

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town
Faculty of Commerce

**IS THE GROWTH IN BOTSWANA'S EXTERNAL
PUBLIC DEBT SUSTAINABLE?**

By: TSHEPO SAYED
Student Number: SYDTSH001

A Dissertation submitted to the School of Economics at University of Cape Town, in partial fulfillment of the requirements for the award of a Master of Commerce Degree in Economics.

March 2004

Declaration

I would like to declare that this dissertation is my own original work, produced by my own efforts apart from the assistance received from my supervisor. All sources of information have been fully credited and acknowledged.

I also declare that this thesis has not been, and will not be presented to any other university for any other degree.

.....

Tshepo Sayed

...../...../.....

Date

This research paper has been submitted for examination with my approval as the supervisor.

.....

Tania Ajam

...../...../.....

Date

Acknowledgments

I would like particularly to thank Tania Ajam who provided her time and very useful suggestions and comments, and contributed substantially to the outcome of this paper. My gratitude also goes to my family and friends for the support they gave me throughout this project.

University of Cape Town

Abstract

As a result of the expansionary fiscal policy that the government of Botswana has embarked on, government expenditure has been growing faster than government revenue. On average government expenditure has been growing at 17% annually from 1993 to 2000 in nominal terms while government revenue grew at 13% during the same period. This has led to government using external debt to finance some of its expenditure. The level of external debt has been growing at an average of 13% annually from 1993 to 2000. As the global economy has been experiencing a decline in economic growth with countries like the US having an economic growth rate of 1.0% in 2001, there is bound to be a decline in demand for Botswana's diamonds in the world market. Diamonds contribute almost 40% to total GDP and the reduction in their demand will lead to a decline in Botswana's economic growth. With the possibility of a decline in economic growth and the increase in public debt, concerns are being raised regarding the sustainability of public debt. This study analyses the data available to assess if the high growth rates of government expenditure and external public debt are likely to be sustainable in the long run with the world economy experiencing a decline in the economic growth. The empirical analysis of Botswana's debt sustainability suggests that currently the country's debt appears to be still sustainable and the country can still borrow to finance its development projects. This is because Botswana is still running a primary surplus and thus can still afford to service the loans that it takes from multilateral institutions. The country's foreign debt is only a tenth of its foreign exchange assets and the debt to export ratio is very low. The empirical analysis also shows that there appears to be no causal relationship between growth rate of real primary surplus/deficit GDP ratio and the growth of real debt/GDP ratio. This suggests that the growth rate of expenditure does not cause the growth rate of the country's debt/GDP ratio. As there would appear to be no causal relationship between the explanatory variables and the dependent variable, it seems to indicate that the problem of debt has to be tackled from many fronts. There is a need to curb non-essential current spending or to secure alternative revenue sources as continued rapid growth in spending could lead to the dissipation of carefully acquired

assets and at the same time increasing the country's indebtedness. It is necessary to find other sources of revenue besides mining so that when the world price of diamonds is depressed Botswana can still maintain a prudent fiscal stance and a healthy economic growth rate.

University of Cape Town

Table of Contents		Page	No
1	Introduction		1
	1.1 Background		1
	1.2 Economic growth		1
	1.3 Inflation		2
	1.4 Exchange rate		2
	1.5 Public Revenue		3
	1.6 Public Expenditure		5
	1.7 Public Debt		8
	1.8 Problem Statement		8
	1.9 Objective of the Study		9
2	Indicators of Public Debt Sustainability		10
	2.1 Macroeconomic Structure		10
	2.1.1 Openness and Trade		10
	2.1.2 Domestic Financial Structure		11
	2.1.3 Economic Growth		12
	2.2 External Factors		13
	2.2.1 External Debt and Foreign Reserves		13
	2.2.2 Real Interest Rate		15
	2.2.3 Real Exchange Rate		16
	2.3 Macroeconomic Policy		17
	2.3.1 Fiscal and Monetary Policy		17
3	Approaches to Evaluating Sustainability of Public Debt		20
	3.1 General Debt Sustainability Analysis		21
	3.2 Evaluation		23
	3.3 Seignorage		28
	3.4 Primary Fiscal Balance		29
	3.5 Accounting Approach to Sustainability		29
	3.6 Present Value Constraint		31
4	Data and Methodology		33
	4.1 Data Source		33
	4.2 Periodicity of Data used		33
	4.3 Macroeconomic Framework		33
	4.4 Models		34
	4.5 Variables used in the analysis		35
	4.6 Data Transformation		35
5	Analysis		36
	5.1 Introduction		36
	5.2 Test for Stationarity		36
	5.2.1 Correlation and Graphs		36

5.3	Unit Root Test	41
5.3.1	Testing Using Levels	41
5.4	Residual Test for Stationarity	45
5.5	Granger Causality Test	49
6	Conclusion and Policy Recommendations	51
	References	54

University of Cape Town

List of tables and Charts		Page
Table 1	Composition of Government Revenue	4
Table 2	Government Expenditure, Revenue and External Debt	6
Table 3	Composition of Government Expenditure	7
Table 4	Real debt/GDP ratio	36
Table 5	Real M1/GDP ratio	38
Table 6	Real (r-g) Debt/GDP ratio	39
Table 7	Real Deficit or Surplus/GDP ratio	40
Table 8	Growth rate of Real debt/GDP ratio	41
Table 9	Growth rate of Real Primary deficit or surplus/GDP ratio	42
Table 10	Growth rate of real interest on debt/GDP ratio	43
Table 11	Growth rate of real M1/GDP ratio	44
Table 12	Residual Test for Stationarity	45
Table 13	ADF TEST	47
Table 14	Engle- Granger Test	48
Table 15	Granger Causality Test	49
 Charts		
Chart 1	Nominal South African Rand/ Pula and USA Dollar/Pula	3
Chart 2	Percentage contribution to Government Revenue in 2000	5
 Graphs		
Graphs 1	Real debt/GDP ratio	37
Graph 2	Real M1/GDP ratio	38
Graph 3	Real (r-g) Debt/GDP ratio	39
Graph 4	Real Deficit or Surplus/GDP ratio	40
Graph 5	Residual test	46

CHAPTER 1

Introduction

1.1 Background

At the time of independence in 1966, Botswana was regarded as one of the poorest countries on the African continent, with an overwhelmingly rural population dependant mainly on agriculture for their livelihood. Beef production was the pillar of the economy in terms of export earnings. During the pre-independence era the country experienced the most severe drought. Almost one third of the national herd estimated to be around 916 000 was affected by the drought. Over 30% of Batswana men, aged between 20-40 years were working in South Africa at the time, mainly in the mines. Besides the railway line from Lobatse to Zimbabwe that is situated in the eastern part of the country, communication and transport infrastructure were barely developed. Prospects of rapid economic development looked bleak, as the country was dependent on foreign aid to finance its recurrent and development (capital) expenditures.

1.2 Economic growth

After more than three decades of independence the country has seen a remarkable economic transformation. Development efforts have made it possible for the majority of Batswana to have access to basic necessities, like water, education, health and roads. School enrolment has improved over the years, with over 90% of primary school aged children enrolled in primary schools by 1996. The government has continued to implement the Primary Health Care strategy, which emphasized that the rural population should be within a radius of 15 kilometres of a health facility. Now about 85% of the rural population are within 15 kilometres radius of a health facility (MFDP¹, 1997).

These developments mainly came about after the discovery of copper, nickel and also diamonds in the early 1970's. As a result of these discoveries the mining sector's

¹ Ministry of Finance and Development Planning

contribution to Gross Domestic Product rose from zero in 1966 to 51% in 1983, before falling to 36.5% in 2000. This growth in mineral revenue brought about a phenomenal growth rate of the whole economy. Real GDP grew at an annual average of 14.5% from 1970 to 1980, 10.1% for the period 1980 to 1990 and 5.4% during 1991 to 2000. This growth has enabled Botswana to be categorized as an upper middle-income country in terms of its per capita GDP. When expressed in 1993/94 prices, annual per capita real GDP has grown from P1 682 in 1966 to P9 992 in 2000/01(MFDP, 2000).

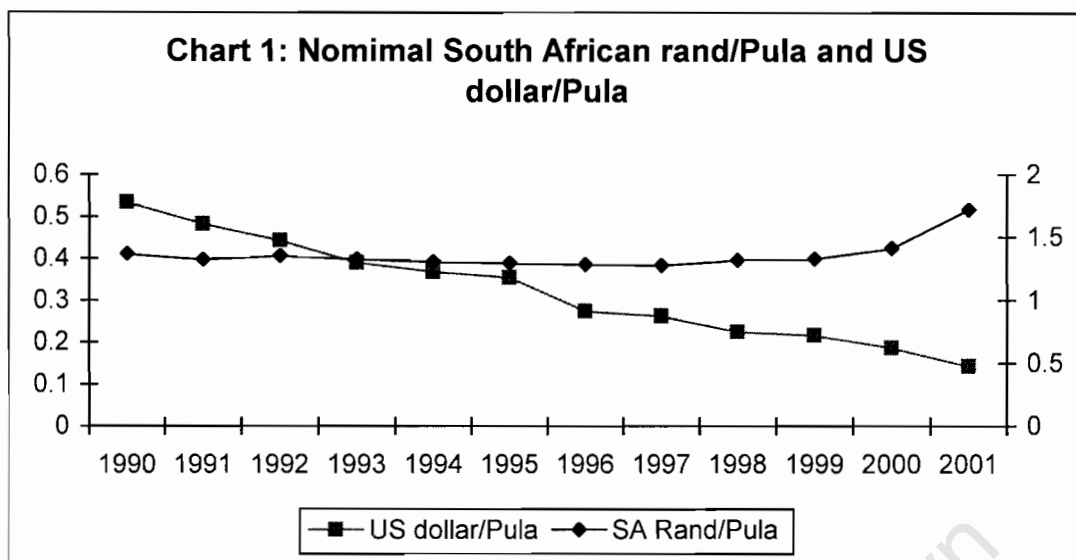
1.3 Inflation

The inflationary pressures in Botswana are caused by a number of determinants, which are similar to those in other small open economies. These include: the inflation rate of trading partners, especially South Africa, the value of the Pula against other trading partners' currencies and fiscal, monetary and other developments in the domestic economy like government policies on cost recovery or user charges. Botswana's annual rate of inflation was 12.5% in 1980 and it has been fluctuating over the years since then, reaching a high of 16.3% in 1981 and a low of 6.5% in 1998. The average annual rate of inflation from 1980 to 2000 was 10.6%, which was higher than the target inflation rate of 6% that Bank of Botswana had set for the economy. It is important for Botswana to maintain relatively low inflation in relation to its trading partners as it contributes to improvement in international competitiveness.

1.4 Exchange rate

Since June 1980, the Pula has been pegged to a basket of major currencies weighted according to their importance to the Botswana economy. Prior to that, it was pegged to the US dollar. The weights of various currencies in the basket, as well as the appropriateness of the pegging system are reviewed continually to make changes which are deemed appropriate. This would include changes in the terms of trade with our major trading partners. Currently the exchange rate between the Pula and the Rand has more weight as South Africa is our major trading partner when compared to other countries in the peg like USA, Japan, United Kingdom. It the terms of trade between

USA, Japan and United Kingdom increase, then there is bound to be a decline in the weights given to the Rand.



As can be seen from the figure above, the Pula has been fairly stable against the South African rand with a major appreciation of the currency in 2000. Since 1990 the Pula has been depreciating against the US dollar. In 1990 a Pula was equivalent to 0.5344 dollars and in 2001 a Pula was equal to 0.1432 dollars (BOB², 2000).

1.5 Public Revenue

Public revenue which includes mineral revenues, tax revenue and non tax revenue has been increasing every year from 1980 to 2000, except in 1998 when the revenues declined. On average from 1980 to 2000 government revenue had been growing at an annual average of 16%. A large proportion of the revenue that the government has been generating since the early 1970 has been derived from the mining sector. Mineral revenues have been contributing an average of 46% of the total revenue from 1980 to

² Bank of Botswana

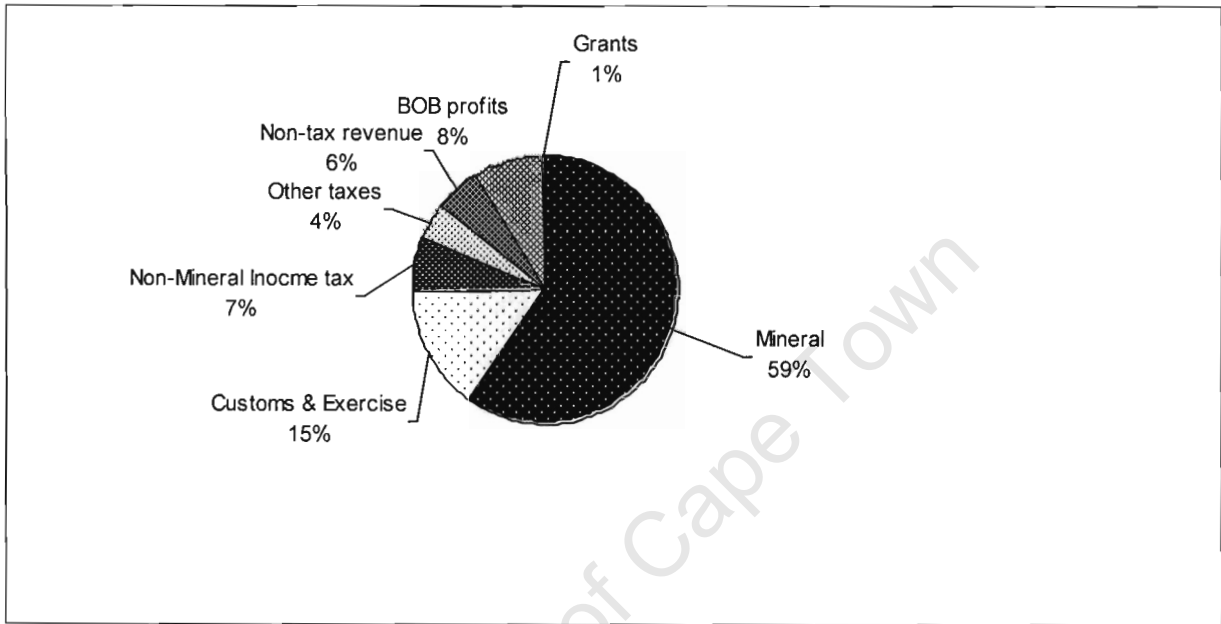
2000, with the largest share of 61.6% experienced in 1988. When looking at chart 2 on the percentage contribution on government revenue in 2000, mineral revenue contributed 59% of total government revenue, while customs and excise, non-mineral income tax, other taxes, BOB profits, non- tax profits and grants shared the remaining 41% amongst themselves.

Table1: Composition of Government Revenue

Year	Revenue and Grants			(P millions)				Total
	Mineral Revenue	Customs and Excise	Non-Mineral Income Taxes	Other Taxes	Other non- Tax Revenue	BOB Profits	Grants	
1980	101.11	102.02	38.45	2.68	24.62	0.00	37.75	306.63
1981	77.05	104.29	41.55	3.73	29.38	26.97	39.66	322.63
1982	99.46	114.32	58.27	7.07	32.46	34.96	47.19	393.73
1983	193.80	156.84	78.91	11.17	37.09	37.00	48.24	563.05
1984	376.48	155.79	87.18	9.31	114.64	20.00	39.52	802.92
1985	581.15	149.23	93.62	11.16	222.07	35.00	41.12	1133.35
1986	844.92	192.28	121.11	18.45	106.78	196.38	67.61	1547.53
1987	1034.47	234.13	129.61	25.38	94.10	201.42	105.92	1825.03
1988	1508.06	292.59	164.76	23.63	138.03	319.29	109.66	2556.02
1989	1596.00	353.14	242.83	43.34	136.40	339.18	40.01	2750.9
1990	2005.37	478.17	289.91	70.69	211.94	566.84	117.79	3740.71
1991	1888.02	761.59	357.26	84.78	146.01	761.93	69.84	4069.43
1992	1866.12	998.35	369.89	140.05	345.71	832.05	100.08	4652.25
1993	2278.73	822.34	420.54	155.63	388.89	1106.75	186.58	5359.46
1994	2349.39	711.80	386.94	184.58	312.74	451.38	75.66	4472.49
1995	2591.41	829.43	356.87	242.17	356.89	1050.53	37.07	5464.37
1996	3640.13	896.22	385.04	277.08	412.99	1700.32	82.99	7394.77
1997	4681.13	1186.06	537.32	362.82	455.12	946.72	112.09	8281.26
1998	3186.60	1261.30	739.34	452.35	682.95	1217.39	137.69	7677.62
1999	6687.27	1931.19	780.18	539.13	699.27	1200.00	126.05	11963.09
2000	8367.80	2188.43	925.29	596.05	806.23	1166.72	64.53	14115.05

Source: Financial Statements, Tables and Estimates of Consolidated and Development Fund Revenues (1985-2001). Ministry of Finance and Development Planning

Chart 2 Percentage contributions to Government Revenue in 2000



1.6 Public Expenditure

Government expenditures are mainly aimed at providing public services to all Batswana and putting infrastructure in place that will provide an environment conducive to private sector investment in the country. Since independence, the government has adopted an expansionary fiscal policy aimed at providing goods and services that were lacking before independence. The level of government expenditure averaged around an annual growth rate of 11% from 1980 to 2000, and government contribution to total GDP from 1980 to 2000 averaged around 15.4%. The level of government expenditure has been growing faster than government revenue.

Table 2: Government Expenditure, Revenue and External Debt

Year	Government Expenditure (P million)	Government Revenue (P million)	Government External Debt (P million)
1980	308.36	306.63	98.73
1981	341.36	322.62	132.45
1982	414.76	393.73	199.23
1983	460.12	563.05	232.37
1984	614.71	802.92	380.62
1985	719.18	1133.35	410.96
1986	1008.21	1547.53	474.12
1987	1312.01	1825.00	557.51
1988	1787.52	2556.00	713.95
1989	2214.45	2750.90	744.22
1990	2942.69	3740.70	787.80
1991	3372.20	4069.43	801.92
1992	3370.95	4652.30	965.80
1993	4481.16	5359.50	1096.20
1994	4276.84	4472.49	1267.80
1995	5194.51	5464.37	1377.70
1996	6092.43	7394.77	1439.90
1997	7406.13	8281.26	1783.80
1998	9065.42	7677.62	1968.30
1999	10427.51	11963.09	2422.80
2000	11880.91	12961.85	2537.30

Source: Statistical Bulletin, Central Statistics Office (1985-2001)

By observing the table below, it can be seen that most of the money that the government spends on its activities funds recurrent expenditure. The recurrent expenditure comprises of personnel emoluments, other charges and public debt interest payments. But almost over 50% of the recurrent expenditure consists of personnel emoluments. The Ministry of

Education has received the largest share of the recurrent expenditure since independence. It also used to get a large share of the development budget when the government was still building many schools so that all Batswana should have access to basic education. These days, the largest share of the development budget goes to the Ministry of Health as a result of AIDS. Government is now currently engaged in building or upgrading health facilities all over the country to improve accessibility of health services in rural areas. As almost one third of the country's population is affected by the HIV virus and the government is trying to provide the antiretroviral drugs to all who are affected, it needs to have these facilities in place to administer this programme well. Currently the programme is only administered at four sites, which are Gaborone, Francistown, Serowe and Maun.

Table 3: Composition of Government Expenditure

Expenditure and Net Lending (P million)					
Year	Recurrent	Development	Net Lending	FAP ³	TOTAL
1980	166.81	121.44	7.78	0.00	308.36
1981	199.97	121.25	20.14	0.00	341.36
1982	226.34	160.36	27.02	1.04	414.76
1983	270.57	140.68	46.81	2.06	460.12
1984	342.26	209.70	60.35	2.40	614.71
1985	427.02	247.52	39.42	5.22	719.18
1986	573.03	405.22	21.83	8.13	1008.21
1987	686.83	558.14	58.17	8.87	1312.01
1988	897.02	797.34	83.26	9.90	1787.52
1989	1141.80	827.65	231.97	13.00	2214.45
1990	1416.61	1090.08	414.00	22.00	2942.69
1991	1789.76	1097.98	458.46	26.00	3372.2
1992	2186.97	1206.96	348.62	28.40	3770.95
1993	2702.41	1558.25	189.30	31.20	4481.16
1994	2975.06	1377.82	-112.24	36.20	4276.84
1995	3437.63	1671.97	12.91	72.00	5194.51
1996	3971.95	2239.56	-191.08	72.00	6092.43
1997	4826.61	2695.54	-218.02	102.00	7406.13
1998	6157.31	2934.47	-134.36	108.00	9065.42
1999	7047.92	3451.02	-181.43	110.00	10427.51
2000	8234.47	3627.21	-148.77	168.00	11880.91

Source: Statistical Bulletin, Central Statistics Office(1985-2001)

³ Financial Assistance Policy (FAP). This is a programme which was started by government to help Batswana set up their own businesses. Loans and grants were given to citizen to start their businesses.

1.7 Public Debt

When compared to most other African and developing countries, Botswana has never experienced debt problems. But the level of public debt has been rising sharply from 1980 to 2000. In 1980 the level of external public debt was P98.73 million and by 2000 the debt had grown to P 2.537 billion. The external public debt has been used to finance some of the country's development expenditure, like building schools, roads and health facilities. When the government borrows to finance the above development projects, it is merely deferring the burden of the exhaustion of the mineral wealth to the future when the mineral extracts are depleted. Over 50% of these loans are from organisations like the International Bank for Reconstruction and Development, African Development Fund and others. The other loans are from governments of countries such as United States and China. Most of the external debt is denominated in US dollars. With the Pula depreciating against the US dollar means that the external public debt in Pula terms is increasing every year and also the interest on the loans. In 2000 the level of external outstanding public debt was P2.537 billion and from 1993 the debt has been growing at an annual average of 13.1%, which is higher than the average annual growth rate of the economy of 5.4% during the same period (MFDP, 1999).

1.8 Problem Statement

As a result of the expansionary fiscal policy that the government has embarked on, government expenditure has been growing faster than government revenue. On average government expenditure in nominal terms has been growing at 17% annually from 1993 to 2000, while government revenue in nominal terms also grew at 13% during the same period. This has led to government using external debt to finance some of its expenditure. The level of external debt has been growing at an average of 13% annually from 1993 to 2000. As the global economy has been experiencing a decline in economic growth and countries like the US having an economic growth rate of 1.0% in 2001, there is bound to be a decline in demand for Botswana's diamonds in the world market. Diamonds contribute almost 40% to total GDP. Therefore, the reduction in their demand will lead to a decline in Botswana's economic growth. With the possibility of a decline in

economic growth and the increase in public debt, questions are being raised regarding the sustainability of public debt. Also with the depreciation of the Pula against the US dollar, given that most of the loans are US dollar denominated, there may also be a problem of the sustainability of the debt, as it shall be increasing in Pula terms.

1.9 Objective of the Study

The main objective of this study is to determine if the high growth rates of government expenditure and external public debt are likely to be sustainable in the long run with the world economy experiencing a decline in the economic growth. Since there is no simple rule for determining, whether, in practice, a government's debt is sustainable, a number of approaches have been developed to look into the issues of public debt sustainability in emerging market and how the situation compares with industrial countries. If the level of public debt is likely to be unsustainable then policy remedies to help resolve the problem will be explored. In a number of developing countries sustainability is achieved if the public debt does not exceed the threshold of 50% of GDP

An overall view of the Botswana economy in terms of its level of debt, expenditure and revenue will be highlighted (section 1). This will be followed by a public finance literature review on the sustainability of public debt to isolate the relevant variables and indicators (see sections 2 and 3). Thereafter, an empirical analysis will be conducted on debt and deficit data from Botswana (in section 4 and 5). The last section of the paper will focus on tentative conclusions and the policy recommendations based on the results of the analysis.

CHAPTER 2

Indicators of Public Debt Sustainability

This chapter takes a non-structural approach to identifying potential indicators that can be helpful in evaluating the sustainability of Botswana's external public debt. In particular we shall be looking at a country's macroeconomic structure and policy, its external position and other indicators that may be regarded as being important. These categories will be discussed below.

2.1 Macroeconomic Structure

2.1.1 Openness and Trade

As the current account of a country reflects the sum of net exports (the difference between exports and imports) and net factor payments, a country's inclination to export and import will influence its external position. The production of tradeable goods is an invaluable source of foreign exchange as these flows are used to service foreign loans and reduce size of the country's external indebtedness (North, 2000). As it is widely seen, countries with larger export sectors are more open and are able to service their external debt more easily as a small amount of their total export payments are absorbed by servicing the external debt. Borrowing and lending considerations may also affect investment and the size of the export sector. Aizenman (1989) finds that investment in any given sector depends upon the expected incidence of the country default and the relative exposure of that sector to international trade. By linking the probability of defaulting on a debt with the extent to which the country is open, Aizenman (1989) asserts that the more 'open' an economy is the less likelihood of it defaulting on its external debt commitments.⁴

A country's external vulnerability can also be affected by the exogenous shocks such as a decline in demand of its exports and as well as changes in global economic conditions.

⁴ Aizenman (1989) however finds this observation dependent upon the centralised decision-makers periodic assessment of the relative cost and benefits of external debt default.

Vulnerability is increased when the country's export sector is less diversified, and the more dependent its sectors are on imported inputs. Given that a nation's export earnings can be used to service and reduce the size of its external debt, countries with large tradable goods sectors would be in a good position to service their external commitments without any fiscal stress.

2.1.2 Domestic Financial Structure

The soundness of the domestic financial structures (especially the banking sector) has bearing on the country's ability to sustain its external public debt obligations. When domestic financial markets become integrated with the global capital markets, well functioning and well-regulated financial markets are essential. The problems of the large-scale banking sector that have emerged in a number of both developed and developing countries in the early 1980's and 1990's have raised concerns about the consequences of these crises. Besides the reduction in investment and consumption, the crises can also threaten the functioning of the payment systems and reduce confidence in the domestic financial system, which may cause a fall in domestic saving and large capital outflows (North, 1999). The existence of well functioning financial markets may reduce the risk of instability in a country and as well as attract more foreign investment and thus reducing the probability of an external crisis.⁵

A large number of the financial (mainly banking) crises and central bank bailouts over the past two decades have raised issues concerning the financial sector, as well as the regulatory framework governing the sector.⁶ Although the specific causes of the crisis differ from country to country, they have regularly induced insolvency in the banking system, and typically featured collapse in asset prices, most often in equity and security markets (Caprio, 1998).

⁵ It must be noted that the existence of well functioning domestic and international financial markets can also increase the probability of an external crisis if foreign capital flows compromise mainly temporary flows

⁶ One of the know example of the financial crisis is the US saving and Loan crisis of 1980-92. Although international financial linkages played no role in the crisis, the cost of the bailout to the US Federal government was estimated at \$127 billion or 2,3% of GDP(Lindgren, Garcia and Saal, 1996, in IMF)

Financial crises often occur when investors or depositors lose confidence in a country's domestic financial system. This may induce a self-fulfilling financial crisis if they anticipate that a bank (or banks) will become insolvent. When it is assumed that there would be a rush to withdraw funds in large amounts, then the domestic sector can become illiquid. If the loss of depositor confidence is due to a genuine deterioration in the balance sheet of the domestic banking sector, foreign creditors may be unwilling to step in unless they expect to be bailed out by the authorities. In the case of the decline in deposits not being matched by an increase in foreign inflows, the run will then result in a net capital outflow. The speed and magnitude of these capital outflows will largely determine to what extent any currency crisis materialises (North, 1999). As empirical evidence from Latin America shows, it was the reluctance of foreign creditors to continue lending to countries like Mexico, Columbia, Argentina and Peru in 1982 that eventually lead to severe banking crisis in these countries (IMF, 1998). Currency crises can also induce a financial crisis. If investors suddenly lose confidence in the domestic currency, it may result in a financial crisis if depositors attempt to convert their currency into foreign exchange.

2.1.3 Economic Growth

The theoretical literature suggests that those countries which are experiencing rapid economic growth can sustain higher and more persistent current account deficits without increasing their external indebtedness relative to national output, provided they have a positive financial account (capital inflows). This will usually lead to a decrease in external indebtedness. Although the accumulation of physical capital through investment can enhance a country's ability to service its external debt commitments, the net impact depends on productivity shocks and their effect on investment and national output (North, 1999). When observing a small open economy, a positive productivity shock occurring in the tradable goods sector would be more beneficial to the country than one occurring in the non-tradable goods sector. The net effect on growth would depend on the relative size of the tradable goods sector as well as the sector's actual and potential export growth

capability. Low export growth in the tradable goods sector could indicate exchange rate misalignment that may require some future policy reversal (Obsfeld and Rogoff, 1995).

2.2 External Factors

2.2.1 External Debt and Foreign Reserves

In addition to the macroeconomic challenges that are posed by the large and volatile capital flows, the structure of a country's external liabilities can have an impact on its ability to manage its external position. If a country's investment needs exceed its available resources, the deficit balance on the current account has to be financed by a capital inflow or the accumulation of foreign debt (North, 1999). A country's ability to successfully manage and sustain its external imbalance is affected by its stock of foreign assets, and the existing size, nature and repayment on its external liabilities. This illustrates how changes in international exchange rates and interest rate can have devastating effect especially if a large part of the country's foreign debt is classed as short-term.

The currency composition and the maturity profile of a country's external debt can contribute to its vulnerability to external shocks. This fact was borne from the 1994 Mexican crisis where financial markets' concerns about the Mexican risk were attributed mainly to the currency composition and the maturity structure of the public debt rather than the size of the debt (Griffith-Jones, 1997). In Mexico, the vulnerability of the government to external crisis was made worse by the debt, which amounted to US\$29 billion of *tesobonos*⁷ maturing in 1995 against the country's low level of foreign reserves of US\$6.3 billion at the end of 1994. When looking at the East Asian crisis, for three of the most affected countries South Korea, Thailand and Indonesia the foreign debt was privately held and short-term debt to reserves ratios had increased to well over 100 percent by mid 1997. The high levels of short foreign debt in these countries were

⁷ Short-term, dollar denominated public debt instruments.

associated with a broader indicator of external vulnerability, the ratio of M2⁸ money to foreign reserves (North, 1999).

Indonesia and South Korea had ratios of M2 to foreign reserves in excess of 600 percent by June 1997. The other important concern about the crisis was the nature of the foreign liabilities. Since the 1970s the composition of foreign flows to developing countries has undergone a significant change in response to various factors. In the 1970s capital flows to developing countries were mainly in the form of syndicated bank loans. When the world economy started to experience a slow down in economic growth, large increases in world interest rate and losses in terms of trade towards the end of the decade, many developing countries experienced a sudden decline of capital flows to their economies. As a result of weak economic policies and institutions in these economies, these eventually lead to the international debt crisis that started in the early 1980s. After these crises the lending to those affected countries were mainly in the form of official loans from international financial institutions like the International Monetary Fund and the World Bank to support policy and institutional reforms.

The impact of the East Asian crisis has increased the net official development finance to many countries to help boost their holding of foreign reserves. While non-concessional flows increased in response to the East Asian crisis, concessional flows have continued their overall decline (IMF, 1999). Despite the unpredictable nature of short-term capital inflows, the cost of the adverse shocks on the economy can, in principle, be absorbed by the asset-price adjustment and partially borne by foreign equity investors through these equity price adjustments (North, 1999). A current account deficit that is financed through long-term inflows such as foreign direct investment is more sustainable than a deficit financed by temporary flows. With regard to debt as a whole, a higher incidence of external debt, a higher ratio of short-term debt to total debt, and variable interest rates are likely to enhance the risk of an external crisis.

⁸ M2= M1+ saving deposits, including money market deposit accounts + small time deposits+ money market mutual funds.

M1= currency in the hands of the public + all checkable deposits.

Payment of foreign debt is usually done in foreign currency. Because of this, a country's level of foreign assets reserves will have an impact on the sustainability of the country's external position. The presence of large foreign reserves will give the country a greater ability to import essential goods and services as well as to pay off its external debt obligations without problems. It looks like those countries with large foreign reserves and a small external debt burden of appropriate composition and maturity structure are less likely to run the risk of having an unsustainable external position (North, 1999). But this will depend on the exchange rate dispensation being used, as under a flexible exchange rate no reserves are required. The assumption on the above will be that you use the Fixed exchange rate system or the peg, which have been argued to increase economic stability by placing a degree of discipline on the economy's domestic monetary and fiscal policies.

2.2.2 Real Interest Rate

The capability of a country to sustain its external public debt is influenced not only by the size and the nature of existing liabilities and the stock of its foreign assets, but also the extent of its debt-servicing burden. As there has been a transformation in both the structure and the size of international capital flows over the past decades, with most international investors moving away from debt instruments in favour of equity instruments, increases in the cost of external debt will impact on the debtor country's ability to service its debt. The impact will, however, depend on other factors such as changes in the macroeconomic environment of the domestic economy, the foreign public debt to GDP ratio and the interest rate structure of the loans.

Increases in the real growth rate and unexpected inflation in the debtor country would also serve to reduce the value of the foreign public debt. When this situation arises, the country with the external debt would be able to spend fewer resources in servicing its debt obligations. However, during times when there is an upward pressure on world real interest rates there is an increased pressure on the country's current account. As in the

case of the early 1980s when there was a sharp increase in real interest rates, it was not long after this increase that many highly indebted developing countries, especially those in Latin America, began to feel the effect of high foreign debt repayments which eventually lead to the debt crisis of 1982.

2.2.3 Real Exchange Rate

Real exchange rate indicates a country's degree of competitiveness in international markets. A widely used definition of real exchange rate is the relative price of tradables to non-tradables (Edwards, 1989). Although real exchange rate appreciation is not necessarily adverse, the source of the appreciation has very important implications. If a change in the economic fundamentals reflects inappropriate domestic policy choices, sustained real appreciation would see the transfer of real resources away from tradable goods sector towards the non-tradable goods sector (North, 1999).

In the early stages of a country's development it may experience a real exchange rate appreciation in response to inflows of foreign savings to finance its capital needs. Foreign capital inflows may also respond to countries that are in a phase of economic transition.⁹ In this regard, a real appreciation could merely reflect the movements towards a new long-run equilibrium real exchange rate after an initial upward overshooting (North, 1999). A real exchange in this case would not necessarily indicate a pending unsustainable position. It would likely reflect investors' expectations of the increased productivity of higher returns to their capital.

Despite their beneficial development role of foreign capital, these inflows can pose a potential problem for the recipient countries. The real appreciation problem appears when capital inflows are mostly consumed rather than invested, as it was the case in Mexico and Argentina in the early 1990s and in Thailand during 1990-96 (Reisen, 1997). In these cases, the large current account deficits were associated with large increases in foreign

⁹ A number of analyses have attributed real exchange appreciation in many emerging and transitional economies during the first half of the 1990s to large capital inflows (Edwards, 1997).

exchange reserves and real exchange rate appreciation. The size of the capital flows were shown to exceed the magnitude of their current account deficits, and in the absence of sterilisation by the monetary authorities, lead to nominal exchange rate appreciation.

Strongly related to the movements in the real exchange rate are a country's terms of trade. The appreciation of the real exchange rate or the negative shocks in foreign demand would put a downward pressure on the domestic economy's terms of trade. The impact on the terms of trade after an external shock would depend on how open a country is, with more open and less diversified economies exposed to more variation in their terms of trade.

2.3 Macroeconomic Policy

2.3.1 Fiscal and Monetary Policy

If a country implements inappropriate domestic economic policies, they can also threaten the sustainability of the economy's external position. Expansionary monetary policy or weak fiscal discipline can place pressure on the balance of payments by changing real income or real interest rate. When this happens there are bound to be problems in both the management of the exchange rate regime and the stock of foreign reserves. However, as was the case with the East Asian crisis, sound management of monetary and fiscal policy provides no guarantee against balance of payments crisis.

Rash monetary and fiscal policy can affect the sustainability of a country's external position through one or both of the following: a consumption effect via the current account; or a perceived threat of government insolvency (North, 1999). The net effect of a change in fiscal policy depends on the exchange rate regime that is used; changes in the fiscal position can set in motion changes in aggregate demand. These could be due to movements in the real interest rate, the real exchange rate and the real level of income, all of which can in the end affect the country's external balance. When using the fixed exchange rate regime, an expansionary fiscal policy will cause domestic interest rates to rise and the current account to move into deficit. Higher domestic interest rate attracts an

inflow of foreign savings that allows for the financing of the deficit. If a fiscal deficit is financed through debt, the fundamental issue is whether or not the current account is independent of the time profile of the government's taxation and expenditure decisions (Barro, 1974). Any increase in government expenditure by acquiring higher domestic debt will not induce higher levels of current consumption. The net outcome will, however, depend of the degree of sustainability between public and private savings. The less sustainable public and private savings are, the higher the correlation between fiscal deficit and the current account deficit will be.

Large and growing fiscal deficits can also place an additional constraint on government expenditure. When concerns about the possibility of a public sector financial meltdown arise, they can cause both domestic and foreign lenders to question the sustainability of a country's fiscal position. Excessive current account deficits may cause local and international private agents to lose confidence in the government's ability to remain solvent. Fears of the government falling into a debt trap, and then forced to either default on its debt repayments obligations or to redeem the debt by creating money, will cause financial market instability due to perceptions by the private agents of increased sovereign and country specific risk (North, 1999).

The most important indicators of the debt sustainability analysis are openness and trade, economic growth, real interest rates, monetary and fiscal policies, external debt and foreign reserves. Openness and trade of tradable goods provides a country with revenues that could be used to service foreign debt and it can also be a source of economic growth for the country. The country's external liabilities also have an impact on its ability to manage its external position. The ability of a country to be able to manage and sustain its external liabilities will depend on its stock of foreign assets and the size and nature of the repayment process of its external liabilities. A country's domestic policies are also important indicators of debt sustainability. If a country implements inappropriate domestic economic policies, they are likely to threaten the sustainability of the country's

external position. These policies include expansionary policies, expenditure, exchange rate policies, interest rate and others.

The variables, drawn from the literature that will be used to analysis the sustainability of Botswana's external debt sustainability will include the following.

- a) External debt
- b) Real GDP growth
- c) Primary surplus/deficit
- d) Seignorage

University of Cape Town

CHAPTER 3

Approaches to Evaluating Sustainability of Public Debt

Introduction

A public debt problem arises when economic agents begin to lose some of their earlier confidence in the ability of the state to service its debt. But this problem of economic agents losing confidence will not arise if the expectations are for a return to stable norm of excess growth rate over interest rate. If this situation arises then debt service would be taken care of by the growth rate. This is not, however, the present scenario in most economies of the world. Most developing countries are experiencing high interest rate levels and relatively low growth rates and this situation is unlikely to change in the near future. Then this means that these countries' ability to service their debt will depend on fiscal policy. This is based on the belief that the country will generate primary surpluses to service its debt. In short it means the government will be able to meet its inter-temporal budget constraints.

The core of debt sustainability analysis is the demand for real monetary base, fiscal surpluses, real interest rates and the rate of income growth. The sustainability of public debt is usually discussed in the context of inter-temporal budgeting constraints that governments usually encounter. When talking about government inter-temporal budgetary constraints we focus on the flow of future primary surpluses and expected real interest rates. When a government faces binding budgetary constraints it can deal with this problem either by issuing money or accumulating debt. When dealing with public debt sustainability there is a need to look at the solvency of a government. A country is deemed to be solvent if it has a positive net worth, that is the discounted value of its overall income flowing from all its assets minus its expenditure flow is positive (Horne 1991).

Hamilton and Flavin (1986) states that, a Treasury would be solvent if the present value of its future surpluses (excluding interest payments) equals the stock of its outstanding debt. They also state that a sufficient condition for solvency is that the debt to income ratio be less than or equal to the present value of primary surpluses, with the discount factor equal to the real interest rates, minus the rate of real income growth. If the present value is equal to or higher than the current debt to GDP ratio, the debt is assumed to be sustainable. In search for fiscal solvency most countries emphasise increases in taxation while doing little to reduce expenditures. However, higher tax revenues have frequently led to higher expenditure. This is a mirror image of what is happening in Botswana. There has also been a growing literature that suggests that spending cuts are more sustainable.

3.1 General Debt Sustainability Analysis

The most utilised variables in assessing debt sustainability are fiscal surpluses, real interest rates and the rate of GDP growth.

Ejaz and Zang (1995) used the following formula to assess debt sustainability in Ethiopia.

$$db = (r-n) b + p - s$$

b = ratio of debt to GDP

db = rate of growth of debt

r = real interest rates

n = growth rate of real GDP

p = primary deficit (ratio to GDP)

s = seignorage (including inflation tax) to GDP

In this formula different assumptions are made for the time path of the primary surpluses, seignorage, interest rate in the income growth in order to map change in debt and as well as to determine whether it is sustainable through the present value technique. The assumptions that were made in the case of Ethiopia were on the following variables:

- 1) They assumed that real Libor of 3.2%
- 2) They assumed debt to GDP ratio of 116%
- 3) They assumed constant velocity of money
- 4) They assumed a primary deficit of 4% of GDP

Based on the above assumptions the results they obtained showed that the debt to GDP ratio will decline by 2.4%. They also observed that if the primary deficit increased to 6.4% of GDP, then the debt to GDP ratio will not grow. Thus as long as the primary deficit is kept under 6.4% of GDP, Ethiopia's debt to GDP ratio won't increase. This would then mean that the debt would be sustainable.

Primary fiscal surpluses are a key variable in the calculation of sustainability. A permanent increase in the primary fiscal surplus would increase debt sustainability if other variables remain unchanged (Garcia, 1999). Furthermore a permanent increase in fiscal primary surplus through expenditure reduction would have an important effect on debt sustainability.

1. This is because a reduction in government expenditure reduces real interest rates through the crowding out reduction. High levels of government expenditure usually lead to low levels of private sector participation in the economy and so the expenditure that government undertakes crowds out the private sector.
2. An increase in fiscal primary surplus by a reduction in government expenditure has a tendency to lead to increases in income growth through increased efficiency in resource allocation and reduced interest rates.
3. Also increase in fiscal primary surplus through a reduction in government expenditure can sometimes lead to an increase in the demand for the monetary base as a result of reduced inflationary expectations.

An indication of a country's ability to service its debt is given by the debt service ratio. When arrears and debt relief are taken into account, the debt service ratio for a number of

countries exceeds 50% and few sub-Saharan countries have debt service ratio exceeding 100%. When using the IMF classification of indebted countries, it shows that countries in the sub Sahara fall in the following three categories:

- a) Market borrowers
- b) Official borrowers
- c) Diversified borrowers

In a group of market borrower's two thirds of their outstanding external debt are from market sources e.g. Nigeria, Congo, Gabon and Cote d'Ivoire. Official borrowers are those countries, where two thirds of external debt is from official borrowers like the IMF and the World Bank. There are thirty sub-Sahara African countries in this category. In a category termed diversified borrowers one third of external debt is from market and official borrowers combined.

3.2 Evaluation

Evaluation of foreign public debt (D) is given by:

$$1) \quad D_t = D_{t-1} + CAD_t = D_{t-1}(1 + i_t) + IM_t - EX_t$$

CAD = Current account deficit

I = nominal interest rate

IM = import

EX = exports

This is a difference equation, which can also be solved forward, subject to a transversality condition to express the maximum sustainable level of foreign debt as a function of future excess of exports over imports.

$$2) \quad D_t = E_t \sum (1+i)^{-j} (EX_{t+j} - IM_{t+j})$$

Where the assumption is made that nominal interest rate is a constant.

According to the second equation a country can repay the foreign debt using the resources obtained by the non-interest section of the current account. The second equation can also be used as a ceiling for the level of foreign debt and does not imply anything about willingness to pay the debt. Estimating future current account surpluses is therefore a way to quantify expected resources from a country in the future and to provide a benchmark to evaluate the solvency of indebted nations. This is particularly relevant today when the main concerns about debt crisis seem to be based more on the qualitative impression or on the simple indexes of solvency rather than on empirical evaluation of future evolution of exports and imports.

Cohen (1985) also followed this line of evaluating the solvency of indebted countries and makes the hypothesis that a country uses a percentage (b) of exports to repay the foreign debt so that the market value of the debt is equal to

$$3) \quad D_t = E_t (bEX_{t+1} / (1+i) + bEX_{t+2} / (1+i)^2 + \dots)$$

From the previous expression it is possible to find the value of (b), which allows the country to entirely repay the foreign debt and which is equal to

$$4) \quad b = D_t (i-n) (1+n)^{-1} X_t^{-1}$$

where n = rate of growth of exports

Cohen(1985) compares the value of b for different countries after making appropriate assumptions about n and i and finds that the debt problem is not so dramatic because of the adjustment, which many countries went through after the emergence of debt crisis. These illustrate the inability of this index to separate temporary and permanent improvements in the current account.

If the surplus is due to a reduction in the imports, it is unlikely that it can be sustained for a long time, and therefore the market value of the debt does not increase. This problem is due to simplified assumptions (on nominal interest being constant and that a country will use a certain percentage of revenue from exports to service its debt) which are made when looking for an empirical counterpart of equation 2.

A good measure of capacity to repay a foreign debt should instead have the following (Beltratti 1989).

- a) It should be time varying.
- b) It should be related in a definite way to observable variable reflecting the general state of the economy.

The maximum sustainable level of foreign debt (D_t) is estimated as a linear function of a variable known by agents at time t .

$$5) \quad D_t = a_1 X_{t-1} + a_2 X_{t-2} + \dots + a_q Z_{t-1} + a_{q+1} Z_{t-2}$$

Where X and Z are pre-determined information variables that can help forecast the future series of trade surpluses. It has the following advantages over simpler indexes:

- a) It is possible to allow for a time varying rate of growth of exports and imports.
- b) Expectations about the future rate of growth of trade surpluses are not assumed a priori, but estimated on the basis of projection of the trade surplus on the information variable known at time t .
- c) By considering a long-term experience of the country in question not so much weight is put on recent events (effects of stabilisation programmes), which are likely to improve the trade balance in the short-run, but are unlikely to be sustainable in the long run.

Garcia (1999) also tested for debt sustainability by using income velocity of base money as one of the variables that can be used. He looks at how income velocity plays a crucial role in the inflationary (deflationary) impact of debt vis-a-vis monetary financing of the primary deficit.

He defined

i = nominal interest rate

y = real income

B = stock of bonds

H = monetary base

P = price level

E = public non-interest expenditure

R = public sector non-interest revenues

$PSBR = E - R + iB$ (public sector borrowing requirements)

$D = PSBR - iB$ (primary balance, deficit when positive and a surplus when negative)

$OD = D + rB$ (Operational balance)

$k = 1/v$ ratio of monetary base to GDP

Z denotes increment

g preceding a variable denotes its rate of change

$r = ((1+i)/(1+gP)) - 1$ real rate of interest

$$6) \quad D = E - R$$

$$7) \quad D + iB = ZB + ZH$$

He then divided equation 2 by GDP, dividing and multiplying ZB by B and ZH by H and assuming $gP = gH - gy$, resulted in:

$$8) \quad d + ib = b gB + kgP + kgy$$

$$9) \quad gP = Vd + Vbi - Vb gB - gy$$

$$10) \quad gP = Vd + Vb (i - gB) - gy$$

When testing for debt sustainability he used the equation

$i = r + gP$, by assuming that a debt sustainability is defined as $gB = gP + gy$ and by substituting them into the third equation we get

$$11) d + br = k gP + b gy + k gy$$

$$12) gP = Vd + Vb (r - gy) - gy$$

re-arranging equation 12, he got

$$13) gP = V [d + b (r - gy)] - gy$$

This equation shows the well known quantitative theory of money: inflation depends on the Velocity of money, money supply ($d + rb$) and real income growth.

From equation (6) solving for b yield the following equation:

$$14) \quad b = (k gP + k gy - d) / (r - gy)$$

Equation 14 shows that, *ceteris paribus*, the sustainability debt ratio (b) will be higher, the greater the inflation rate and the greater the income growth. For the same equation the part $k (gP + gy)$ measures government revenue from money creation, which is an inverse function of income velocity of money. This will imply that the higher the income velocity, the lower the government revenue generated from money creation. According to equation 14 a fiscal surplus (negative d) will have a positive effect on the amount of sustainable debt.

The denominator for equation 14 is the difference between real rate of interest and the real rate of economic growth. In the normal case, the interest rate is higher than the rate of income growth, but in the opposite scenario a primary surplus is not needed to achieve sustainability. The government could run primary deficits of any size which could be consistent with a sustainable debt ratio (Blanchard, 1990). The equilibrium value of constant debt will be lower, the lower the primary surplus¹⁰ and the higher the real

¹⁰ If there is a sustainable debt ratio, despite having a primary deficit, it is due to the tax revenue generate from money creation.

interest rate. Real income growth plays a dual role in as much as it is a source of seignorage to government and increases the denominator of the debt ratio.

3.3 Seignorage

This is particularly important as it is exhibited in equation (14) as real base money (k) multiplied by the inflation rate and real the income growth rate.

Equation (14) assumes a floating exchange rate. If a country has a fixed exchange rate, a shift in k will cause a change in international reserves (Garcia, 1999). In this particular case an increase in k would invariably allow the reserve bank to reduce its net public debt, which in turn reduces interest rates and have a direct impact on the sustainability of the new debt ratio. In a floating exchange rate regime model a rise in k that is not offset by a rise in inflation will increase the sustainability figure. In general when given a positive growth in income, it is quite likely that increases in k would have a positive significant impact on the debt sustainability figure.

Equation (12) establishes that *the partial effect on inflation, from changes in the real interest rate depends on both the real stock of bonds and on income velocity of base money. (Garcia, 1999). The higher the debt that has already been incurred and the higher the income velocity of base money, the greater the impact on inflation from a given change in real interest rates. A lot of time shifts in interest rate affect growth of income. Consequently, a policy of sterilizing capital inflows with debt issue may, through increased interest rate bill and reduced rate of income growth, raise the rate of inflation.*

The impact of b shows that: the higher the real stock of bonds, the higher the real interest rate bill that must be financed. Also the impact of V must be emphasised: the same interest rate bill will have a different impact on inflation depending on the degree of financial deepening, as measured by real quantity of higher powered money.

3.4 Primary fiscal balance

There are three ways in which a reduction in government expenditure affects the sustainability of debt:

- a) Increasing the primary surplus or a reduction in primary deficit
- a) Increasing the rate of growth of the economy
- b) Reducing the real rate of interest

There has been recent literature analysing fiscal deficit sustainability, which was used on the US and other industrial countries in an attempt to see if it can be used in the context of less developed countries. Two approaches were used for this analysis and they are the accounting approach and the present value constraint (PVC) approach.

3.5 Accounting Approach to Sustainability

This approach is sometimes regarded as an approach to fiscal sustainability. This approach focuses on a particular debt ratio, especially debt to GDP.

$$15) \quad \frac{B}{Y} = \frac{(1+r)B}{(1+g)Y} - \frac{SURP}{Y}$$

Or

$$16) \quad b = \frac{1+r}{1+g} b - \text{surp}$$

where g_t is the growth rate in GDP between $t-1$ and t . By using the above equation to look for changes in the debt/GDP ratio equals

$$17) \quad \Delta b = b_1 - b_0 = \frac{1+r}{1+g} b - \text{surp}$$

where $\text{surp}_t = \text{SURP}_t / \text{GDP}_t$

- If the primary surplus/GDP ratio is equal to zero, then the debt/GDP ratio will increase (or shrink) at the rate $r-g$.
- If a government runs a primary deficit (or surplus), the debt/GDP ratio will grow at the rate exceeding (less than) $r-g$.

In the accounting approach a primary deficit (or surplus) is regarded as being sustainable if it generates a constant (rather than ever increasing) debt/GDP ratio, given a specified GDP growth target and constant real interest rate.

The accounting approach has also been used to assess the consistency among various macroeconomic policies targets. Suppose the government of a certain country is following this policy targets;

- a) a constant debt /GDP ratio b^*
- b) a target GDP growth rate equal to g^*
- c) a primary surplus/GDP ratio equal $surp^*$

The question that usually comes to mind is whether these policies targets are mutually consistent. In trying to answer this question the accounting approach assumes that changes in the primary surplus will have no effect on either GDP growth rate or on real interest rate. This is surely unrealistic. It is because the level of equilibrium real interest rate depends positively on the level of government expenditure and or the amount that has been borrowed.

The main shortcoming of the accounting approach is that it attempts to determine the fiscal deficit by making the assumption that liabilities can continue to grow at the rate at which the economy is growing so that the debt/GDP ratios remain constant. It leaves a vague role that lenders can ultimately decide for themselves which debt strategies are sustainable for them and which are not.

3.6 Present Value Constraint Approach (PVC)

This approach begins with the government financing constraint in level

$$18) \quad B_{t-1} = \sum_{j=0}^N \frac{SURP_{t+j}}{(1+r)^{j+1}} + \frac{B_{n+1}}{(1+r)^{n+1}}$$

In deriving the above equation it has been assumed for expositional simplicity that the (expected) real interest rate is constant overtime.

The “no Ponzi game” (NPG) condition is invoked to argue the last term in equation (18) goes to zero in the limit.

$$19) \quad \lim_{N \rightarrow \infty} \frac{B^{N+1}}{(1+r)^{N+1}} = 0$$

This condition states that the present value of the government’s debt in the indefinite future converges to zero. In order for this to happen, real debt B (in the numerator) must grow more slowly than the real interest rate (which is the growth rate of the denominator)

The NPG condition is justified by making an argument that lenders would not be willing to allow the government to pay their entire current interest obligation merely by perpetually borrowing more. If lenders were willing to do this debt would grow at the rate equal to the interest rate. Hence the discounted debt in equation (19) would not converge to zero.

Imposing the NPG condition in equation (18) implies that government debt at any point in time must equal the present value of its expected future primary surpluses.

Fiscal policy is constrained by the need to finance the deficit. Virtually any pattern of deficits would be sustainable if it were possible to borrow money and pay the interest rate by borrowing more. Indeed, in some economies it is possible for the government to do exactly that (Diamond, 1965). In economies, which are regarded as being dynamically inefficient, a rise in the current debt has no implications for the future surpluses. Governments in dynamically efficient economies, on the other hand, face a present value borrowing constraint, so called because it states that the current market value of the debt equals the discounted sum of the expected future surpluses (Cuddington, 1996).

An optimising government should never plan to have a stream of future primary surpluses with a NPV strictly in excess of its current debt, because this would imply lower government expenditure and or higher taxes than necessary to service the debt.

Cuddington (1996) concluded that he appropriately viewed the PVC tests as tests of the sustainability of the current fiscal policy stance, as reflected in the historical time series data on government expenditure, revenue, deficits and or debt, not as solvency tests.

University of Cape Town

CHAPTER 4

Data and Methodology

In this chapter the data to be used in the analysis will be reviewed and then a brief description will be given of the model and the variables that are to be used in the subsequent econometric analysis.

4.1 Data Source

The data used in this paper were obtained from the Ministry of Finance and Development Planning and the Central Statistics Office of Botswana. The World Development Indicators and the International Financial Statistics were the two main sources of data.

4.2 Periodicity of Data used

Annual data were used in the analysis of debt sustainability in Botswana due to the non-availability of quarterly data in the earlier periods. The use of quarterly data series in Botswana was initiated in 1993 and this period up to 2000 would be too short to make statistically sound tests. The variables are expressed in Pula and Thebe terms, the currency of Botswana¹¹. Before the data were used, they were converted into real terms to remove the common price component (the overall price level in the economy), which might render the variables spurious, meaning that the regression statistics such as t and F may not be reliable. That is, they may indicate a significant statistical relationship between the variables even though there is none, hence not a true reflection of the economic relationship. Some of the variables were divided by the consumer price index so as to derive real values, while for GDP we shall be using the GDP deflator.

4.3 Macroeconomic Framework

The basic framework for the macroeconomic analysis is the standard model of external and internal balance that assigns fiscal policy to internal balance and monetary policy to external balance. Mundell took the balance of payments as the external objective defined as an acceptable level of foreign exchange reserves, a stock variable. At the aggregate

¹¹ Pula (P) is the currency for Botswana and P1.00 is equivalent to 100 thebes.

level, the government controls two instruments: the level of the budget deficit (or surplus) and the mix of financing the deficit between borrowing from the public (domestic debt), including abroad (external debt), and money issue. The Mundell assignment sets the budget deficit to control aggregate demand to achieve the inflation objective, sets the financing mix to maintain the reserve level, adjusts the budget setting to allow for feedback from the financing mix onto inflation, and iterates to a solution where both objectives are approximately met. In this framework, debt sustainability is an integral element of macroeconomic stability. Interactions between different policy variables (such as debt, fiscal and interest rate policies), and outcome variables (such as GDP and export growth), as well as international economic conditions (international interest rates) define if the country is on a sustainable debt path.

4.4 The Models

The core of the debt sustainability analyses must be applied within the framework where the determinants of debt sustainability would include real interest rate, growth rate of real GDP, current account balance (surplus/deficit) seignorage and macroeconomic policies among others. The model to be used for the analysis is the one below:

$$D = \beta_0 + \beta_1(r-g) Dt_{-1} + \beta_2 P + \beta_3 S + \varepsilon$$

r = real interest rate

g = growth rate of real GDP

P = primary surplus/ deficit (non interest government expenditure less tax revenue)

S = seignorage (government revenue derived from the authority to print money. In this case we shall be using M1)

ε = stochastic error term

The relative significance of public debt is commonly measured via its share of the GDP. Despite its technical deficiency in assessing a country's fiscal management the ratio is often pivotal for the analysis. The debt/GDP ratio is a key indicator to assess the solvency of a country and it has a bearing on the risk assessment and the overall rating of the

country by international monetary institutions. So we divide the above stochastic equation by GDP to get ratios.

$$D/GDP = \beta_0 + \beta_1 (r - g) D_{t-1}/GDP + \beta_2 P/GDP + \beta_3 S/GDP + \varepsilon$$

The above equation can now be written as flows so as to simplify it

$$d = \beta_0 + \beta_1 (r - g) d + \beta_2 p + \beta_3 s + \varepsilon$$

d = public debt/GDP ratio

r = real interest rate

g = growth rate of real GDP

p = primary deficit as a fraction of GDP

s = government revenue derived from authority to print money (M1) as a fraction of GDP

ε = stochastic error term

4.5 Variables used in the analysis

The model above makes use of the following variables, namely current account balance, real interest rate, growth rate of real GDP and government revenue derived from authority to print money and for the seignorage we shall be looking at M1. The variables are analysed as percentage of GDP and are thus divided by GDP at market value.

4.6 Data Transformation

The data that was used was taken from TSE, transferred to Microsoft excel and then to the eviews software. The indicators used were in nominal terms and so they were divided by the Consumer Price Index to make them real.

CHAPTER 5

Analysis

5.1 Introduction

As described in the previous section, time series data such as Botswana's government expenditure, government revenue, government external debt, current account surplus/deficit and other exogenous variables were used in the analysis to see if the growth in the Botswana's external public debt is sustainable. The data were collected from various sources like the Ministry of Finance and Development Planning, Central Statistics Office and Bank of Botswana. The data span the period 1980 to 2000.

5.2 Test for Stationarity

When testing for the real values of the variables in the model the variables became stationary when taking the second difference of the unit root test. Ideally the variables should become stationary when taking the first difference and so in order to improve the variables I had to take the growth rates of the variables and test for stationarity using them. All the variables to be tested are in growth rate form.

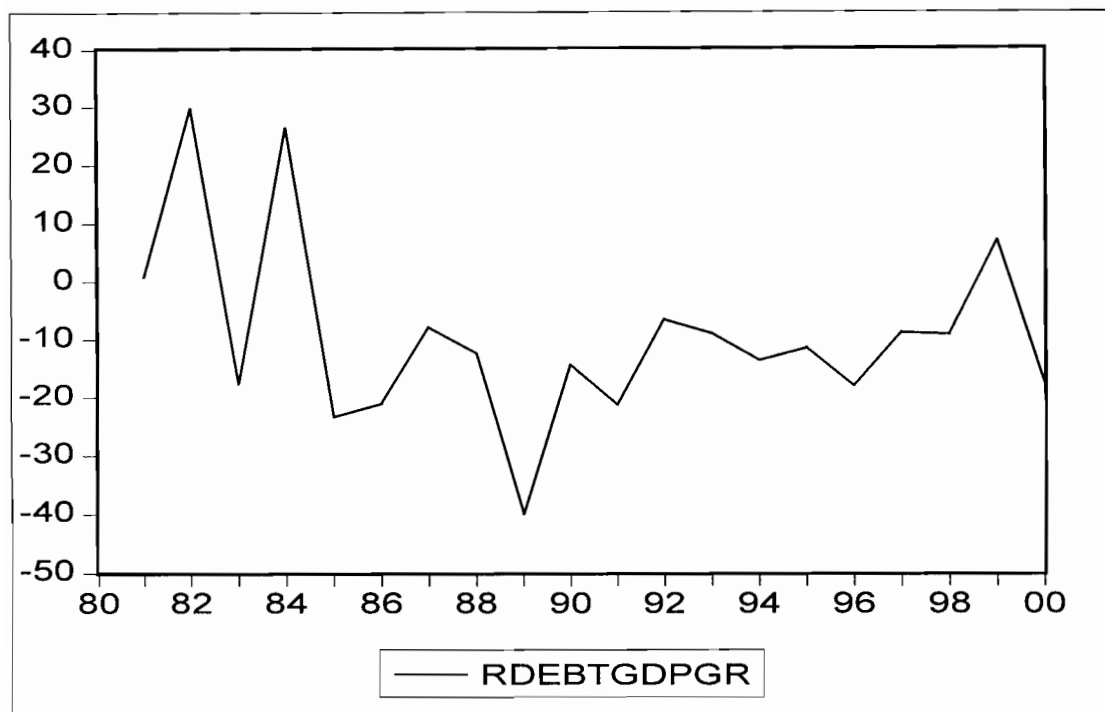
5.2.1 Correlation and Graphs

Table 4 Real debt/GDP ratio

Date: 07/17/03 Time: 10:02
Sample: 1980 2000
Included observations: 20

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. * | .	. * | .	1	-0.085	-0.085	0.1670	0.683
. | ** | .	. | ** | .	2	0.280	0.275	2.0896	0.352
. | . | .	. | * | .	3	0.040	0.088	2.1312	0.546
. | . | .	. | * | .	4	-0.044	-0.123	2.1852	0.702
. * | .	. ** | .	5	-0.149	-0.219	2.8331	0.726
. | . | .	. | * | .	6	0.054	0.080	2.9247	0.818
. ** | .	. | * | .	7	-0.278	-0.170	5.5491	0.593
. * | .	. | * | .	8	-0.099	-0.186	5.9119	0.657
. * | .	. | . | .	9	-0.093	-0.023	6.2559	0.714
. * | .	. | . | .	10	-0.101	-0.006	6.7084	0.753
. | * | .	. | * | .	11	0.068	0.098	6.9341	0.804
. * | .	. | * | .	12	-0.086	-0.158	7.3379	0.834

Graph 1: Real debt/GDP ratio



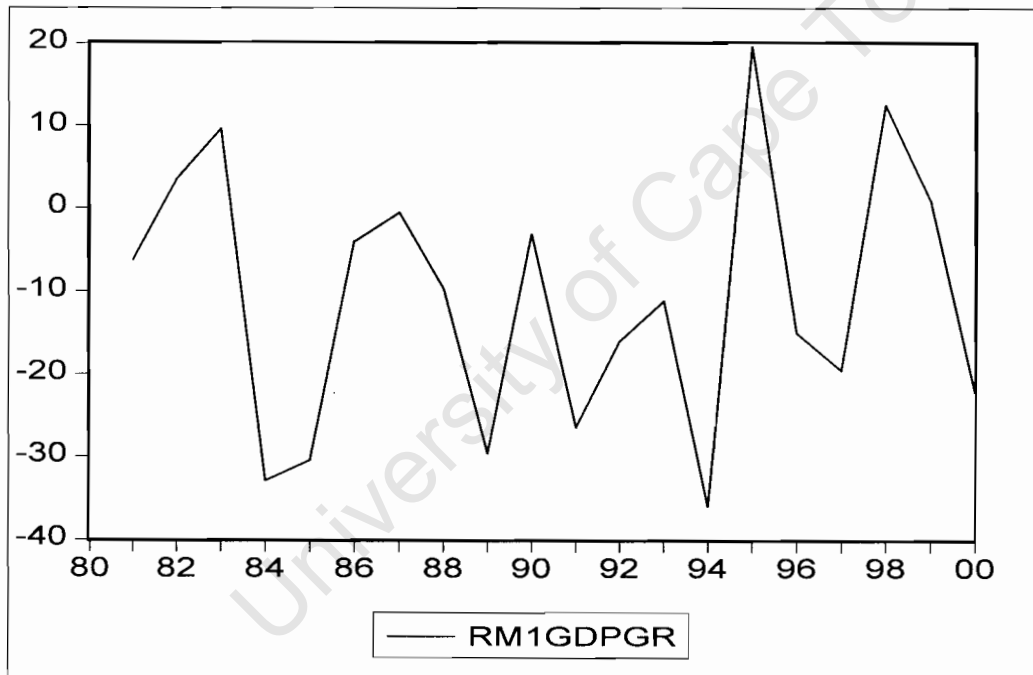
As shown by the correlogram above the growth rate of the real debt/GDP ratio is stationary at levels. This is because at all lags the autocorrelation coefficient is around the value zero. The graph also shows that growth rate of real debt/GDP ratio is stationary as there is no trend upwards or downwards in the graph. This would mean that when we run a regression using the above variable it would not give wrong results. If you use a non-stationary time series data to run a regression the results may be spurious and render the usual t and F test invalid. As this variable is stationary it can be used in our model to test if the growth rate of the Botswana's external public debt is sustainable.

Table 5 Real M1/GDP ratio

Date: 07/17/03 Time: 10:15
 Sample: 1980 2000
 Included observations: 20

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. * | .	. * | .	1	-0.172	-0.172	0.6826	0.409
. ** | .	. *** | .	2	-0.292	-0.331	2.7616	0.251
. | * .	. | . .	3	0.156	0.038	3.3927	0.335
. * | .	. * | .	4	-0.076	-0.150	3.5514	0.470
. | * .	. | * .	5	0.097	0.135	3.8246	0.575
. * | .	. * | .	6	-0.115	-0.177	4.2431	0.644
. * | .	. | . .	7	-0.062	-0.012	4.3727	0.736
. | . .	. * | .	8	0.037	-0.135	4.4233	0.817
. | . .	. | * .	9	0.041	0.078	4.4894	0.876
. * | .	. ** | .	10	-0.123	-0.220	5.1554	0.881
. * | .	. * | .	11	-0.150	-0.156	6.2601	0.855
. | * .	. | . .	12	0.165	-0.051	7.7561	0.804

Graph 2: Real M1/GDP ratio



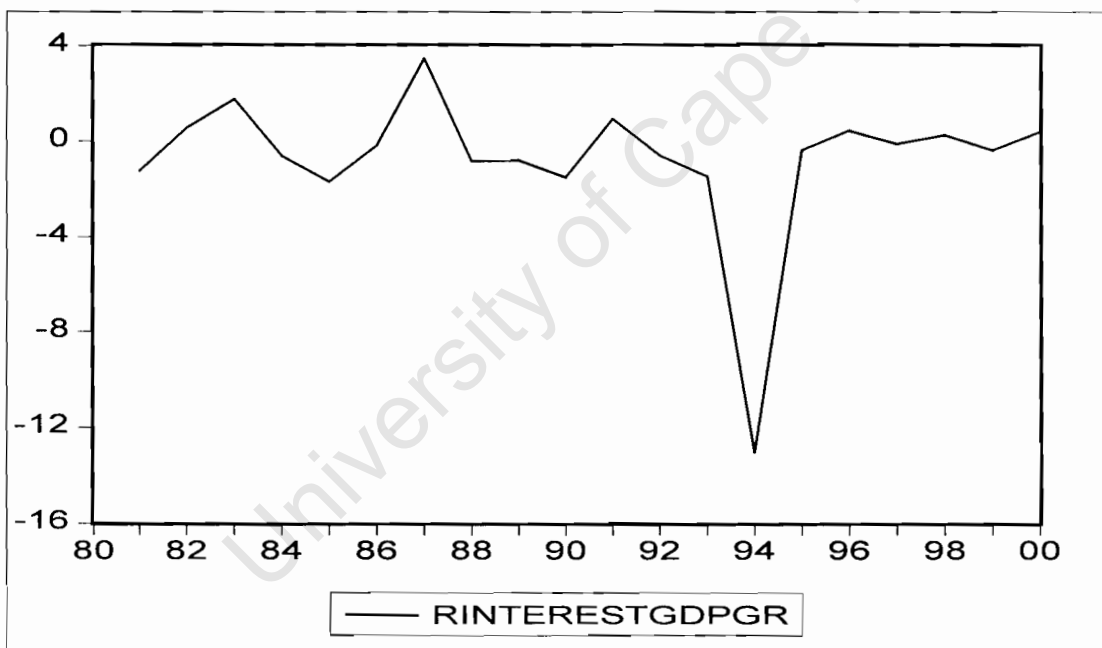
The correlogram of growth rate of real M1/GDP ratio is stationary at all levels. The lags of the autocorrelation coefficient (AC) are around the value zero. As this variable is stationary it can be used in our regression analysis of the sustainability of Botswana's external public debt.

Table 6 Real (r-g) Debt/GDP ratio

Date: 07/17/03 Time: 10:26
 Sample: 1980 2000
 Included observations: 20

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
. | .	. | .	1 0.055	0.055	0.0700	0.791
* | .	* | .	2 -0.124	-0.128	0.4477	0.799
* | .	* | .	3 -0.161	-0.149	1.1198	0.772
. | *	. | *	4 0.091	0.095	1.3469	0.853
. | .	. | .	5 0.024	-0.023	1.3644	0.928
* | .	* | .	6 -0.105	-0.114	1.7107	0.944
** | .	** | .	7 -0.285	-0.259	4.4516	0.727
. | .	. | .	8 -0.008	-0.018	4.4540	0.814
. | *	. | .	9 0.113	0.027	4.9688	0.837
. | .	. | *	10 -0.010	-0.100	4.9734	0.893
* | .	* | .	11 -0.153	-0.125	6.1153	0.866
* | .	* | .	12 -0.069	-0.080	6.3805	0.896

Graph 3: Real (r-g) Debt/GDP ratio



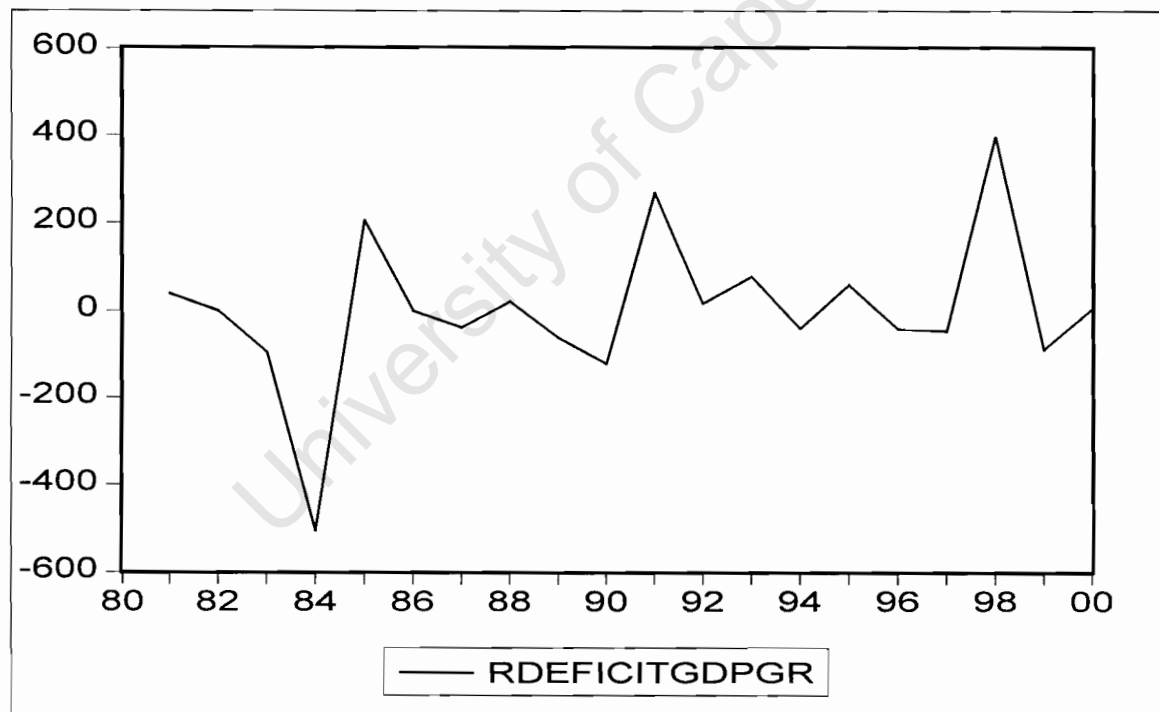
The correlogram of growth rate of real (r-g) debt/GDP ratio also gives us a stationary time series at all lags. As the variables are stationary it can be used for the regression analysis of the sustainability of the growth in Botswana's external public debt.

Table 7 Real Deficit or Surplus/GDP ratio

Date: 07/17/03 Time: 10:22
 Sample: 1980 2000
 Included observations: 20

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
**| .	**| .	1 -0.237	-0.237	1.2991	0.254
*| .	*| .	2 -0.063	-0.126	1.3970	0.497
| .	| .	3 0.034	-0.014	1.4273	0.699
| .	| .	4 -0.056	-0.063	1.5142	0.824
| .	| .	5 0.040	0.014	1.5623	0.906
| *| .	| **| .	6 0.179	0.197	2.5674	0.861
| .	| *| .	7 -0.005	0.112	2.5682	0.922
| *| .	| *| .	8 -0.160	-0.114	3.5030	0.899
| *| .	| **| .	9 -0.116	-0.211	4.0389	0.909
| *| .	| .	10 0.088	-0.015	4.3813	0.929
| *| .	| *| .	11 -0.088	-0.115	4.7573	0.942
| .	| *| .	12 0.020	-0.084	4.7802	0.965

Graph 4: Real Deficit or Surplus/GDP ratio



The growth rate of real deficit or surplus/ratio is also stationary. This is because at all lags the autocorrelation coefficient is around the value zero. This means that the variable can be used to run the regression.

5.3 Unit Root Test

This is another way of testing for stationarity. If, when running the regression, the ρ -value is equal to one, then the stochastic variable has a unit root. If a time series that has unit root it is known a random walk. A unit root test is done using the Augmented Dickey Fuller test. The test is done on levels and also on differences.

5.3.1 Testing Using Levels

Table 8 Growth rate of Real debt/GDP ratio

ADF Test Statistic	-3.093215	1% Critical Value*	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	-2.6608

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(RDEBTGDPGR)
 Method: Least Squares
 Date: 07/22/03 Time: 09:28
 Sample(adjusted): 1983 2000
 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RDEBTGDPGR(-1)	-0.871481	0.281739	-3.093215	0.0074
D(RDEBTGDPGR(-1))	-0.286892	0.195190	-1.469813	0.1623
C	-10.78547	4.113561	-2.621931	0.0192
R-squared	0.726722	Mean dependent var	-2.634161	
Adjusted R-squared	0.690285	S.D. dependent var	23.55762	
S.E. of regression	13.11029	Akaike info criterion	8.135683	
Sum squared resid	2578.194	Schwarz criterion	8.284078	
Log likelihood	-70.22115	F-statistic	19.94462	
Durbin-Watson stat	2.019010	Prob(F-statistic)	0.000060	

The absolute value of the ADF test statistics is more than the critical values at 10% and 5% and it is less than the critical value at 1%, so we reject the null hypothesis of non-stationarity and conclude that the growth rate of real debt/GDP ratio has no unit root at 5% and 10%. The growth rate of real debt/GDP is non-stationary at 1% and this means it

has a unit root. When we reject the null hypothesis at 5% and 10% we are basically saying that the chance of my sample being incorrect is 5% and 10%. This means that the probability of the growth rate of real debt/GDP is being stationary is 95% and 90%.

Table 9 Growth rate of Real Primary deficit or surplus/GDP ratio

ADF Test Statistic	-3.451651	1% Critical Value*	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	-2.6608

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RDEFICITGDPGR)

Method: Least Squares

Date: 07/22/03 Time: 09:46

Sample(adjusted): 1983 2000

Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RDEFICITGDPGR(-1)	-1.395932	0.404425	-3.451651	0.0036
D(RDEFICITGDPGR(-1))	0.128179	0.257785	0.497231	0.6262
C	0.272760	44.67649	0.006105	0.9952
R-squared	0.624872	Mean dependent var	0.250072	
Adjusted R-squared	0.574855	S.D. dependent var	290.5038	
S.E. of regression	189.4175	Akaike info criterion	13.47680	
Sum squared resid	538184.9	Schwarz criterion	13.62519	
Log likelihood	-118.2912	F-statistic	12.49319	
Durbin-Watson stat	1.981335	Prob(F-statistic)	0.000640	

The absolute value of the ADF test statistics is more than the critical values at 10% and 5%, but it is less than the critical value at 1%. As the ADF is greater than the critical values at 5% and 10%, we reject the null hypothesis of non-stationarity and conclude that the growth rate of real primary deficit or surplus as a ratio of GDP has no unit root at the above mentioned critical values.

Table 10 Growth rate of real interest on debt/GDP ratio

ADF Test Statistic	-3.022728	1% Critical Value*	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	-2.6608

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RINTERESTGDPGR)

Method: Least Squares

Date: 07/22/03 Time: 09:58

Sample(adjusted): 1983 2000

Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RINTERESTGDPGR(-1)	-1.063593	0.351865	-3.022728	0.0086
D(RINTERESTGDPGR(-1))	0.129163	0.255649	0.505238	0.6207
C	-0.843973	0.866042	-0.974517	0.3453
R-squared	0.480064	Mean dependent var	-0.009748	
Adjusted R-squared	0.410739	S.D. dependent var	4.524355	
S.E. of regression	3.473045	Akaike info criterion	5.478953	
Sum squared resid	180.9307	Schwarz criterion	5.627348	
Log likelihood	-46.31057	F-statistic	6.924851	
Durbin-Watson stat	2.034670	Prob(F-statistic)	0.007407	

As can be seen the ADF statistics is (in absolute value) greater than the critical value at 10% only, while it is less than the critical values at 5% and 1%. We reject the null hypothesis of non-stationary and conclude that the growth of real interest on debt/GDP ratio has no unit root at 10%. By rejecting the null hypothesis on non-stationary at 10%, we are taking a chance of being wrong 10% of the time. This would mean that there is a 10% possibility of the series being non-stationary.

Table 11 Growth rate of real M1/GDP ratio

ADF Test Statistic	-4.367642	1% Critical Value*	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	-2.6608

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(RM1GDPGR)
 Method: Least Squares
 Date: 07/22/03 Time: 20:40
 Sample(adjusted): 1983 2000
 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RM1GDPGR(-1)	-1.586893	0.363329	-4.367642	0.0006
D(RM1GDPGR(-1))	0.345792	0.241064	1.434439	0.1720
C	-18.17256	5.415628	-3.355578	0.0043
R-squared	0.648037	Mean dependent var	-1.430044	
Adjusted R-squared	0.601108	S.D. dependent var	25.40832	
S.E. of regression	16.04736	Akaike info criterion	8.539977	
Sum squared resid	3862.765	Schwarz criterion	8.688373	
Log likelihood	-73.85980	F-statistic	13.80904	
Durbin-Watson stat	2.020949	Prob(F-statistic)	0.000397	

As can be seen, the ADF statistic is (in absolute value) greater than the critical values (even at 1%), and thus we reject the null hypothesis of a unit root. We can also notice that the intercept is significant as it has a low p value. As the p value is the lowest significance level at which a null hypothesis can be rejected. In the results above shows that the probability of rejecting the null hypothesis of the intercept is 0.04%. This means that the likelihood of the series being wrong is less than 1%.

5.4 Residual Test for Stationarity

Dependent Variable: RDEBTGDP
 Method: Least Squares
 Date: 07/14/03 Time: 14:55
 Sample: 1980 2000
 Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000380	0.000349	1.089115	0.2913
RINTERESTGDP	-0.001058	0.019068	-0.055488	0.9564
RDEFICITGDP	-0.334226	0.154460	-2.163825	0.0450
RM1GDP	1.505241	0.396898	3.792514	0.0015
R-squared	0.893169	Mean dependent var		0.003502
Adjusted R-squared	0.874317	S.D. dependent var		0.002771
S.E. of regression	0.000982	Akaike info criterion		-10.84374
Sum squared resid	1.64E-05	Schwarz criterion		-10.64479
Log likelihood	117.8593	F-statistic		47.37671
Durbin-Watson stat	2.498178	Prob(F-statistic)		0.000000

When we regressed our variables not as growth rate the R^2 was 89.3% and after taking the growth rates of the variables under consideration, we run the regression as they are of the same order which is in levels and we want to see if they are stationary. The table of residual from above in growth rate shows that they became stationary.

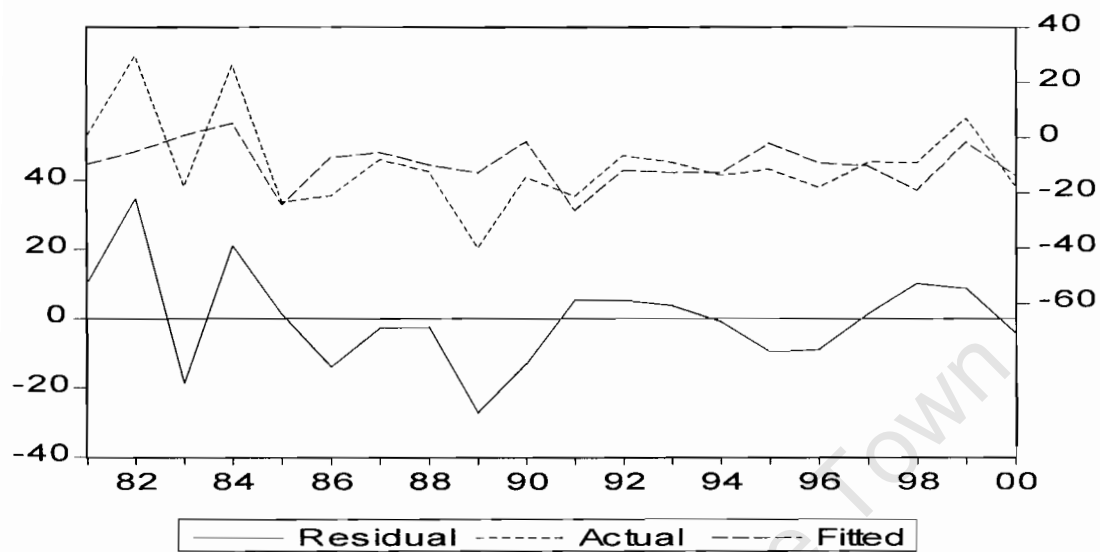
Table12 Residual Test

Dependent Variable: RDEBTGDPGR
 Method: Least Squares
 Date: 07/14/03 Time: 14:45
 Sample(adjusted): 1981 2000
 Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.910185	4.175633	-1.415399	0.1761
RINTERESTGDPGR	-0.245078	1.237746	-0.198004	0.8455
RDEFICITGDPGR	-0.043586	0.020408	-2.135683	0.0485
RM1GDPGR	0.327823	0.250556	1.308381	0.2092
R-squared	0.250765	Mean dependent var		-9.350157
Adjusted R-squared	0.110284	S.D. dependent var		16.00821
S.E. of regression	15.09971	Akaike info criterion		8.444085
Sum squared resid	3648.020	Schwarz criterion		8.643231
Log likelihood	-80.44085	F-statistic		1.785040
Durbin-Watson stat	2.007709	Prob(F-statistic)		0.190522

The short run effect of the Debt/GDP ratio growth rate is significant meaning that the Debt/GDP ratio growth rate is sustainable. The deficit/GDP growth coefficient of -0.043586 is significant at 5%. The sign is expected as an increase in the country's debt will lead to a decrease in the primary surpluses. The low p value of the primary surpluses also implies that it is significant

Graph 5: Residual test



The residual from the growth rate regression model are as depicted by the graph above

Correlogram

Date: 07/22/03 Time: 21:16
 Sample: 1981 2000
 Included observations: 20

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
. | .	. | .	1 -0.021	-0.021	0.0101	0.920
. | .	. | .	2 0.001	0.000	0.0101	0.995
. | *	. | *	3 0.108	0.108	0.3104	0.958
* | .	* | .	4 -0.160	-0.157	1.0115	0.908
** | .	** | .	5 -0.189	-0.201	2.0640	0.840
. | *	. | *	6 0.141	0.133	2.6906	0.847
* | .	. | .	7 -0.091	-0.051	2.9692	0.888
** | .	** | .	8 -0.220	-0.237	4.7466	0.784
* | .	* | .	9 -0.065	-0.178	4.9167	0.842
. | .	. | .	10 0.014	0.054	4.9254	0.896
. | .	. | *	11 0.010	0.106	4.9308	0.934
. | .	** | .	12 -0.043	-0.189	5.0311	0.957

The lags of the correlogram are small and appear not to have any pattern at all so they may be white noise depicting that the residuals might be stationary. This would imply that the regression is not spurious, but we shall undertake two more tests to verify this result.

Table 13 ADF TEST

ADF Test Statistic	-3.934514	1% Critical Value*	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	-2.6608

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(RESID2)
 Method: Least Squares
 Date: 07/22/03 Time: 21:22
 Sample(adjusted): 1983 2000
 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID2(-1)	-1.131903	0.287686	-3.934514	0.0013
D(RESID2(-1))	0.003984	0.201761	0.019747	0.9845
C	-2.544765	2.836389	-0.897185	0.3838
R-squared	0.673649	Mean dependent var	-2.156849	
Adjusted R-squared	0.630136	S.D. dependent var	19.77788	
S.E. of regression	12.02821	Akaike info criterion	7.963399	
Sum squared resid	2170.168	Schwarz criterion	8.111794	
Log likelihood	-68.67059	F-statistic	15.48139	
Durbin-Watson stat	1.525449	Prob(F-statistic)	0.000225	

Cointegration

As the two series are integrated of the same order, which is I (0), we conclude that they may be cointegrated. We performed several test to this effect. We did the ADF test above on the residual and we got a value of 3.934514 on the ADF test statistics and it was greater than all the critical values and the intercept and the first lagged variables are insignificant, which means that the residuals are stationary. The growth rate of the real

debt/GDP ratio is cointegrated with the other independent variables that are being used in the model.

Table 14 Engle- Granger Test

Significance Level	1%	5%	10%
Constant	-3.90	-3.34	-3.04
Trend and Constant	-4.32	-3.78	-3.87

The above absolute value of 3.934514 is greater than all the critical values using significance level of a constant and as such we reject the null hypothesis of non-stationary and unit root and conclude that the residual are stationary and so the growth rate of real debt/GDP ratio is cointegrated with the growth rates of real primary deficit or surplus/GDP ratio, real M1/GDP ratio and real interest on debt/GDP ratio. We used the critical values of -3.90 (1%), -3.34 (5%) and -3.04 (10%).

University of Cape Town

5.5 Granger Causality Test

Table 15 Granger Causality Test

Pairwise Granger Causality Tests

Date: 08/29/03 Time: 14:18

Sample: 1980 2000

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Probability
RDEFICITGDPGR does not Granger Cause RDEBTGDPGR	17	1.14349	0.37834
RDEBTGDPGR does not Granger Cause RDEFICITGDPGR		6.63621	0.00960
RINTERESTGDPGR does not Granger Cause RDEBTGDPGR	17	0.30075	0.82422
RDEBTGDPGR does not Granger Cause RINTERESTGDPGR		0.62200	0.61671
RM1GDPGR does not Granger Cause RDEBTGDPGR	17	0.78110	0.53106
RDEBTGDPGR does not Granger Cause RM1GDPGR		0.21018	0.88706
RINTERESTGDPGR does not Granger Cause RDEFICITGDPGR	17	0.11742	0.94782
RDEFICITGDPGR does not Granger Cause RINTERESTGDPGR		2.65496	0.10566
RM1GDPGR does not Granger Cause RDEFICITGDPGR	17	1.30521	0.32620
RDEFICITGDPGR does not Granger Cause RM1GDPGR		0.90539	0.47243
RM1GDPGR does not Granger Cause RINTERESTGDPGR	17	0.24258	0.86471
RINTERESTGDPGR does not Granger Cause RM1GDPGR		0.45058	0.72248

The Granger causality approach is a widely used for testing the relationship between variables, which is the direction of the causality (cause and effect relationship). According to this approach, a variable Y is caused by another variable X if Y can be predicted better from past values of Y and X than from past values of Y alone.

According to the p-value of 0.37834 it means the probability of rejecting a true null hypothesis is high, so we do not reject the null hypothesis that the growth rate of real primary deficit or surplus/GDP ratio, (RDEFICITGDPGR) does not cause the growth rate of real debt/GDP ratio (RDEBTGDPGR). However a p-value of 0.00960 it means that the probability of rejecting the true null hypothesis is very low so we reject the null hypothesis that RDEBTGDPGR does not granger-cause RDEFICITGDPGR. The table also shows that there is no causal relationship between RDEBTGDPGR and other variables.

University of Cape Town

CHAPTER 6

Policy Recommendations and Conclusion

This paper has looked at a number of macroeconomic indicators that the theoretical literature suggests are important in assessing debt sustainability. Notwithstanding exogenous shocks such as the terms of trade and the international interest rate, these indicators have shown the importance of responsible domestic macroeconomic policies to avoid a situation where the country falls into a debt trap. The empirical analysis of Botswana's debt sustainability suggests that currently the country's debt appears to be still sustainable and the country can still borrow to finance its development projects. This is because the country is still running a primary surplus and thus can still afford to service the loans that it takes from multilateral institutions. The country's foreign debt is only a tenth of its foreign exchange assets and the debt to export ratio is very low. The analysis also shows that there appears to be no causal relationship between growth rate of real primary surplus/deficit/GDP ratio and the growth of real debt/GDP ratio. This suggests that the growth rate of expenditure does not cause the growth rate of the country's debt/GDP ratio. In the case of Botswana this means that even if the country's expenditure grows it would lead to an increase in the country's debt/GDP ratio, leading to the conclusion that the growth rate of expenditure is not one of the variables that cause the country's debt/GDP ratio to increase. However, a low p-value of 0.00960 indicates that there may be a causal relationship between growth rate of real debt/GDP ratio and growth rate of real primary deficit/surplus. This implies that an increase or decrease in the debt/GDP of the country may result in an increase or a decrease of the country's primary

deficit/surplus. As there appears to be no causal relationship between the explanatory variables and the dependent variable it seems to indicate that the problem of debt has to be tackled from many fronts rather than focussing policy attention mainly on the explanatory variable. Some of the possible approaches are explored further below. If there had been a causal relationship between growth rate of real primary surplus/deficit GDP ratio and the growth of real debt/GDP ratio it would have meant that the increase in government expenditure and a reduction in the government revenue would lead to an increase in the country's public debt. It would also have meant that a decrease in money supply, decrease in economic growth rate and increase in real interest rate on the debt would lead to the debt burden of the country increasing, assuming there is no change in non-government debt.

Botswana's healthy reserves have so far cushioned the economy from adverse international debt problems. Nevertheless, trends that increase the debt and reduce the level of reserves, if sustained, could have a negative impact on the country's creditworthiness given the lack of other sources of high revenue. It has been observed that the trends, which have supported the fiscal performance in the past, are drawing to a close, as a result of the global slowdown in demand for diamonds. Future earnings from the mining sector will depend on demand and price fluctuations and at the same time the government expenditure will continue to rise especially on education and health care as a result of the HIV/Aids pandemic.

The most important drive for the country towards dealing with its new future revenue limitations if spending exceeds the revenue boundaries would be to borrow more to cover

its shortfall and thus increasing the level of debt. It would, at this, point be important for government to rationalize yearly expenditure and thus hold the line on wage increases for public servants which was implemented during this financial year. There is a need to curb non-essential current spending or to secure alternative revenue sources as continued rapid growth in spending could lead to the dissipation of carefully acquired assets and at the same time increasing the country's indebtedness (Lindow and Sheth, 2002). The government needs to cut its spending by privatising some of the state owned enterprises which are not making profits and as a result depend on government to support them. The government is at this moment privatising Air Botswana and many believe that the privatisation should be accelerated, as it would attract foreign investment that is needed for alternative engines of growth.

It is necessary to find other sources of revenue besides mining so that when the world price of diamonds is depressed the country can still maintain a prudent fiscal stance and a healthy economic growth rate. With the country becoming a financial services centre it will go a long way in providing other sources of revenue for the government. There is still however a need to accelerate the drive to find other engines of growth.

Given the current circumstances, maintaining the delicate balance between current socio-economic needs and preserving an adequate cushion against future shocks is essential. Prudent fiscal management will be required to successfully withstand these challenges, in turn protecting the Botswana's creditworthiness.

REFERENCES

- Aizeman, J. (1989) "Investment, Openness and Country Risk in Analytical Issues in Debt", edited by Jacob A. Frenkel, Michael P. Dooley and Peter Wickham, pp. 83-101. Washington, DC: International Monetary Fund, 1989.
- Aron, J. (1997) "Measuring Currency Misalignment: The importance of Real Shocks and Regime Changes" Centre of Research in Economic and Finance in Southern Africa, Quarterly Review, London School of Economics
- Arrow, K.J. and Boskin, M.J. (1988) "The Economic of Public Debt" Proceedings from a conference held by International Economic Association at Stanford, California, Macmillan Press.
- Atkinson, A.B. and Stiglitz, J.E. (1980) "Lectures on Public Economics" McGraw-Hill
- Bank of Botswana (2000), "Annual Report", Gaborone
- Barro, R. (1974) "Are Government Bonds Net Wealth", Journal of Political Economy Vol 82, pp 1095-1117
- Beltratti, A. (1990) "Empirical Estimates of the Capacity to Repay a Foreign Debt: A vector Autoregressive Methodology" in H. O'neil ed Third World Debt: How Sustainable are Current Strategies? Frank Cass, London
- Blanchard, O.(1990) "The Sustainability of Fiscal Policy", OECD Economic Studies 0 (15) pp7-36.
- Buiter, W.H. (1985) "A guide to Public Sector Debt and Deficit", Yale University and NBER, Massachusetts, USA
- Caprio, G. (1998) "Banking on crisis: Expensive Lessons from Recent Financial Crisis" World Bank, Working Paper no 1979, Washington D.C
- Central Statistics Office Botswana (March 2001) "Statistical Bulletin", Volume 26 No 1
- Cohen, D. (1996) "Sustainability of the African Debt" World Bank Working Paper no 1621 Washington D.C
- Cohen, D. (1985) "How to Evaluate the Solvency of the Indebted Nation" Economic, Policy 1 pp 141-167.
- Corbo, V. and Hernandez, L. (1996) "Macroeconomic adjustment to Capital Inflows: Lessons from recent Latin American and East Asian Experience" World Bank Research Observer Vol 11 ,pp 61-85

- Corden, W.M (1991) “Does Current Account Matter? The old View and the new”, International Monetary Fund, Washington DC.
- Cuddington, J.T (1996) “Analysing the Sustainability of Fiscal Deficits in Developing Countries” Economics Department, Georgetown University, Washington
- Diamond ,P. (1965) “National Debt in a Neoclassical Growth Model” American Economic Review 55 (5) pp 1126-1150.
- Edwards, S. (1989) “Real Exchange rates, Devaluation and Adjustment: Exchange rate Policy in Developing Countries” MIT Press, Los Angeles
- Ejaz,G. and Zang, H. (1995) “Is Ethiopia’s Debt Sustainable?” Policy Research Working Paper no 1525, World Bank, Washington DC
- Garcia, V.F. (1999) “Public Debt Sustainability and Demand for Monetary Base” World Bank , Washington DC
- Griffith-Jones, S. (1997) “Causes and Lessons of the Mexican Peso Crisis” WIDER Working Paper no 132.
- Gujarati, D, N (1995) “Basic Econometrics”, Mcgraw-Hill International Editions.
- Horne, J. (1991) “Criteria of External Sustainability” European Economic Review, Vol 35, part 8, pp 1559-1574
- Hamilton. J.D. and Flavin. M. (1986) “On the Limitations of Government Borrowing: A Framework for Empirical Testing,” American Economic Review 76, pp 808-819
- International Monetary Fund (1998) “Financial Crises: Characteristics and Indicators of Vulnerability” World Economic Outlook, Washington DC.
- International Monetary Fund (1999) “Global Economic Prospects and the Developing Countries-Beyond the Financial Crises”, Washington DC.
- Lindow, K and Sheth, A, “Global Credit Research for Botswana”, Moody’s Investors Services, August 2002
- Milesi-Ferret, G and Razin, A (1996) “Current Account Sustainability” Princeton Studies in International Economics, no 81, Department of Economics, Princeton University, New Jersey, USA
- MFDP, Botswana (1990-2000) “Annual Economic Reports” Various editions.
- MFDP¹², Botswana (1997) “National Development Plan”.

¹² MFDP: Ministry of Finance and Development Planning

MFDP, Botswana (1998) “Financial Statements, Tables and Estimates of Consolidated and Development Revenues”.

North, A. (1999) “Current Account Sustainability: Evidence of South Africa” Master of Commerce dissertation, University of Cape Town, South Africa

Obstfeld, M and Rogoff, K (1996) “The Intertemporal Approach to the Current Account” National Bureau of Economic Research, Working Paper no 4893, Massachusetts, USA

Reisen, H (1989) “Public debt, External Competitiveness and Fiscal Discipline in Developing Countries”, International Economic Section, Department of Economics, Princeton University, New Jersey, USA

Reisen, H (1997) “Sustainable and Excessive Current Account Deficits” Working Paper no 133, IMF, Washington DC

Roubini, N and Wachtel, P (1998) “Current Account Sustainability in Transition Economies” National Bureau of Economic Research, Working Paper no 6468, Massachusetts, USA

University of Cape Town