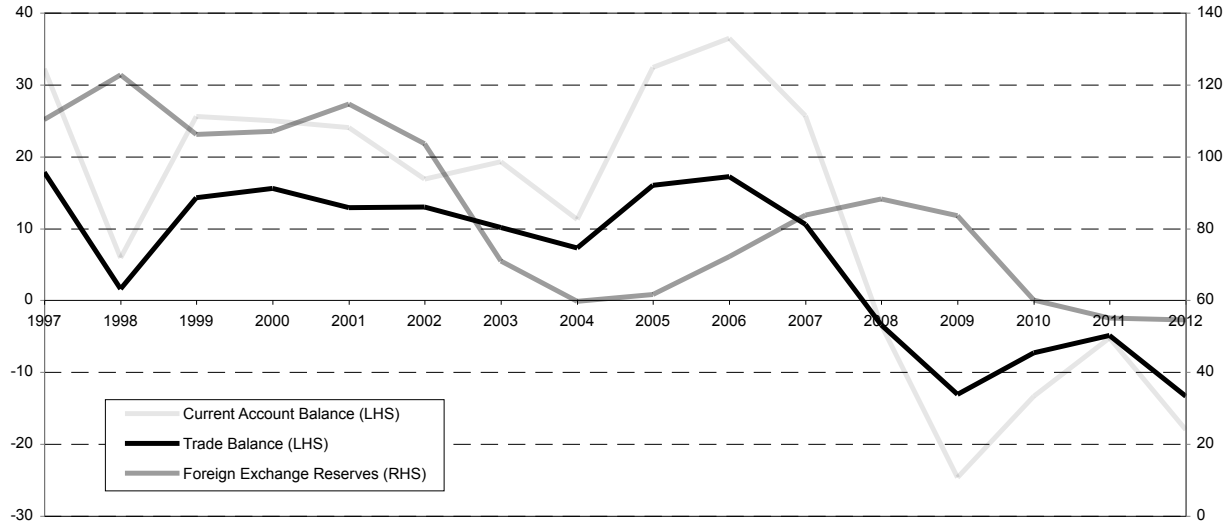
Botswana has consistently maintained current account surpluses over the period from 1998 to 2011 (Chart 1), except during the recession of 2008 and 2009. These surpluses were influenced by inflows from trade, where, since the discovery of diamonds shortly after independence in 1966, Botswana became the largest producer of diamonds in the world by value. Exports of goods and services contributed around 40 percent to GDP over the past decade, while the trade and the current account balance surpluses averaged around 12 percent and 10 percent of GDP, respectively, between 1998 and 2008 (Chart 1). The financial account, however, has been negative, driven mainly by portfolio investment abroad. Nevertheless, foreign direct investment was positive during the same period (Chart 2)[2].

The large and persistent foreign exchange inflows, especially from diamond sales, had the potential to induce currency appreciation pressures. Government has adopted the overall strategy of diversifying the economy beyond minerals, and any significant unchecked exchange rate appreciation could have undermined attainment of this objective. Therefore, Government decided to maintain a managed exchange

1 Acting Deputy Director, in charge of Monetary Policy and Forecasting, Monetary and Financial Stability Department. The views expressed in the paper are those of the author and do not necessarily reflect those of the Bank of Botswana.

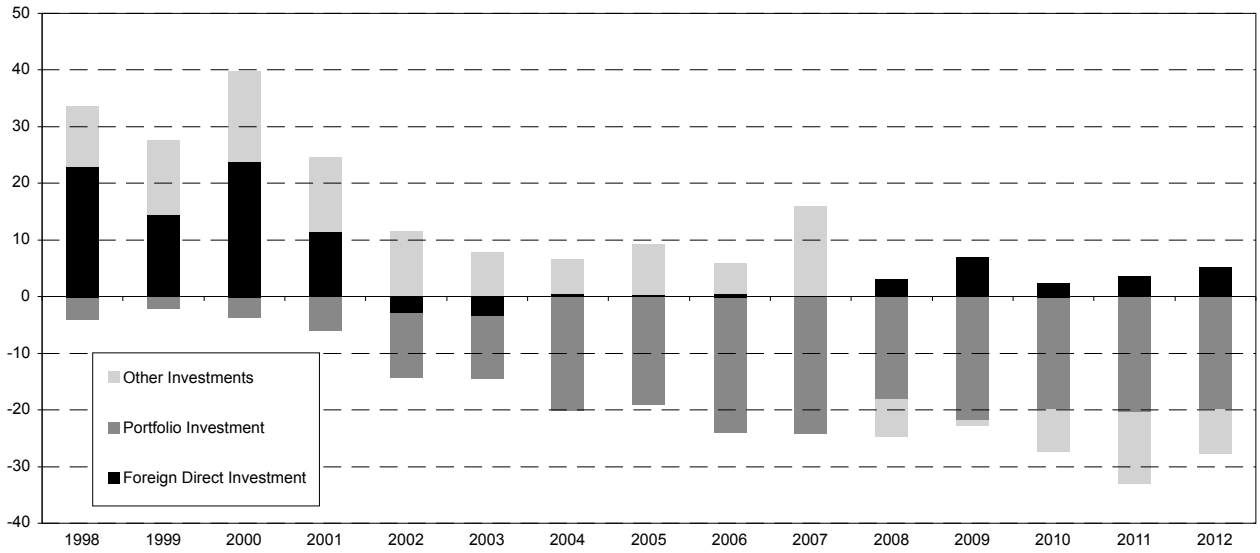
2 It is worth noting that there are significant estimation problems that may have led to some under- recording of financial inflows.

CHART 1: TRADE, CURRENT ACCOUNT BALANCES AND FOREIGN EXCHANGE RESERVES (AS A PERCENT OF GDP)



Source: Bank of Botswana

CHART 2: NET PRIVATE FLOWS TO BOTSWANA (AS A PERCENT OF GDP)



Source: Bank of Botswana

rate policy in order to restrain any currency appreciation pressures. In particular, there was concern about the possible crowding out of the manufacturing sector and other growth-generating economic activities by the diamond resource boom. Hence, Botswana sought to avoid the so called "Dutch Disease" often associated with commodity booms. Therefore, from its introduction in 1976, the exchange rate of the Pula was fixed to the US dollar[3] and from June 1980 to a trade-weighted basket of currencies, including the Special Drawing Right (SDR) of the IMF and the South African rand. However, with a fixed exchange rate regime, there was substantial accumulation of foreign exchange reserves, averaging around 80 percent of GDP between 2001 and 2010 and managed by the Bank of Botswana.

Overall, the combination of sustained current account surpluses, a fixed exchange rate[4] framework, limited absorptive capacity and partial sterilisation[5] led to a surge in liquidity surplus in the financial system. This gave rise to concerns about the impact of

3 From independence in 1966 up to 1976, Botswana was in the Rand Monetary Area, a regional monetary union controlled by South Africa, which also includes Lesotho, Namibia and Swaziland. Therefore, Botswana could not pursue an independent monetary policy.

4 Under a floating exchange rate regime, theory postulates that the exchange rate will appreciate over time, making exports more expensive and gradually offsetting the current account surplus.

5 The commercial banking system benefited from a large portion of liquidity flowing into the domestic economy as a result of the increase in exports and through government expenditure. Coupled with the view that there were few viable lending opportunities in the economy, this resulted in commercial bank's deposits at Bank of Botswana being well in excess of the legally required levels and, therefore, there was a growing level of excess liquidity in the financial system.

Table 1: Chronology of exchange rate events

DATE	ACTION	COMMENTS
Pre-1976	Part of the Rand Monetary Area (RMA)	Exchange rate and monetary policies not independent – Botswana was dependent upon South Africa's policy frameworks
August 1976	Introduction of the Pula pegged to US dollar at P1 = USD1.15 (Pula also at par with the rand)	Pula pegged to the US dollar at the same rate as Rand/ US dollar peg
April 1977	5 percent Pula revaluation	Anti-inflationary measure
September 1979	Rand taken off US dollar peg and SA introduced managed float	Rapid appreciation of the rand against the US dollar as gold prices rose
June 1980	Pula taken off US dollar peg and Pula basket consisting of the SDR and rand introduced	To reduce volatility of rand/Pula exchange rate
November 1980	5 percent Pula revaluation	Anti-inflation measure to curb imported inflation following Pula depreciation against rand and accelerated inflation in South Africa
January 1981	Steep drop in world gold price (from USD 850 in January 1980 to USD 493.75 per ounce in January 1981)	RSA exports earnings decline significantly and rand depreciates rapidly. Therefore, Pula depreciates against major currencies and appreciates against the rand
May 1982	10 percent Pula devaluation	Part of stabilisation measures in response to 1981/82 balance of payments crisis
February 1984	RSA freezes debt payments and run on the rand	Rapid depreciation of the Pula against the US dollar as rand deteriorated; Pula appreciates against the rand
July 1984	5 percent Pula devaluation	To improve competitiveness as Pula appreciated against rand following rand collapse largely due to economic imbalances and loss of confidence in South Africa
August 1984	rand weight in Pula basket adjusted	To reduce drift of Pula from rand as rand deteriorated against US dollar
January 1985	15 percent Pula devaluation	Further competitiveness measures in response to rapid Pula appreciation against the rand
January 1986	New Pula basket introduced	In response to the rapid Rand appreciation against the US dollar following the re-introduction of the Financial rand
June 1989	5 percent Pula revaluation	Anti-inflation measure to curb imported inflation
August 1990	5 percent Pula devaluation	Competitiveness measure
August 1991	5 percent Pula devaluation	Competitiveness measure
September 1991	Zimbabwean dollar introduced to the Pula basket	To capture the increase of trade with Zimbabwe (both imports and exports)
June 1994	Technical adjustment and the removal of the Zimbabwean dollar from the basket	Changes made to Pula basket to reflect changes in trade patterns and aimed at maintaining competitiveness and real exchange rate stability
February 2004	7.5 percent devaluation of the Pula	Competitiveness measure
May 2005	12 percent devaluation of the Pula	Competitiveness measure
May 2005	Adoption of the crawling band mechanism	To avoid the need for large discrete adjustments to the exchange rate
February 2013	Announcement of the Pula basket weight (55 ZAR : 45 SDR) and rate of crawl (–0.16 percent per annum)	To foster transparency in the operation of the exchange rate mechanism

Source: Bank of Botswana

the surplus liquidity on growth in money supply and credit that could lead to high inflation, negative real interest rates, real exchange rate appreciation and the deterioration in the non-mineral trade account balance.

It is important to indicate that a substantial amount of the foreign exchange inflows was, however, effectively sterilised in the banking system. In particular, Government deposits at the Bank of Botswana were increased, while the Bank of Botswana also offered a deposit taking facility for certain large private depositors (one large depositor was Debswana by then) and some of the parastatals (prior to 1991). Moreover, from 1991, the Bank of Botswana sterilised the excess liquidity through open market operations, so that monetary and financial stability objectives were not compromised.

3. Botswana's Exchange Rate and Monetary Policy: Formulation and Implementation

Exchange Rate Policy

Botswana's exchange rate policy has evolved over time (Table 1). The main objective of exchange rate policy is to achieve and maintain competitiveness of local producers of tradable goods and services in both international and domestic markets, so as to support

the national objectives of economic diversification and employment creation (Bank of Botswana Annual Reports). This is achieved through maintaining a stable real effective exchange rate (REER) of the Pula against a basket of currencies of major trading partners' countries, comprising the IMF Special Drawing Rights (SDR) and the South African rand. The crawling band exchange rate mechanism was introduced in May 2005 to help maintain stability of the REER through a continuous gradual adjustment of the nominal effective exchange rate (NEER) of the Pula at a rate based on the differential between the Bank's inflation objective and forecast inflation of Botswana's trading partner countries. In the 2013 Budget Speech, the Minister of Finance and Development Planning announced that Government had decided to disclose both the rate of crawl (-0.16 percent per annum) and weights (55 percent South African Rand and 45 percent SDR) in the Pula basket to foster transparency in the operation of the exchange rate mechanism.

Prior to 1999, Botswana had relatively liberal exchange controls, with no restrictions on current account transactions. The remaining exchange controls on capital account transactions were abolished in February 1999. Under full capital account liberalisation, the rigidity of the exchange rate is expected to constrain monetary policy independence. In such a scenario, it can be difficult for the central bank to use interest rates as a monetary policy instrument to meet domestic policy objectives. Thus, the standard textbook argument that under conditions of open capital account, monetary policy would be ineffective in small open economies with fixed exchange rates (Samuelson and Nordhaus, 1998). This is because any increase in interest rates by the Bank in response to anticipated higher inflation will, in normal circumstances, be expected to lead to capital inflows, and an increase in money supply, resulting in lower interest rates and, therefore, offsetting the initial increase in interest rates. In short, any monetary policy action by the Bank of Botswana would be immediately offset through capital inflows or outflows, so that monetary conditions will remain unchanged; with the result, therefore, that monetary policy becomes ineffective. Consequently, it is expected that real interest rates in Botswana will not significantly deviate from international real interest rates, as this could create incentives for capital inflows or outflows depending upon whether real interest rates in Botswana are higher or lower than those in international capital markets.

However, there is evidence that capital mobility remains incomplete in Botswana, which provides scope for independent monetary policy, even with a fixed/crawling peg exchange rate[6]. In other words, under the current exchange rate regime, the effectiveness of monetary policy may be reduced, but not entirely eliminated as there seems to be very limited cross-border movements of capital. From the domestic investor perspective, some of the factors that could explain the apparent lack of capital mobility include the (a) lower tolerance for the increased risk associated with holding international assets "home bias"; (b) increased informational requirements; (c) costs associated with investing in offshore markets; and (d) the additional risks with regard to settlement, liquidity, transferability and exchange rate. Similarly, from the international investor perspective, lack of capital mobility could be attributed to: (a) large premiums for inflation, exchange rates[7] and liquidity that are required to affect the desired capital flows; (b) withholding of tax on interest in Botswana that is a deterrent to foreign investors; and (c) the lack of developed financial markets and instruments (relatively low stock of government securities and illiquid money and capital markets and paucity of hedging instruments) and, therefore, limited investment opportunities.

Regulations, in Botswana and elsewhere, and other prudential measures may also act as a form of capital control, contributing to segmentation of money markets across borders. Neighbouring South Africa, which is a likely potential source of investment in Botswana, has exchange control regulations (albeit with high thresholds), which, can restrain financial flows in and out of the country. At the same time, in Botswana, the net open foreign currency position (NOFP) is limited to a maximum of 30 percent of unimpaired capital for commercial banks. As a result, banks have to sell a large share of their foreign currency holdings to the Bank of Botswana in part to comply with the NOFP limit, constraining their ability to deploy surplus liquidity in international markets. Consequently, limited capital mobility allows the Bank of Botswana to use the interest rate instrument towards meeting the objective of a low and stable inflation rate.

Monetary Policy

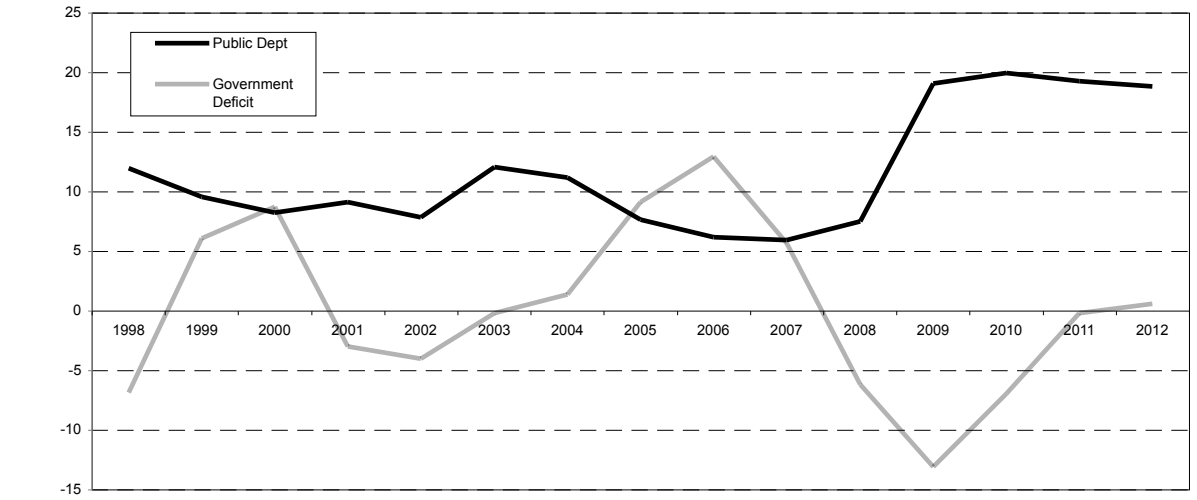
Under the current monetary policy framework, the Bank of Botswana Monetary Policy Committee (MPC) sets monetary policy by determining the policy interest rate, i.e., the Bank Rate[8]. The

6 In the long run, markets will become developed as Government, through the various initiatives and as indicated in the Financial Sector Development Strategy, strives to deepen the financial markets and address the structural bottlenecks that inhibit free capital mobility. This will obviously render the current framework ineffective, prompting a transition to an alternative regimes or frameworks. However, in the medium term, given that these are structural issues that take time to implement, the current framework seems to be the appropriate one.

7 Historically high inflation in Botswana compared to major trading partners and the past unexpected devaluations under the old exchange rate regime are possibly contributing to high risk premiums on inflation and the exchange rate.

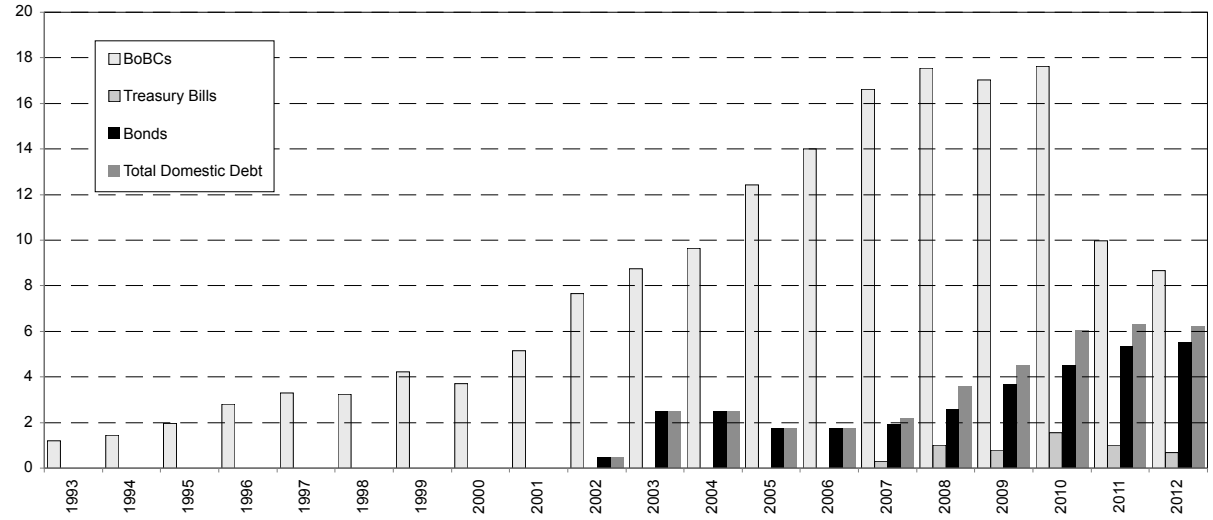
8 The Bank Rate is the interest rate charged by the Bank for short-term borrowing by commercial banks. The

CHART 3: GOVERNMENT DEFICIT AND PUBLIC DEBT (AS A PERCENT OF GDP)



Note: Public debt includes external debt.
Source: Bank of Botswana

CHART 4: TOTAL OUTSTANDING BANK OF BOTSWANA CERTIFICATES AND GOVERNMENT DOMESTIC DEBT (P BILLION)



Note: Public debt includes external debt.
Source: Bank of Botswana

Bank Rate is set taking into account various factors that can influence price and economic developments, and adjusted in response to a sustained deviation of the inflation forecast from the medium-term inflation objective. The Bank Rate is complemented by Open Market Operations (OMO) and Bank of Botswana Certificates (BoBCs) are the main instrument of liquidity management used to steer short-term money market rates, with the aim of influencing lending, deposit and other medium to long term rates, which impact on household and business economic decisions, thereby, ultimately, affecting aggregate demand and inflation. Moreover, reverse repos are used to smooth short-term excess liquidity by banks. Reserve requirements have also been used for sterilisation purposes and to reduce liquidity that is mopped up through BoBCs[9] and, therefore, helped in containing the cost of monetary operations.

Introduced in 1991, BoBCs represent a market-based management of excess liquidity[10] (Chart 4)[11]. This

rate is also a signal for the desired level and direction of banking system interest rates.

9 Prior to 1993, the rate was 8 percent of current deposits, 6 percent of call deposits and 3 percent of savings deposits. The rate was maintained at 3.25 percent of total deposits from December 1993 to January 2006. The rate was then increased from 5 percent in February 2006 to 6.5 percent in November 2010 and 10 percent in July 2011 for average total deposits excluding foreign currency deposits.

10 Excess liquidity is defined here as total liquidity less the bank's required reserves, or alternatively, it is considered as the bank's discretionary deposits at the Bank of Botswana.

11 Such activities were not possible in Botswana in the 1980s. Similarly, as in Botswana, for most developing economies, shallow financial markets constrained central banks' ability to sustain sterilisation interventions.

resulted in enhanced ability to drain excess liquidity from the money market and, therefore, improvement in determination of market interest rates and in controlling inflation. However, in the process, there have been periods when the Bank has incurred rising costs given the need to issue large amount of BoBCs to mop-up the increased level of excess liquidity. Consequently, in November 2011, the Bank decided to reduce the amount of BoBCs issued to absorb the excess liquidity[12]. In addition to the need to moderate costs, this action was taken in recognition that access to BoBCs could impede commercial banks' initiative to seek bankable projects, and, therefore, not support government initiatives aimed at economic development and diversification. Among others, Nyawata (2012) argues that, compared to central bank securities (that have limited externalities to overall market development as participation is often limited to commercial banks), treasury bills are the first best option for absorbing excess liquidity because of the positive externalities[13] for the financial sector and the rest of the economy. However, in Botswana, because of historically large fiscal surpluses (Chart 3), the amount of treasury bills and bonds by the Government is small, leading to insufficient volume of securities and, therefore, slow growth of the capital market. Total outstanding BoBCs increased from around P1.2 billion in 1993 to around P17.6 billion in 2010 before falling to around P5.5 billion in 2013, while total outstanding government bonds and Treasury Bills (introduced in 2003 and a continuous issuance programme initiated in 2008, respectively), increased from P500 million in 2002 to around P6 billion in the first half of 2013[14] (Chart 4).

Therefore, there is considerable scope for the use of government securities to support monetary sterilisation. Nevertheless, the direct cost of issuance will shift to Government, but this should be generally viewed as a necessary precursor to the further development of the money and capital markets in Botswana. Reliance on the Bank's own paper has the drawback that the Bank can incur losses which might erode its credibility and autonomy and, therefore, undermine the effectiveness of monetary policy.

Besides supporting monetary policy to sterilise the excess liquidity in the financial system, an increase in the supply of long-term government debt should be seen in the context of overall capital market development. Various reports, including the Bank of Botswana Annual Report (2005), present other positive externalities from deepening and widening the government securities markets, including: fostering a healthy capital market, improving the functioning of the financial system by putting in place a basic financial infrastructure, including laws, institutions, products, services and complementary markets (repos and derivatives), enhancing the transmission mechanism of monetary policy and providing a risk-free yield curve that other financial markets can use as reference for pricing other financial assets.

However, increasing the issuance of long-term government debt would also require that, there be a sufficient level of consistency in policy formulation and administrative coordination between the monetary and fiscal authorities. These will ensure that the fiscal policy objectives are consistent with the monetary policy objectives and to guard against any unintended negative consequences of issuing excessive government debt[15].

4. POLICY TRACK RECORD

In spite of the crawling peg exchange rate regime constraint, the Bank has managed to control commercial banks' excess reserves over time to maximise the potential for monetary policy to stabilise the rate of inflation. The amount of excess reserves maintained by banks (as a percentage of average deposits in the banking sector) has been relatively stable, averaging 1.9 percent in the late 1990s and 1 percent from 2000 to 2009. Excess reserves declined from 2.8 percent at the end of 2010 to about 0.5 percent in 2013 (Chart 5). This may generally suggest that monetary operations have been effective in absorbing the excess liquidity in the banking system.

The transition to a market-based absorption of excess liquidity and monetary operations in 1991 has strengthened the response of interest rates to monetary policy changes. Unlike in other countries where there are liquidity shortages[16], in

12 See Bank of Botswana Press Release on Excess Liquidity and Monetary Operations (November 2011) where the Bank capped the level of outstanding BoBCs at P10 billion.

13 As indicated in the paper by Nyawata (2012), the positive externalities associated with issuance of government securities include: serving as a benchmark in pricing for other financial assets and therefore a benchmark yield curve that helps to establish the overall credit curve and enable the effective use of market based instruments of monetary policy, dissemination of information (a public good) on inflation expectations and term premiums and provide opportunities for markets to express views on the overall macroeconomic performance and policies as reflected in the level of discounts for securities. The additional beneficial effects of government securities include availing the opportunity for the general public to invest in government paper, as well as distributing the interest income more widely.

14 In February 2011, parliament approved an increase in government bond issuance from P5 billion to P15 billion in an effort to develop the government bond market and increase the scope for government borrowing. The approval of the expanded borrowing programme was at a time when the budget was in deficit. Now that fiscal consolidation has been achieved more quickly than anticipated and the budget is in surplus, it may be a challenge to ensure that the government is willing to increase issuance of its securities to develop the capital markets.

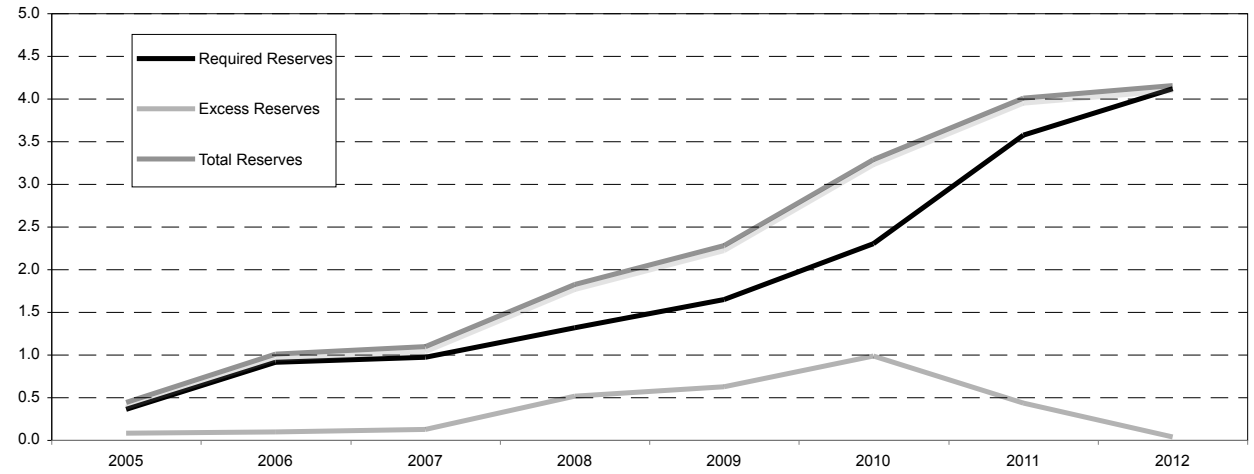
15 This may include possible erosion of Botswana's credit ratings and resultant increase in the cost of capital to the private sector and possibility of government securities squeezing out the private sector and its role in developing financial markets.

16 In a liquidity shortage situation, the central bank, as the ultimate creator of reserves, finds itself in a monopoly position as a lender to the market. Because

Botswana, because of persistent excess liquidity, banks may not be forced to participate in liquidity absorption operations and this can generally be expected to weaken the monetary transmission mechanism. However, the same excess liquidity has enabled the Bank to get banks to participate in its liquidity operations. In the past, this was mainly attributed to the lack of bankable projects in the economy and apparent use of BoBCs by banks as an investment vehicle rather than an instrument for liquidity management. At the same time, commercial banks' lending to private businesses has been relatively modest, given the resources available, possibly a result of information asymmetry and inadequate investment in skills and systems by banks for assessing and monitoring of such credit. Consequently, banks' assets tend to be dominated by BoBCs, which are essentially risk-free assets and for which the Bank was, in the past, prepared to pay the associated costs and lending to a profitable segment of wage earning households.

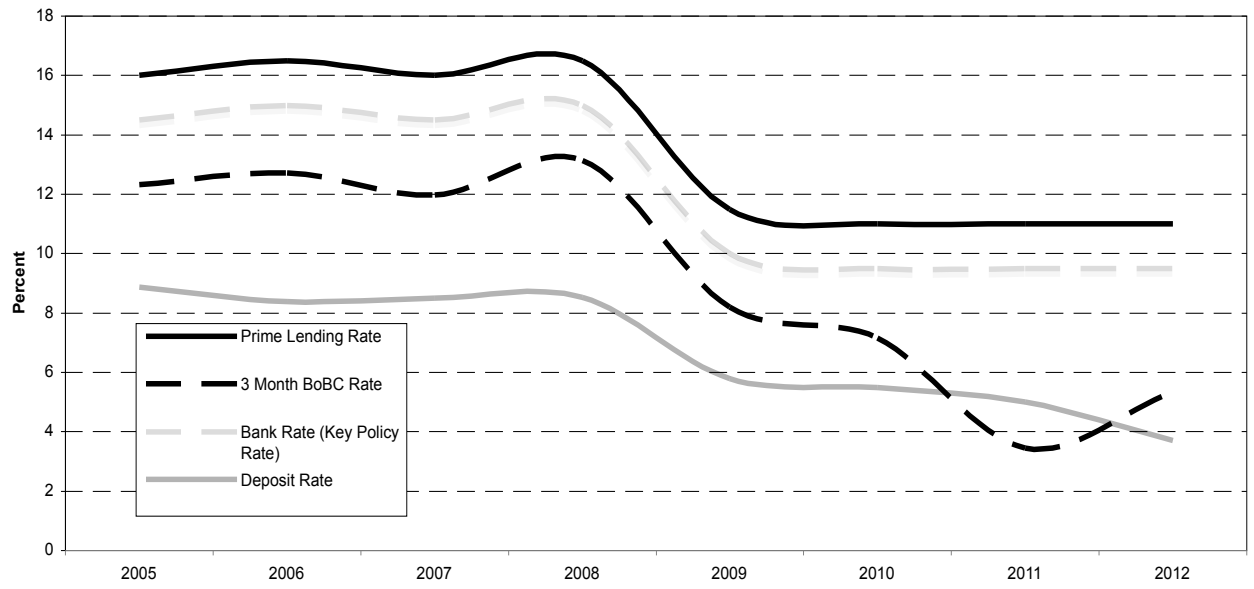
Monetary operations are conducted such that interest rates are generally in line with the Bank of Botswana's overall monetary policy stance (Chart 6). In particular, Chart 6 shows that the Bank Rate (policy rate) pass-through to other market interest

CHART 5: COMMERCIAL BANK RESERVES (P BILLION)



Source: Bank of Botswana

CHART 6: INTEREST RATES

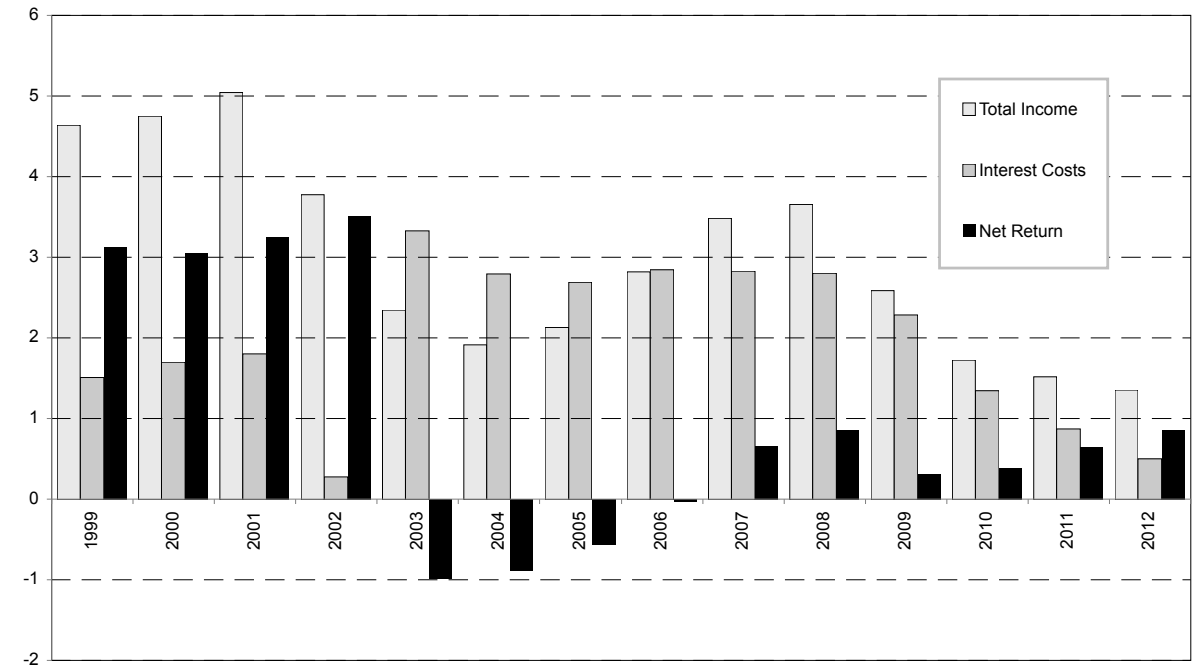


Source: Bank of Botswana

of its position as a monopoly supplier of reserves, the central bank is able to engage in credit transactions with the market as a price setter, thereby setting the marginal price of the bank's liabilities. As a result, the central bank is able to control short-term interest rates, enhancing the monetary transmission mechanism.

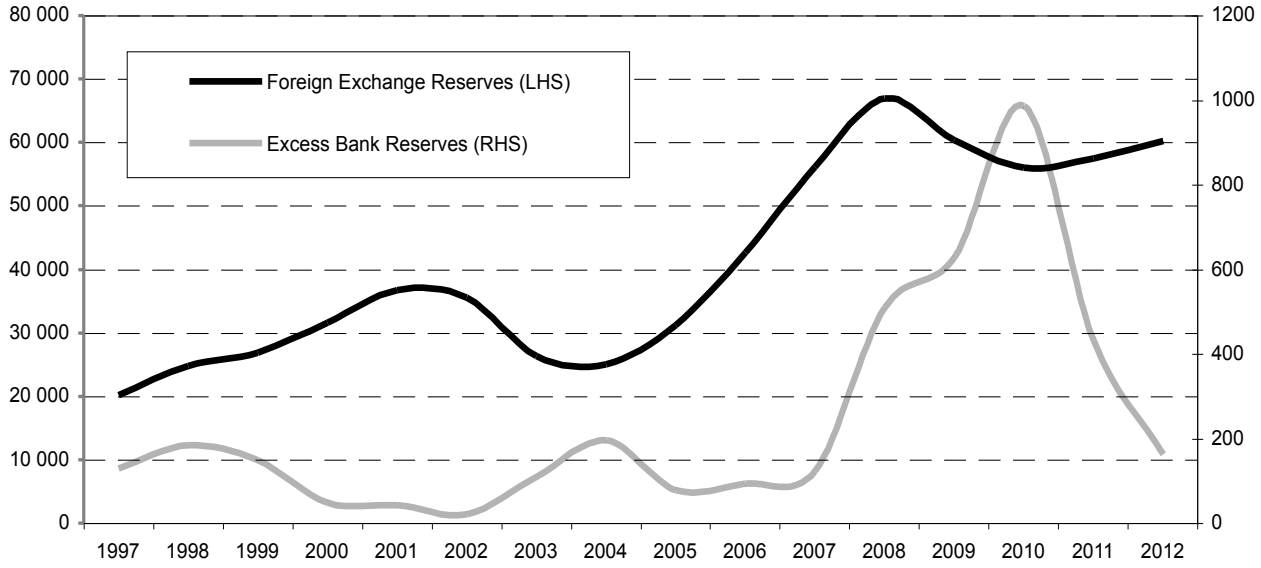
rates is generally fast. However, it is noted that, in November 2011, there was a discretionary move by the Bank to limit issuance of BoBCs in an effort to encourage commercial banks to lend to viable projects that would support economic diversification. In such

CHART 7: NET COSTS OF CONDUCTING OPEN MARKET OPERATIONS



Source: Bank of Botswana

CHART 8: FOREIGN EXCHANGE RESERVES AND COMMERCIAL BANKS' EXCESS RESERVES (P MILLION)



Source: Bank of Botswana

cases, this will normally result in a fall in market rates due to the ample unsterilised liquidity in the market. Therefore, from October 2011, interest rates on the 14-day BoBCs fell from 6.5 percent to 2.6 percent in November 2011, while the Bank Rate was unchanged at 9.5 percent. However, there was a rebound in BoBC rates to around 4.5 percent by the end of the year.

The efficient conduct of monetary policy is judged ultimately by its ability to bring inflation within the Bank's medium-term objective of 3 – 6 percent and keep it there. Inflation in Botswana has maintained a downward trend and was within the Bank's medium-term objective range of 3 – 6 percent since June 2013. The generally lower levels of inflation reflects the dissipation of the impact of the 2012 increase in administered prices and easing of pressure on prices across a range of commodities. As a result, inflation reached 4.1 percent in December 2013 and was at 4.5 percent in April 2014. Moreover, lending rates have generally been positive in real terms (except 2008), potentially discouraging borrowing for unproductive purposes and investments in low return projects, while the real effective exchange rate of the Pula has generally been stable helping to support

competitiveness of domestic producers of tradeable goods and services.

5. Possible Costs to Implementation of Monetary Policy

In an environment of persistent excess liquidity in the financial system, the Bank's monetary operations inevitably involve increased costs of liquidity management. However, the Bank has generally maintained positive real net returns on its balance sheet. Chart 7 shows total returns (interest income and dividends) from holding foreign exchange reserves and interest costs of conducting monetary operations by issuing BoBCs. Overall, total income from the foreign exchange reserves exceeded the cost of issuing BoBCs for the conduct of monetary policy[17]. The only exception was during the 2003 to 2006 period. The losses were a result of a variety of factors, including the revaluation losses emanating from the appreciation of the Pula against the SDR, decline in reserves in foreign currency terms due to capital outflows related to overseas investments by the Botswana Public Officers Pension Fund, the poor performance of world equity markets, the relatively high domestic interest rates and the increase in the volume of BoBCs issued to support a restrictive monetary policy stance (Bank of Botswana Annual Reports).

Similarly, the Bank's assets have always exceeded the amount of liquidity to be absorbed in the market. This is shown in Chart 8, where the value of foreign exchange reserves has been significantly larger than total excess reserves in the banking system[18].

Table 2 compares the cost of conducting monetary operations for Botswana and selected countries, which shows that, although the costs of undertaking monetary operations are understandably a concern to the authorities, the Bank has remained relatively better and compares favourably with other central banks[19]. Indeed, for some central banks, the costs have been quite significant and, therefore, served to constrain the implementation of monetary policy.

17 It should be noted that this does not take into account the implications of changes in the Pula exchange rate against the currencies in which the foreign exchange rate reserves are invested. If that is taken into account, given that the Pula has generally depreciated against the SDR currencies and thus generated substantial currency revaluation gains, the net cost of issuing BoBCs may be much less compared to what is typically reported in the income and financial statements of the Bank.

18 This is a simplified way of looking at the issue, since it is using total foreign reserves, rather than the portion of foreign reserves that had their counterpart in the monetary operations. In addition, the commercial banks' excess reserves may include the precautionary reserves which may not necessarily need to be absorbed by the central bank.

19 As indicated in paragraph 5.1, the only exception was in the period 2003 to 2006, where the Bank experienced some significant losses.

Similarly, Dalton and Dziobek (2005) give examples of the experiences of central banks that made losses in the 1990s. These include the cases of Brazil, Chile, Czech Republic, Hungary, Korea and Thailand, which all made losses as a result of the interest rate differentials between the cost of monetary operations and the relatively low return on holdings of foreign currency reserves. In addition, Nyawata (2012) indicates that other central banks also incurred losses in the 1990s: Chile (–1.4 percent of GDP), Colombia (–0.5 percent to –0.7 percent of GDP) and Mexico (–0.2 percent to –0.4 percent). Also mentioned are the central banks of Indonesia, Malaysia and Sri Lanka, which incurred losses because of issuance of their own paper.

Table 2: Experiences of other countries with sterilisation losses from issuance of their own paper. (Average losses as a percent of GDP)

Country	1999	2000 – 2002	2003 – 2005
Botswana	3.1	3.3	–0.8
Chile	–1.1	–1.2	–0.7
Guatemala	–0.3	–0.6	–0.5
Jamaica	0.0	–0.6	–1.4
Uruguay	–0.2	–0.3	–0.3
Venezuela	–0.5	0.2	0.8

Source: Stella and Lonnberg (2008), Bank of Botswana

The prevalence of surplus liquidity in the financial system makes it imperative for the Bank to absorb the excess liquidity in the banking system in order to achieve the price and financial stability goals. Therefore, the Bank essentially participates in operations that expose it to potential losses, which are, nevertheless, necessary to ensure formulation and implementation of monetary policy, price stability and appropriate financial conditions for economic activity.

Another major concern about the issuance of central bank or government securities is the potential crowding out of private borrowing. Indeed, it is notable that during periods when the Bank has to issue BoBCs to support a restrictive monetary policy, commercial banks generally maintained high levels of liquid assets, particularly BoBCs, while allocating a relatively modest amount of funds to the private sector. Therefore, any issuance of public paper that results in crowding-out of bank lending for productive activity can be viewed as being costly to the economy as it undermines prospects for diversified and durable growth. However, it can be argued that, in an environment of structural excess liquidity, as is the case in Botswana, there is sufficient liquidity in the domestic economy to obviate any concerns about the crowding out of private borrowing. In addition, an increase in banks' holdings of BoBCs may simply reflect the banks' preference to invest excess liquidity in low risk investment, and cannot be a single reason for the possible decline or lack of increase in credit to the private sector. Moreover, commercial banks' lending behaviour to the private sector may also be more influenced by asymmetric information problems,

which can potentially be resolved through the use of collateral, credit bureau reports,[20] maintenance and presentation of appropriate financial information and business plans for loan prospects. There is also scope for banks to improve operational strategies and skills to support lending beyond the household sector and established corporates.

6. CONCLUSION

The strategy of foreign exchange reserve accumulation, resisting excessive nominal exchange rate appreciation and sterilisation of excess liquidity in the financial system has so far served the country well. The success of this policy may partially be attributed to market imperfections, which allowed the authorities to set objectives for both the domestic monetary and the exchange rate policies. The persistent inflows of diamond revenues have obviously complicated liquidity management. However, the Bank has sustained the ability to mop up the excess liquidity, and, therefore, was able to influence interest rates in the economy and sustain general macroeconomic stability. The inflows have also helped to boost the supply side of the economy, which should increase the productive capacity of the economy and its competitiveness in the long run.

It is difficult to predict how Botswana's monetary strategy will evolve over the next decade or two. The current phase of the monetary policy strategy may be viewed as a transition stage, where there is a need to strike an optimal balance between the goals of maintaining competitiveness and keeping inflation within the Bank's desired medium-term inflation objective range of 3 – 6 percent. Looking ahead, there is a possibility that large liquidity surpluses that have been a feature in Botswana's financial system could disappear, and in such circumstances, BoBCs may cease to be issued and the Bank may assume the role similar to that of many other central banks of providing liquidity to the banking system. In addition, the Botswana market is likely to be more integrated with the global financial markets, and this may ultimately result in the need to resolve conflicts emerging from the pursuit of multiple objectives (exchange rate and inflation objectives). Therefore, there is need to continuously monitor developments, and, when appropriate, make necessary adjustments to the existing framework based on changing economic conditions, with a view to guarding against risks that may lead to any disorderly exits or severe pressures on the current exchange rate arrangement.

It is worth noting that many of the problems resulting from structural excess liquidity are not peculiar to Botswana.[21] Indeed, for many central banks that operate in an environment of excess liquidity, commercial banks generally have no need to borrow from the central bank and, although monetary policy changes still have some impact on economic behaviour, central bank control over monetary aggregates is generally weakened (Rule, 2011). Similarly, reserve requirements have often been used to absorb the excess liquidity, given that they involve lower costs compared with other sterilisation instruments. But, such reserve requirements also implicitly raised the spreads between borrowing and lending rates, with potential negative consequences for long-run financial intermediation. Excess liquidity has also meant that, most banks have limited need for overnight funds, hence an inactive overnight interbank market. As a result, inactive money market has the potential to constrain further development of the inter-bank markets.

A possible long-term solution to problems arising from the structural excess liquidity in the financial system would be to increase issuance of government securities to widen and deepen the financial markets. This can be achieved through utilising more fully the scope provided by the upper limit of the P15 billion Government note issuance programme approved by parliament in February 2011. Consideration can be made to increase issuance and/or volumes for longer-maturity securities for structural liquidity management and, therefore, allow the Bank to issue a limited amount of short-term BoBCs for monetary policy implementation. As indicated, the cost implications of issuance will shift directly to Government, but this should be generally viewed as a necessary precursor to the further development of the money and capital markets in Botswana and helping the Bank to prioritise focus on ensuring effectiveness of monetary operations alongside the management of costs.

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20 There is currently an initiative to establish a credit bureau that will collect and disseminate credit information widely on individuals and businesses.

21 The central banks of Korea, India, Turkey and Russia are some of the examples of central banks that operated or are still operating in an environment of surplus liquidity caused by capital and trade inflows.

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Sources of Economic Growth in Botswana: A Production Function Approach

L. K. Sediakgotla and T. Mokoti[1]

Abstract

This paper provides an extension by time coverage on the existing empirical work on the sources of economic growth in Botswana. The main underlying objective of this exercise is to explore whether the growth process has been "extensive" or "intensive". The study uses a growth accounting framework based on a Cobb-Douglas production function to examine the sources of growth in Botswana between 1975/76 and 2011/12. The results indicate that Botswana conforms to the general finding that factors of production drive economic growth in Africa. Nonetheless, although significant, the average contribution of TFP growth has generally been declining over the years. In the context of long-run objective of sustainable GDP expansion, intensive growth, where overall output is stimulated through increases in TFP, needs to be pursued vigorously in Botswana.

1. Introduction

The debate on the sources of economic growth in the East Asian countries instigated by Young (1994) and later by Krugman (1994) has incited a growing literature on the subject. Both authors contend that the "Asian Miracle" was a myth because the driving force behind the spectacular growth in the region came essentially from factor accumulation (mainly capital accumulation), instead of total factor productivity (TFP) growth. The two authors' argument is based on the neoclassical growth model, which contends that gross domestic product (GDP) growth can only be sustained over longer periods of time when based on improvements in TFP, rather than factor accumulation.

With the last known comprehensive work on the sources of growth in Botswana being those done by Bank of Botswana in 2004, there is need to relook at this topic, given the changing structure of the Botswana economy. This is more important, given that Statistics Botswana has carried out a comprehensive revision and rebasing of the country's National Income Accounts in 2012. This resulted in the revision of GDP estimates from 2000 to 2011 which, consequently, changed the size of the GDP, growth rates, sectoral contributions and other related indicators. Therefore, the primary objective of this paper is to undertake a comprehensive examination of the growth performance of the Botswana economy from a supply side perspective for the period 1975/76 to 2011/12. The paper provides an extension by time coverage of the already existing empirical work on the sources of growth in Botswana. The underlying objective of this exercise is to explore whether the growth process has been "extensive" or "intensive", thus determining whether GDP growth in Botswana can generally be sustained over the long run.

An extensive growth process occurs when long-run economic growth is driven mainly by an increase in factors of production.[2] Capital accumulation is an essential element in the growth process, as it enlarges the economy's capacity to produce; while increases in the labour force have traditionally been considered a positive factor in stimulating economic growth. Conversely, the intensive growth process occurs when output expansion is a result of increases in the efficiency of the economy. For example, the intensive growth process is the main stimulant of economic performance in the rich industrial countries since their population growth rates have more or less reached the replacement levels. As such, economic growth based on improvements in efficiency is more sustainable than when based on factor accumulation, and, therefore, offers the best basis for increasing the economy's long-run supply potential. This study is also important for budget estimation because an efficient and productive allocation of national resources is more likely, if sources of growth are known.

Section 2 gives an overview of trends in GDP growth rates between 1975/76 and 2011/12. Section 3 reviews the relevant empirical literature. Section 4 specifies the model, while Section 5 covers the descriptive statistics and data analysis. Section 6 presents the results from the growth accounting method based on the Cobb-Douglas production function. Section 7 examines growth prospects and challenges for the Botswana economy, while Section 8 concludes the paper.

2. Overview of Trends

Botswana's growth trajectory has been consistently positive for over three decades. The economy grew[3] on average by 8.1 percent per annum for the period 1975/76 to 2011/12, largely driven by mining, especially diamond production. For the period 1975/76 to 1984/85, the economy grew on average by 11.6 percent annually, falling to 10.4 percent per annum for the period 1985/86 to 1994/95. During the period 1995/96 to 2004/05, the economy grew on

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2 This study is restricted to two factors of production i.e., labour and capital.

3 These growth rates are for total real GDP.

average by 4.7 percent annually, and at 4.7 percent in the most recent period (2005/06 to 2011/12). The latter period deceleration in growth is attributed to the decline in the mining sector contribution, which, has been the mainstay of the economy traditionally (from the mid-1970s). More recently, the severe global economic recession led to the temporary closure of some mines in Botswana in the first quarter of 2009.

Meanwhile, the Government of Botswana has long recognised the urgency of diversifying the economy. Alongside the trend decline in average output growth, it is projected that diamond production will begin to decline in 2020, resulting in a sharp downturn in mineral revenue (Ministry of Finance and Development Planning, 2009:165). Also, revenues from the Southern African Custom Union (SACU) are expected to decline. The prospective developments demonstrate the importance of economic diversification for Botswana.

3. Empirical Literature

Tahari et al. (2004) examined the sources of growth in Sub-Saharan African countries for the period 1960 to 2002. The study used a growth accounting framework based on a standard Cobb-Douglas production function with the share of capital stock set at 0.4. The study found that real GDP growth in Sub-Saharan Africa was driven largely by factor accumulation. The average TFP contribution for Sub-Saharan Africa as a whole was found to be nil. Almost half of the countries in the study experienced declines in TFP, with only five countries experiencing an average TFP growth of more than one percent. However, the study did not differentiate between skilled and unskilled labour, thus part of the growth process could be attributed to improvement in skills of the labour force rather than TFP.

Meanwhile, Arora and Bhundia (2003) investigated the sources of growth in South Africa using a production function approach and concluded that the increase in economic growth in South Africa during the post-apartheid period (1994-2001) was attributed to higher TFP growth, rather than to increases in factors of production. They argued that the increase in TFP growth was largely driven by private investment in machinery and equipment and gains in trade following the lifting of sanctions after the 1994 democratic elections. Similarly, the study did not differentiate between skilled and unskilled labour such that part of the growth process could also be due to improvement in skills of the labour force, rather than increases in TFP.

Based on a growth accounting approach with factor shares averaged from the Social Accounting Matrices (SAMs) of 1985/86 and 1992/93, Leith (1997) estimated the contribution of factor inputs and TFP to output growth in Botswana between 1975 and 1995. The TFP estimates derived by Leith (1997) were adjusted by excluding mineral rents from total real GDP and also differentiating between skilled and unskilled labour. The results from the analysis, based on both undifferentiated and differentiated labour, indicate that both factor inputs and TFP contributed positively to real GDP growth.

In a subsequent analysis, Bank of Botswana (2004) estimated the contribution of factor inputs and TFP between 1975 and 2005 using a growth accounting approach, with factor shares averaged from the SAMs for the years 1985/86, 1992/93 and 1996/97. The TFP estimates by Bank of Botswana (2004) were adjusted by excluding mineral rents from total real GDP and also differentiating between skilled and unskilled labour. The results from the analysis, based on both undifferentiated and differentiated labour, indicate that both factor inputs and TFP contributed to real GDP growth between 1975 and 2005, with capital stock contributing the largest share, followed by TFP and then labour.

Using a growth accounting framework based on a Cobb-Douglas production function with the shares of factor inputs derived from the 1992/93 SAM, Matovu and Yuguda (1999) examined whether the growth process of Botswana during 1978 to 1996 was intensive or extensive. The results show that the impressive growth since independence was made possible by both sizeable factor accumulation and TFP growth. The contribution of TFP on total real GDP growth was 3 percentage points, while the estimate of TFP after adjusting for mineral rents (excluding the mining sector) was 3.5 percentage points. Furthermore, the values of TFP found after differentiating between skilled and unskilled labour were consistently lower than those obtained using aggregated labour force, i.e., some of the undifferentiated TFP was due to the impact of skilled labour not picked up in the labour measure.

The results by Tahari et al. (2004) for Botswana indicate that capital stock contributed the largest share to output growth (3.8 percentage points), followed by TFP (2 percentage points) and lastly labour (1.7 percentage points). However, the TFP estimates for Botswana used in this study were not adjusted for mineral rents, which are not attributable to labour or capital inputs. Furthermore, the study did not differentiate between skilled and unskilled labour. It is possible that part of the growth process would be because of improvements in skills of the labour force rather than increase in TFP.

4. Model Specification

A growth-accounting framework, based on a standard constant returns-to-scale Cobb-Douglas production function is used in this study.[4] The Cobb-Douglas production function represents the amount of output that can be produced given labour, capital and TFP. The function is expressed as:

4 The Cobb-Douglas production function is thought to provide a reasonable description of actual economies despite some of its limitations which are covered later in this section.

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}, \qquad 0 < \alpha < 1 \tag{1}$$

Where Y_t is output, A_t is TFP, K_t represents aggregate capital stock utilised, L_t is labour utilised and α and $1-\alpha$ are the shares[5] of output that accrue to capital and labour, respectively, where α is a constant. Taking the natural logarithm of Equation (1) and differentiating with respect to time gives the following:

$$y_t = a_t + \alpha k_t + (1-\alpha) l_t \tag{2}$$

Where lower case letters are growth rates of the variables. From Equation (2), TFP growth is derived as the difference between observed real GDP growth and the weighted sum of labour and capital growth. However, the Cobb-Douglas production function is not without limitations. In particular, with respect to the constant returns-to-scale assumption, there is no theoretical or empirical reason why this must be the case. Furthermore, the use of A_t as a measure of TFP is not uncontroversial (Wright, 1999). A_t is not directly observable, but is calculated as a residual and, as such, includes various measurement errors that can occur.[6] To take account of some of these concerns, the study derives TFP for both an undifferentiated and differentiated[7] labour force.

5. Descriptive Statistics and Data Analysis

This study uses annual data for the period 1975/76 to 2011/12. The variables used in assessing the sources of growth in Botswana are real GDP excluding mineral rents, capital stock and labour force. It should be noted that part of the output of the mineral sector includes mineral rents, which is the difference between the opportunity cost of inputs and the value of the output.[8] The rents are thus not attributable to labour or capital inputs. Therefore, the real output measure used in this study excludes mineral rents, which are approximated using the mineral revenues that accrue to Government.

With direct observations of capital stock not generally available in Botswana, the series for capital stock is derived using the perpetual inventory method (PIM) as explained in the Appendix. With regard to the labour input, the available employment surveys for the period under review are not so useful in this context, since they cover mostly employment in the formal sector. As a result, periodic estimates of the labour force through population censuses and dedicated labour force surveys are supplemented by assumptions about growth and participation rates in the intervening periods to derive a time series for the labour force (including skilled and unskilled). Hence, this study uses total labour force instead of the actual utilised labour, which is consistent with previous growth accounting work on Botswana and elsewhere.

The growth rates for each variable used in the model are calculated as the log of the variable in the current year minus the log of that variable in the previous year. Factor elasticities used in this study are calculated as the averages of the SAMs for the years 1985/86, 1992/93 and 1996/97. This yields 0.517 for capital and 0.483 for labour. The data is sourced from Statistics Botswana and Bank of Botswana.

6. Results

The results from the growth accounting exercise based on the Cobb-Douglas production function are presented in Table 1 overleaf. The analysis is divided into five periods: the first period covers the whole sample (1975/76 to 2011/12); period two covers 1975/76 to 1984/85; period 3 covers 1985/86 to 1994/95; period four covers 1995/96 to 2004/05; and lastly, period five covers 2005/06 to 2011/12.

The results in Table 1 show that the rate of output expansion has trended downwards over the period 1975/76 to 2011/12. Real output growth plummeted in the last period (2005/06 – 2011/12) to an average of 3.1 percent, from 8.5 percent during the period 1975/76 to 1984/85. The decline in average growth of output in this period reflects the fall in the contribution of mining sector to overall GDP, although mining remains on average the largest contributor to overall GDP. This period also covers the global economic downturn of 2008. From a supply-side perspective, the decline can also be attributed to the contraction in TFP over the period 2005/06 to 2011/12. During most of the review period, output growth was mainly driven by the increase in capital, followed by growth in TFP, except for the last period where the contribution of TFP contracted. The high contribution of capital to economic growth partly reflects the contribution of the mineral sector, which is more capital intensive.

The results confirm that Botswana conforms to the general finding that factors of production drive economic growth in Africa. The results indicate that economic growth in Botswana is mostly extensive. That is, long-run economic growth is driven mainly by an increase in factors of production (capital and labour). Nonetheless, the contribution of TFP to growth has been significant. The only time the contribution of TFP to output growth was negative, was in the period 2005/06 – 2011/12. Meanwhile, when differentiating between skilled and unskilled labour, the values of TFP are slightly lower than those obtained using aggregated labour force for the periods

5 These shares can also be explained as the elasticities of output with respect to capital and labour, respectively.

6 For example, if the data on factor inputs has not been adequately adjusted for quality improvements, then factor specific effects will be attributed to TFP. It is thus sensitive to the accuracy of the measurement of capital and labour, as well as that of the shares of capital and labour.

7 This means differentiating between skilled and unskilled labour.

8 In other words, mineral rents are the return above the cost of production to the nation from mining and selling minerals, especially diamonds.

Table 1: Contributions to Growth

Period	1	2	3	4	5
	1975/76 2011/12	1975/76 1984/85	1985/86 1994/95	1995/96 2004/05	2005/06 2011/12
Output growth (percent)	6.9	8.5	8.9	5.9	3.1
Contributions (percentage points)					
Capital	4.1	4.9	6.2	2.2	2.7
Labour	1.1	0.7	1.4	1.1	1.3
Skilled	1.1	0.5	1.2	1.2	1.4
Unskilled	0.2	0.2	0.3	0.1	0
TFP					
Undifferentiated	1.7	2.9	1.4	2.6	-1.0
Differentiated	1.6	2.9	1.2	2.4	-1.0

Note: TFP contribution is derived as the difference between observed average real GDP growth and the weighted sum of labour and capital growth. The contribution of factor inputs to output growth is simply the average growth rate of the factor input multiplied by the share of that input.

Sources: Statistics Botswana and authors' own calculations

1975/76-2011/12, 1985/86-1994/95 and 1995/96-2004/05, suggesting that part of the growth process in that period can be attributed to improvement in the skills of the labour force.

It is worth noting that the results from this study do not differ much with those from the previous four[9] studies on Botswana in terms of the contribution of TFP to real GDP growth. In the four related studies, the contribution of TFP was significant and in most cases, TFP contribution was second best only to that of capital stock. However, given the sensitivity of TFP to the accuracy of the measurement of capital, labour and the share of capital, several factors could explain the slight difference in the results.

First, as explained earlier, Statistics Botswana carried out a comprehensive revision and rebasing of the country's National Income Accounts. This resulted in the revision of GDP estimates from 2000 to 2011, which consequently changed the size of GDP, growth rates, sectoral contributions and other related indicators. Second, due to lack of a consistent time series for capital stock, this study derived a capital stock series based on the perpetual inventory method which is bound to differ from other studies given the revision of the national accounts data carried out in 2012. Third, the available employment surveys for the period under review are not so useful in this context since they cover mostly those only employed in the formal sector. As a result, periodic estimates of the labour force through population censuses and dedicated labour force surveys are supplemented by assumptions about growth and participation rates in the intervening periods. Fourth, the rates of depreciation used in estimating the capital stock series differ across the studies, hence possibility for differing results.

7. Growth Prospects and Challenges

There is need to generate high GDP growth on a sustained basis. Therefore, intensive growth, where output expansion is stimulated through increases in TFP, need to be pursued. Tahari et al. (2004) observed that good quality institutions, human capital development, favourable macroeconomic policy environment and diversification of the economic base, have a positive influence on TFP growth. Berthlemy and Soderling (2001) found that, in Sub-Saharan Africa, countries that successfully diversified their economic base from the primary sector to the secondary and tertiary sectors experienced higher TFP growth. Thus, the challenge that Botswana is facing is to diversify the economy beyond extractive industries, notably mining.

Successful economic diversification depends critically on structural reforms such as privatisation, financial sector reform and trade liberalisation. Therefore, ongoing efforts towards privatisation provide scope for enhanced private sector activity that could potentially promote overall economic efficiency and sustainable growth. Moreover, initiatives to improve the ease of doing business environment and enhancing the quality of the infrastructure, provide a basis for innovation and adaptation of new technologies, thereby contributing to higher TFP growth. Additionally, the maintenance of good governance and institutions, as well as conducive macroeconomic policies, is supportive of economic diversification, and these must continually be aligned to the changing economic and business environment to ensure their relevance and efficiency. Proposals for enhanced financial intermediation and inclusion articulated in the Botswana 2012-2016 Financial Sector Development Strategy, would also help raise productivity (TFP). Trade liberalisation can also contribute to the acceleration of TFP growth by promoting the competitiveness and market opportunities for domestic producers.

8. Conclusion

Results from the study show that although economic growth in Botswana was made possible by both sizeable factor accumulation and TFP growth, changes in factor inputs were the main drivers of economic growth in Botswana for the period 1975/76

9 All the four studies used the growth accounting methodology applied in this study.

to 2011/12. Results from the growth accounting exercise also show that capital input played a more important role in terms of contribution to economic growth compared to labour. The strong contribution by the capital stock reflects the high contribution of the mining output to economic growth. Meanwhile, the contribution of TFP to output growth was significant, though generally declining over the years. As such, economic growth in Botswana has been extensive rather than intensive. If more effort is put towards diversifying the economy, the growth rate of TFP might increase. The importance of growing the economy through TFP growth (intensive growth) is premised on the fact that, while extensive growth is achieved by employing more factor inputs, with intensive growth, a higher growth rate can be sustained with the same factor inputs.

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APPENDIX

TABLE A1: FACTOR INPUTS AND OUTPUT: 1974/75-2011/12 (2005/06 PRICES)

	GDP (Pmillion)	GFCF (Pmillion)	Capital Stock (Pmillion)	Labour Force (persons)	Skilled Labour (persons)	Unskilled Labour (persons)
1974/75	4571.3	1222.9	8972.1	309474	154669	154796
1975/76	5277.0	1559.6	9813.9	310464	154886	155570
1976/77	5628.9	1359.3	10388.2	311458	155103	156347
1977/78	5866.6	1724.2	11281.3	312454	155320	157129
1978/79	7332.8	2331.9	12710.8	313454	155537	157915
1979/80	8452.7	3081.7	14775.6	314457	155755	158704
1980/81	8192.2	3331.6	16925.2	315475	156025	159450
1981/82	7929.3	3079.2	18650.4	326233	162235	163962
1982/83	9017.3	2907.6	20065.9	337357	168692	168603
1983/84	9272.6	2725.4	21186.0	348861	175406	173374
1984/85	10714.3	3660.0	23151.1	360757	182387	178281
1985/86	13614.0	3513.3	24812.4	373059	189646	183326
1986/87	14070.4	4972.9	27800.3	385780	197194	188514
1987/88	17855.4	7275.3	32851.6	398936	205042	193849
1988/89	25913.4	10514.2	40737.6	412539	213203	199335
1989/90	27014.7	11638.8	49117.4	426607	221688	204976
1990/91	27523.0	12048.5	57236.5	441203	230461	210742
1991/92	28837.7	11339.1	63996.7	451748	238988	212344
1992/93	28896.8	10433.1	69310.1	462545	247831	213957
1993/94	30644.5	9873.0	73638.2	473599	257000	215584
1994/95	26214.9	8473.5	76220.7	484918	266509	217222
1995/96	25128.5	8018.5	78141.6	496508	276370	218873
1996/97	27251.4	8620.8	80511.0	508374	286596	220536
1997/98	31974.8	9681.8	83752.0	520525	297200	222212
1998/99	35510.7	10872.4	87924.2	532965	308196	223901
1999/00	42104.2	11740.5	92630.8	545703	319600	225603
2000/01	43524.3	11703.0	96923.3	558745	331425	227317
2001/02	40517.1	12563.6	101733.1	572099	343688	229045
2002/03	40976.9	12997.1	106591.5	585772	356404	230786
2003/04	41682.3	13016.5	111080.7	599772	369591	232540
2004/05	47409.5	13631.8	115826.0	614107	383266	234307
2005/06	41988.2	13987.5	120547.4	653191	411510	241681
2006/07	44791.3	15697.3	126601.0	675329	432210	243118
2007/08	47784.6	17595.7	134068.6	697466	453353	244113
2008/09	47305.0	18406.7	141749.8	704033	464662	239371
2009/10	49061.7	19078.9	149488.7	710600	476102	234498
2010/11	57359.0	20658.6	158188.2	727736	494860	232875
2011/12	58797.9	22052.1	167585.2	745285	514247	231038

Notes:

1. *The output series is GDP less Government's mineral revenues, deflated using the CPI deflator.*
2. *The capital stock series was calculated using the perpetual inventory method (PIM), which computes additions to the stock through gross fixed capital formation (GFCF) and deductions through depreciation (i.e.,* $K_t = K_{t-1}(1-\sigma) + GFCF_t$*, where* K_{t-1}*= 8972.1 and* $\sigma = 0.08$*).*
3. *Labour force series from 1974/75 to 2004/05 was obtained from Bank of Botswana Annual Report of 2004, where those who never attended school and who did not complete more than primary school were classed as unskilled, and the remainder treated as skilled. The series was then extended using the results from the Botswana AIDS Impact Survey of 2008 and the Botswana Core Welfare Indicators Survey of 2009/10, where the intervening years were interpolated using simple averaging and growth rates.*

The Role of Emerging Market Debt in Enhancing Risk-Adjusted Returns: The Optimal Mix of South African and US Government Bonds in a Portfolio

Pako Thupayagale[1]

Abstract

This study investigates the optimal ratio of US and South African government bonds, which would enhance risk-adjusted returns in a fixed-income portfolio comprising these assets. Initial results show that US treasuries (USTs) behave as 'safe-haven' assets given their generally low volatility and mostly low correlation to emerging market debt. In contrast, South African government bonds (SAGBs) trade mostly like 'risky' assets given their correlation to the global growth cycle and the level of risk-aversion in international financial markets. This changing behaviour means that the optimal portfolio weights change considerably depending on the assessment period. For this reason, the analysis is performed over multiple periods so that the optimal ratio of USTs to SAGBs is revealed. Consequently, portfolio Sharpe ratios are calculated to highlight optimal weights. The drivers of the different allocations are captured by letting volatility and correlation dynamics in the data drive the optimal weights. There are two main conclusions. First, adding SAGBs to a UST portfolio enhances risk-adjusted returns; however, this inclusion is not without bounds. Second, if the 1997-2000 period is excluded (when SAGBs displayed very different behaviour relative to the rest of the sample period), then an allocation of around 40 percent SAGBs and 60 percent USTs produces the highest portfolio Sharpe ratio. This finding is reasonably robust to different correlation assumptions, and these results may, in turn, inform determination of the most efficient allocation of SAGBs and USTs from a portfolio construction perspective.

1. Introduction

The main objective of portfolio management is to generate superior returns and risk reduction through diversification. This study investigates optimal international portfolio diversification in the context of sovereign bond markets. The aim of this study is to determine the optimal weighting of US treasuries (USTs) and South African government bonds (SAGBs) in a fixed income portfolio. A combination of mature and emerging market debt may, in turn, provide an attractive risk-reward profile. Indeed, a long-term total return portfolio manager (e.g., a sovereign wealth fund or similar) may be required to hold a portion of their financial resources in US government bonds. This is typically to benefit from the safety and liquidity of the US treasury market.[2] The same investor may also wish to target higher returns and diversification benefits associated with emerging market bonds. The combination of a safe-haven security and an asset benefiting from a track record of strong risk-adjusted returns and low correlations with other asset classes, may have characteristics that are attractive from a portfolio optimisation perspective. This could lead investors (or market participants in general) to re-examine their portfolio investment strategies. Against this background, this study examines to what extent a long-term total return investor could improve his/her risk-return ratio by diversifying out of traditional safe-haven bond markets, i.e., US treasuries, and into emerging market debt, i.e., South African government bonds.[3] This empirical analysis, therefore, aims to determine the optimal weights of a joint portfolio consisting of USTs and SAGBs hedged into US dollars (USDs) that would maximise risk-adjusted returns. This stylised exercise, will in turn, demonstrate the possible benefits of diversifying across developed and emerging bond markets.

Focus is on South Africa's fixed income market for a number of reasons. First, bond yields in South Africa are relatively high and, therefore, attractive from an investor's perspective. Second, the institutional and legal framework underpinning the operation of the debt market is well-developed and credible. Third, as a result of regulatory initiatives and various reforms, South Africa's bond market has grown rapidly in size and sophistication. Fourth, according to the Emerging Markets Trading Association (EMTA) Debt Trading Volume Survey (2011), South African fixed income securities were the fourth most actively traded emerging market debt (after Mexico, Hong Kong and Brazil) in the third quarter of 2011, at USD113 billion,

1 Chief Dealer, Financial Markets Department, Bank of Botswana. The views expressed in the paper are those of the author and do not necessarily reflect those of the Bank of Botswana.

2 This investment style, which focuses on liquidity and safety, is usually associated with official institutions (e.g., central banks) and institutional investors (e.g., pension funds).

3 Both US and South African long-term debt are rated investment grade by the major rating agencies. An investment grade credit rating indicates that the bonds have a low risk of default, i.e., these bonds are very safe.

compared to USD86 billion a year earlier.[4]

From the outset it is important to highlight that foreign exchange reserve holdings of central banks are traditionally invested in liquid financial assets denominated in the major floating currencies, namely the US dollar, euro, pound sterling and the yen. Approximately 95 percent of all global foreign exchange reserve holdings for which the composition is disclosed are invested in these four currencies (IMF, 2012). Furthermore, while recent evidence indicates that some central banks have started to diversify part of their reserve portfolios into non-traditional currencies (in particular, Australian and Canadian dollars), there is no evidence to suggest that SAGBs meet the requirements of non-traditional reserve assets. As such, investment in SAGBs by central banks would be very unlikely, since South Africa's bond market is markedly thinner and less liquid than those of major reserve and non-traditional reserve currency issuers. This analysis, therefore, is of more relevance to investors with a higher risk tolerance, including, global asset and fund managers, large corporates, financial institutions and emerging market debt specialists.

The rest of this paper is structured as follows. Section 2 highlights the return and diversification benefits associated with investing in emerging market debt. Section 3 briefly considers why currency hedging may be relevant; and, Section 4 provides a description of the data used in the analysis. Section 5 presents the methodology; in addition, the empirical results and their investment implications are also expounded. Section 6 concludes.

2. Emerging Market Debt: A History of Return-Enhancements and Diversification Benefits

The role and weight of emerging markets in international financial markets continue to increase. Given their fast-growing economic and financial role, an important development in international financial markets has been the emergence of emerging market debt as an asset class. Indeed, emerging market local currency sovereign debt has showed particular return-generation and diversification benefits consistently over short and long horizons. Table 1 below shows that local currency emerging market debt has consistently outperformed US Treasuries over the past 9 years, 3 years and 1 year in total and risk-adjusted returns.[5] The JP Morgan Global Bond Index for Emerging Markets (GBI-EM) Broad Unhedged (BU) registered the best performance over the past 9 years, while the GBI-EM Broad Hedged (BH) has been the best performer over the past 3 and 1 years. These results provide a broad guide as to the gains associated with investing in emerging markets. In general, one can say that emerging markets exposure is prefereable on an unhedged basis. An evolving emerging market sovereign credit would be accompanied by improving fundamentals, a stronger foundation for exchange rate stability or even a trend real exchange rate appreciation, and decreasing yield levels. These factors tend to explain the outperformance of local market exposure. Accordingly, investors have unsurprisingly diversified into emerging markets. More generally, Table 1 suggests that emerging market debt could add efficiency to a global portfolio (i.e., a US Treasury portfolio) through higher returns and increased diversification.

3. Why Hedging Currency Risk May Be Appropriate

Investors whose portfolios comprise fixed income securities diversified across currencies are subject to currency risk.[6] Currency (or exchange rate) risk refers to the risk that an investment's value may be affected by changes in exchange rates. The possibility (or fear) of exchange rate risk may, therefore, deter investors from investments in potentially higher-yielding foreign bond markets. To protect the value of the portfolio against foreign exchange movements, an investor can hedge their currency exposure. Such a bond, by design, offers the opportunity to benefit from higher foreign yields, while neutralising exchange rate risk.[7] In other words, hedged foreign bonds offer an opportunity to diversify a fixed income portfolio's interest rate risk without adding exchange rate risk.[8] From Table 1, it is shown that the GBI-EM Broad Hedged index outperformed investment in USTs (over the specified horizons) indicating that even after adjusting for exchange rate risk emerging market debt offer high risk adjusted returns.

4 Liquidity is high across the yield curve with bid-offer spreads of around 1-3 basis points (Bank of America Merrill Lynch, 2011).

5 The Sharpe ratio is a risk-adjusted measure of return that is often used to evaluate the performance of a portfolio. The ratio helps to make the performance of one portfolio comparable to that of another portfolio by making an adjustment for risk.

6 In addition to the other risks that face a bond investor, such as interest rate and credit risk.

7 A hedge is implemented by combining a short-dated forward exchange contract with a longer-dated foreign currency bond. This procedure for reducing or eliminating exchange rate risk is called a rolling forward hedge. The forward contract creates a foreign currency liability equal in value to the foreign currency asset – the bond. But because its duration is short, the forward contract does not substantially alter the bond's interest exposure.

8 The problem with a general hedging strategy, when exposed in emerging market local markets is that it is expensive (due to high local rates and very often flat interest rate structure). Therefore, most emerging market portfolio managers prefer to be fully exposed to the specific emerging market sovereign, i.e., they are investing unhedged in securities at local rates.

TABLE 1: EM BONDS HAVE CONSISTENTLY OUTPERFORMED IN TOTAL AND RISK-ADJUSTED RETURNS

Review Period	9 year			3 year			1 year		
	Return	Volatility	Sharpe ratio	Return	Volatility	Sharpe ratio	Return	Volatility	Sharpe ratio
EMBIG	18.1	8.7	1.8	9.4	12.2	0.7	8.2	5.5	1.4
GBI-EM BH	7.2	2.6	1.9	4.2	2.9	1.2	3.0	1.6	1.7
GBI-EM BU	21.3	7.7	2.5	6.8	9.8	0.6	9.1	5.6	1.6
ML UST	6.7	4.8	0.9	3.7	5.6	0.5	4.4	4.3	1.0

Notes:

1. *EMBIG is the JP Morgan Emerging Market Bond Index Global. It includes USD denominated sovereign/quasi sovereign bonds issued in EM countries.*
2. *GBI-EM BH is the JP Morgan Government Bond Index – Emerging Markets Broad Hedged, i.e., the various local currencies are hedged against USD.*
3. *GBI-EM BU is the JP Morgan Government Bond Index – Emerging Markets Broad unhedged. It includes performance of local currency government debt issued in EM countries.*
4. *ML UST is the Bank of America Merrill Lynch US Treasury index.*

Source: Bloomberg, JP Morgan, own calculations

4. DATA

The data used in this study have been obtained from Bloomberg; in particular, the total return bond indices compiled by JP Morgan. The data are weekly in frequency and span the period from February 28, 1997 to December 31, 2012, representing 827 observations. The GBI SA (hedged) is used to represent the South African bond market. The GBI SA is a total return index for South African government bonds hedged in US dollars. The GBI US, which is total return index for US treasuries is used to proxy the US government bond market. These indices permit the measurement of returns from both US treasuries and SAGBs in a consistent manner, by use of the same currency (i.e., the US dollar); and it allows the analysis to examine the contribution of local interest rates across different tenors to the overall performance of the portfolio, without the influence of exchange rate dynamics contributing to performance attribution. Moreover, many investors prefer reporting the performance of their international bond holdings in US dollar terms. Analytically, this study focuses on excess returns, i.e., total return minus the risk free rate. The excess return represents the risk premium of the asset, i.e., the reward for taking the risk of investing in the bond index as opposed to the investor leaving his funds in cash, which is presumed to be risk-free. Accordingly, the Emerging Local Markets Index (ELMI) South Africa yield is used as the risk free rate (cash rate) in South Africa. Similarly, the return on the JP Morgan 1-month US cash index is used as the cash rate or risk free rate for the US.

5. METHODOLOGY

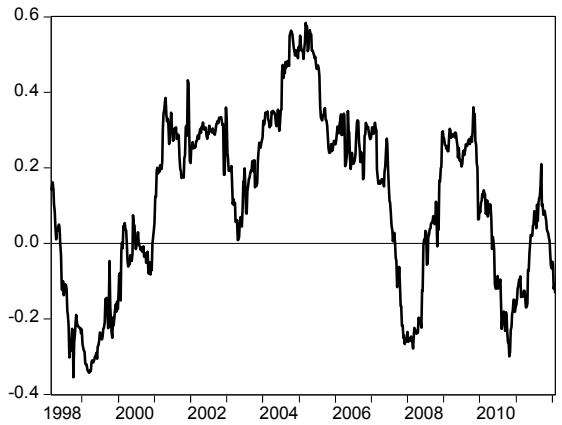
In order to determine the relevant ratio of SAGBs and USTs that would optimise the portfolio's Sharpe ratio, a sensitivity analysis on a portfolio of treasuries and SAGBs hedged into USD (i.e., using the JP Morgan GBI-EM indices) is performed.[9] The results will be presented in the form of tables and charts. The sensitivity analysis involves several steps which are implemented sequentially.

(i) Correlation Analysis

First, we begin by looking at correlations between the two bond market indices. Specifically, we examine the rolling 52-week correlation of daily excess returns between the GBI SA index (hedged into USD) and the GBI US index.[10]

Chart 1 highlights the time-varying nature of the correlations between these indices. The correlation between the two indices has also varied markedly over different time periods. In particular, three main phases are apparent: from February 1998 to November 2000, the correlations of excess returns

CHART 1: ROLLING 52-WEEK CORRELATION OF GBI SA HEDGED IN USD VERSUS GBI US



9 Sensitivity analysis on a portfolio is a technique used to determine how different values of an independent variable will impact a particular dependent variable under a given set of assumptions.

10 The excess return is defined as its total return (change in price + any income) minus the risk free rate. For the US, this study uses the JP Morgan 1-month cash index (i.e., excess return = total return – 1-month cash index). For the South African cash rate, the ELMI South Africa yield is used. Excess return (i.e., over the risk free cash rate) is a fairer measure of the performance of an investment since it accounts for the opportunity cost of giving up the return on cash.

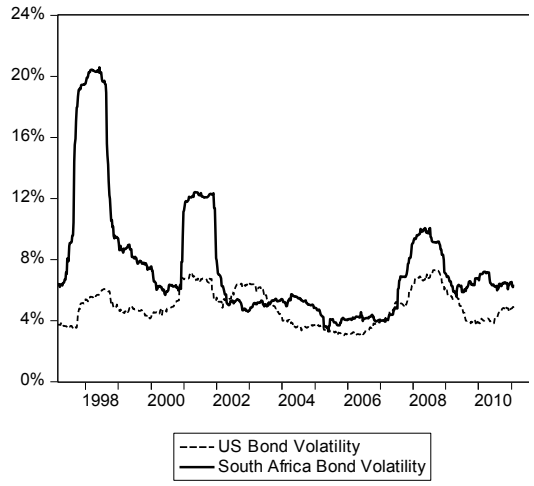
are mostly negative, in fact the lowest correlation is -0.35 recorded in October 9, 1998. The second phase encompasses the period to August 2007 and the correlations are positive, with the highest correlation being 0.55 on January 14, 2005. The final phase has a mixed correlation performance marked by periods of both positive and negative correlations between excess returns of US treasuries and SAGBs. The three stages also coincide with major international economic events. The first stage captures emerging market crisis which saw a 'flight-to-quality' favouring USTs (and hence the negative correlations with emerging markets in general). The second period reflects an episode of prolonged global growth, whereby global rates drifted higher and, hence, excess return correlations were positive. The last stage correlates with a period of uncertainty relating to the robustness of the global economic recovery. The observed correlation behaviour of USTs and SAGBs over different periods appears to reflect the fact that during crises, USTs behave as a safe-haven asset, while SAGBs trade more like risky assets (during these periods), i.e., during the bankruptcy of Lehman Brothers and the ongoing European debt and financial crisis more recently, the correlation between the two turned negative. Interestingly, during non-crisis periods, the correlation was positive.

The changes in correlation shown in Figure 1 reflect the fact that SAGBs trade in a manner analogous to a mixture of bonds and risky assets, i.e., their returns are affected by the stance of monetary policy and inflation dynamics, but they also reflect that South Africa is an emerging market and returns are affected by investor risk perception at a more macro level. In the recent crisis, investors typically withdrew capital from emerging markets to invest in safe (and liquid) developed market government bonds, thus causing the decorrelation with USTs.

(ii) Volatility Analysis

Second, we examine the volatility of the US and South African total return indices. Chart 2 shows the rolling 52-week volatility of both return series. Over the sample period, it is evident that US excess returns display more stability compared to South African excess returns. The South African return volatility is shown to cluster and remain elevated during three periods: February 1998 to January 2000 averaging about 20 percent during this period, volatility peaks at close to 21 percent on June 4, 1999. Another volatility cluster is from December 2001 to August 2002, where volatility averages 12 percent, and from December 2008 to December 2009, where volatility averages 9 percent. More generally, Chart 2 indicates that South African bond volatility has been significantly more stable from 2001 onwards. From these volatility clusters, it would appear that South African bond volatility is driven to high levels by emerging market crises and other events which trigger risk aversion in international financial markets. During periods of global economic expansion – bond return volatility is more stable. For the US bond market, volatility moves in a narrow range over the sample period of between around 3 percent and 7 percent.

CHART 2: ROLLING 52-WEEK ANNUALISED VOLATILITY OF GBI SA HEDGED IN USD VERSUS GBI US



(iii) The Changing Pattern of Volatilities and Correlations

Third, we examine the time-varying patterns of fixed income volatilities and correlations. Table 2 shows the changing correlation and volatility profile of the various excess returns associated with exposure to USTs and SAGBs. The table corroborates previous evidence (Charts 1 and 2). In particular, when the volatility of the GBI SA is high, the correlation with the GBI US is low and vice versa. For example, from the start of 2010 to February 2012 – a period characterised by global risk aversion given Europe's ongoing debt and financial crisis – the GBI SA volatility was 14 percent, while that of the GBI US was 9 percent. The correlation between the two bond markets was –0.11 reflecting the perceived risks of emerging markets and the safety of developed markets. In contrast, over the period from 2003 to 2007 – a period marked by robust global growth – the volatility of both the treasuries and SAGBs were 10 percent and the correlation between the returns from the two markets was 0.31. This suggests that bond returns from both markets were affected by the same (or similar) drivers, including their respective monetary policy stances and inflation rates.

Charts 1 and 2, along with Table 2, highlight the changing behaviour of (excess) return correlations and volatilities between the various bond markets. In other words, the variance-covariance matrix is very different from one period to the next (as suggested in Table 2). This, in turn, indicates that optimal portfolio weights will vary considerably depending on the time period (in particular, whether financial markets were on 'risk-on' or 'risk-off' mode).

TABLE 2: VOLATILITIES AND CORRELATIONS OVER DIFFERENT PERIODS (USING WEEKLY EXCESS RETURNS)

Period	Correlation	GBI SA volatility in percent	GBI US volatility in percent
1997-2012	0.07	19	11
2001-2012	0.18	15	11
2003-2007	0.31	10	10
2007-2009	0.17	17	13
2010-2012	–0.11	14	9

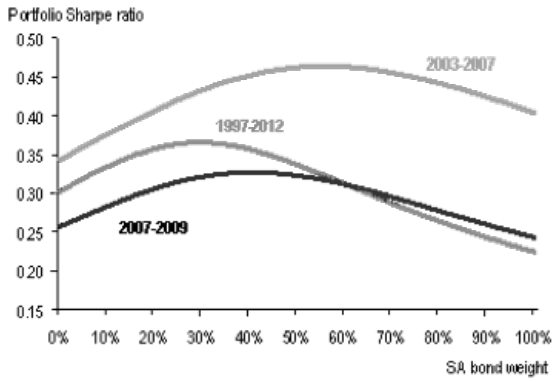
Note: Volatility is annualised

(iv) Constructing the Optimal Portfolio Mix of US and SA Bonds: Sensitivity Analysis

In order to construct a fixed income portfolio, which delivers superior risk-adjusted returns in terms of a combination of US treasuries and SAGBs, the derived variance-covariance matrix for the two bond indices is applied to build the optimal portfolio. In other words, an efficient frontier of USTs and SAGBs is constructed in order to determine the portfolio weights that would maximise the portfolio's risk-adjusted returns. In particular, the Sharpe ratio is used to measure performance. A sensitivity analysis is implemented in order to construct efficient frontiers, which present combinations of USTs and SAGBs that would maximise risk-adjusted returns. Since correlations and volatilities vary considerably from period to period, optimal weights are evaluated across several periods for clarity and conciseness. These periods encompass the entire sample period (1997 to 2012); a period of low risk aversion (2003 to 2007); and finally a period of financial stress, characterised by high risk aversion (2007 to 2009). Portfolio weight computations are derived through sensitivity analysis of various weightings, essentially scaled from zero percent to 100 percent, and are evaluated in order to ascertain combinations which generate the highest Sharpe ratio attained through a combination of USTs and SAGBs. The portfolio weights, along with the maximal Sharpe ratio, are presented in Chart 3. The efficient frontier shows the highest risk-adjusted returns that can be achieved given a combination of USTs and SAGBs. Given that the principal interest is in determining the appropriate weight of the SAGBs in the blended portfolio, the vertical axis is the Sharpe ratio, while the horizontal axis captures the weight of SAGBs that would result in the optimal mix with USTs, in order for risk adjusted returns to be maximised.

From Chart 3, it is observed that, over the entire sample period, i.e., 1997 to February 2012, an allocation of about 30 percent SAGBs (which means an allocation of 70 percent to USTs) in the joint fixed income portfolio would deliver a Sharpe ratio of 0.36. Over the period 2003 to 2007 – when the global economy was growing robustly, an allocation of almost 60 percent to SAGBs (and hence 40 percent USTs) would have generated a total portfolio Sharpe ratio of 0.47. In other words, emerging market debt outperformed developed market debt in this

CHART 3: PORTFOLIO OF US AND SA BONDS WITH DIFFERENT WEIGHTS OF EACH ASSET OVER DIFFERENT TIME PERIODS



environment; and, hence, a dominant exposure to SAGBs would have been appropriate. Meanwhile, from 2007 to 2009, when global risk aversion was high given the onset of the global financial crisis, the returns to our joint UST and SAGB portfolio would have been optimised with a weighting of 40 percent SAGBs (i.e., 60 percent USTs), leading to a Sharpe ratio of 0.33.

Table 3 below provides a diagnostic check with relation to the validity of our results on the optimal weights of SAGBs in a hybrid fixed income portfolio (also comprising Treasuries). By using different expected return assumptions we can evaluate if previous findings are robust (i.e., not spurious). As a result, this will strengthen the conviction that the results of the statistical portfolio analysis are not spurious and, hence, are plausible. The current yield-to-maturity (YTMs) shows the weight of the South African bond index that delivers the highest portfolio Sharpe ratio using current YTMs as expected returns. Meanwhile, the 'same expected return' indicates that

TABLE 3: SOUTH AFRICA WEIGHT OVER DIFFERENT PERIODS USING DIFFERENT EXPECTED RETURN ASSUMPTIONS

Period	YTMs (percent)	Same Expected Return (percent)
1997-2012	29	24
2001-2012	41	33
2003-2007	56	44
2007-2009	41	33
2010-2012	36	32

Notes:

1. *YTM (yield to maturity) is essentially the return you will earn if you hold the bond to maturity (assuming you can reinvest all coupons at the same YTM). It has a component of income (the coupon) and capital appreciation (the pull to par, i.e., as the bond approaches maturity its market value will approach par). More formally, it is the discount rate that equates the present value of discounted future returns to the current price.*
2. *The column of YTMs show the SAGB weight that gives the highest portfolio Sharpe ratio using current yield to maturities as expected returns.*
3. *The column of Same Expected Return uses the same expected return for both US and SA bonds (1.5%).*

the same expected return for both USTs and SAGBs, i.e., the YTM of the GBI US index (i.e., 1.5 percent), was used in the computation. This was done in order that the results would not be influenced by the difference in return expectations, but rather by the volatilities and correlations of the two assets. It is, therefore, another form of sensitivity analysis to show the robustness of the results. These simple diagnostics point to an optimal ratio of between 30 percent and 40 percent for SAGBs in the joint portfolio. In particular, on the basis of the current YTMs, the average weightings for SAGBs is 40.6 percent, while if the 'same expected return' is used as a criterion, the optimal ratio of SAGBs in the portfolio is 33.2 percent.

6. CONCLUSION

This paper shows that adding SAGBs (hedged into USDs) to a US treasury portfolio enhances the total risk-adjusted returns of the overall portfolio. In other words, SAGBs add efficiency to the US treasury portfolio through higher returns and diversification. In particular, a statistical portfolio analysis is performed in order to determine the optimal composition of USTs and SAGBs in this joint portfolio. The analysis shows that it is always better to have exposure to SAGBs in the portfolio, rather than none at all. That is, the Sharpe ratio is higher when SAGBs are included in the portfolio. The empirical analysis also shows that the optimal mix of SAGBs and USTs changes considerably depending on the period examined. During periods of low risk aversion in international financial markets, e.g., over the period 2003 to 2007, a weighting of 60 percent SAGBs (and, therefore, 40 percent US treasuries) would have maximised risk-adjusted returns. Conversely, we find that during periods of high risk aversion, e.g., from 2007 to 2009, as the most recent financial crisis unfolded, the optimal ratio of SAGBs falls to 40 percent (and, hence, the exposure to UST increases to 60 percent).

From this, it would appear that a key driver of allocation (between SAGBs and USTs) is the prevailing level of risk aversion. Hence, strategic allocation is inversely correlated with the level of risk aversion in global financial markets. Based on diagnostic tests and the general empirical results, an average weight of 40 percent SAGBs would provide the best risk-return trade-off in the portfolio. These results may, in turn, inform the most efficient allocation to SAGBs and USTs from a portfolio construction perspective. These results may be pertinent in selecting a strategy for global asset allocation, particularly, from the perspective of a long-term total return manager. Similarly, the findings of this study could be important to national wealth managers and institutional investors as they re-examine their portfolio investment strategies, particularly, in light of the need to enhance returns in an environment where nominal yields in the developed market are low and real yields mostly negative. Finally, for official institutions (e.g., national wealth managers) and institutional investors (e.g., pension funds) who are required to invest in investment grade bonds, this analysis shows that emerging market debt has a potentially important role to play in a portfolio in terms of return generation, and, as a consequence, represents an attractive asset class.

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