Are HIPCs' Current Account Sustainable? The Case of Sub-Saharan Africa*

Tohru Nakamura†

July 21, 2005

Abstract

This paper investigates whether African Heavily Indebted Poor Countries(HIPCs)' current account deficits are sustainable using econometric methods. First, we have applied dynamic panel data approach to grasp the structure of Sub-Saharan Africa's current account. Second, we have tested whether African HIPCs have sustainable current account deficits using two econometric methods which take intertemporal budget constraints into consideration. All sample HIPCs but four countries (Benin,Côte d'Ivoire, Ghana, and Madagascar) fall in a trap of unsustainable current account deficits.

Keywords: HIPC Initiative, Current account deficit, Sustainability

*JEL classification:*E65, F34, O11, O57

1 Introduction

The United States is now caught in a gradual and very perceptible deterioration in the current account and the fiscal balance, and the deterioration could continue for a long time. The current account deficit was about $665.9 billion, equal to 5.7 percent of G.D.P. in 2004.[1] The source of financing of the U.S. current account deficit relies on Asian central bank's purchases of treasury securities.[2] A number of analysts have argued that the U.S. has become vulnerable to sudden changes in expectations and economic sentiments and the deterioration could bring the U.S. to a turning point, a lack of confidence in the financial market. Up to now, these inflows in large part have reflected the perceived attractiveness of the U.S. investment environment, but such perceptions are subject to reappraisal.

*We gratefully acknowledge financial assistance from Institute of Developing Economies.

†Kobe Gakuin University(tohru_nakamura@ksg.harvard.edu)

[1]IMF, *International Financial Statistics*, CD-ROM.

[2]China and Japan held $1.3 trillion in Treasuries as of June, 2004. *The New York Times*, September 18, 2004.

There are other countries which face more serious problems in current account deficit and external debt. They are so-called Highly Indebted Poor Countries(HIPCs), where both extreme poverty and financial insolvency have been prevailing and worsening dramatically.

In September 1996, the IMF and World Bank announced the HIPC Debt Initiative, which was to allow the poor countries to "exit, once and for all, from the rescheduling process" and to resume "normal relations with the international financial community, characterized by spontaneous financial flows and the full honoring of commitments."

In 1999, the IMF and World Bank adopted the enhanced HIPC Initiative. This was aimed at accelerating the delivery of HIPC Initiative assistance and linking debt relief more firmly and transparently to poverty reduction. While debt sustainability remains the core objective in the enhanced HIPC Initiative, does most of HIPCs enjoy debt sustainability now? Comprehensive reduction of debt will cause to a reduction of debt service and current account improvement temporarily, but doesn't guarantee debt sustainability in the coming future. Perpetual deteriorating current account deficit never fails to fall into a trap of unsustainable current account deficit.[3]

The question of sustainability of the current account deficit in less developing countries such as Sub-Saharan Africa and Latin America as well as in the U.S. has had profound implications for macroeconomic theory and practice since the mid-1980s.[4] Several tools have been developed and accumulated to analyze the sustainability of the current account deficit and government budget deficit.[5]

The aim of this paper is twofold. First, we update Calderon *et al.*[6], estimates of the various determinants of current account deficits in African HIPCs and explain whether those countries' current account deficits are different from U.S. and other less developing countries. Second, using several useful frameworks to analyze the sustainability of the current account deficit or external debt, we test whether long-term data from African HIPCs are consistent with the intertemporal external borrowing constraints, e.g., a sustainable current account deficit. These tests consist of the approaches adopted by Hamilton and Flavin[12], Hakkio and Rush[11] and Ahmed and Rogers[1]. Their approaches consider in common intertemporal budget constraints, which impose some restrictions on macroeconomic variables such as the current account and external debt.

The outline of this paper is as follows: Section 2 describes the dynamic panel method to analyze the structures of current accounts in HIPCs, LDCs, and the United States. Then we show the degree to which the determinants of current account in HIPCs are different from those in the United States and the LDCs.

[3]Sun[27] shows that completion point countries' export structures remain weak and they have experienced large current account deficits of about 8 percent of GDP since the mid-1990s.

[4]The United States, unlike other debtors, borrows in its own currency, correcting its large external liability position through the valuation mechanism even if dollar depreciation happens. See Lane and Milesi-Ferretti[16] and Gourinchas and Rey[10] for the valuation mechanism.

[5]In his seminal paper in 1985, Krugman provided a framework for asking whether the value of the dollar or the external debt of the U.S. are sustainable. See Krugman[14].

Section 3 discusses the testing frameworks for the current account sustainability. We apply them for African HIPCs, then report the empirical results and find out whether external debt and current account in two HIPCs are sustainable. Section 4 has conclusions.

2 Determinants of Current Account Deficits

2.1 Dynamic Panel Approach

We consider a dynamic panel model to analyze the determinants of current account in African HIPCs. That is,

$$y_{it} = \delta y_{i,t-1} + x_{i,t}^{'}\beta + \mu_i + \nu_{it} \qquad i = 1, 2, \ldots, N; \qquad t = 1, 2, \ldots, T \quad (1)$$

where y_{it} is current account deficit, $\mu_i \sim IID(0, \sigma_\mu^2)$ is a fixed-effect, $x_{i,t}^{'}$ is a $(K-1) \times 1$ vector of exogenous regressors, $\nu_{it} \sim IID(0, \sigma_\nu^2)$ is a random disturbance, i indexes countries and t indexes time. The equation is dynamic since it allows for the lagged current account as separate explanatory variables. With respect to method of estimation in dynamic models of panel data, there are active debates on superiority between Instrumental Variable method approach and the generalized method of moments(GMM) approach. The former is derived by Anderson and Hsiao[2] and Arellano[3], the latter by Arellano and Bond[4]. Our preferred method of estimation is a first-differenced form by the two step GMM estimator proposed by Arellano and Bond[4] since our equation to be estimated could include jointly endogenous variables, and unobserved country-specific factors correlated with the explanatory variables. We estimated using a panel across six periods from 1979-1982 through to 1999-2002 for African HIPCs.[6] Thus, an observation is a country's performance averaged over a four-year period. We have used annual data covering the period 1975 to 2002 for the United States. For the comparison with LDCs, the result is cited from Calderon et al.[6]. We employ the same regression variables as Calderon et al.[6] from the theoretical literature: the first lagged current account deficit, domestic output growth, the real effective exchange rate, terms of trade, openness(export/GDP), black market premium on the exchange rate, aid flows, private and public savings, demestic savings, industrial output growth, and international real interest rate.[7]

2.2 Regression Results and Implications

Our measures of the determinants of current account deficits are summarized in Table 1. The significance and the value of lagged current account are particularly

[6]Sample countries are constructed and confined to both those had reached the decision points and completion points as of July 2003, and those has data availability such as; Benin, Mauritania, Mozambique, Tanzania, Uganda, Cameroon, Chad, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Madagascar, Malawi, Niger, Rwanda, Senegal, Sierra Leone, Zambia.

[7]See Appendix for the data definitions and sources.

noteworthy in view of the policy discussion on current account sustainability. The coefficients on the lagged current account deficits become statistically highly significant and positive in all two regions (African HIPCs)and the United States. The estimated coefficient in the United States is the largest value, 0.79. This large value is called " persistent" in current account deficit as Calderon et al.[6] puts it. Contrary to that, the coefficient in the case of African HIPCs , 0.16 is small, that is, less persistent. This result may reflect several current account reversals caused by IMF conditionality and other related policy in case of African HIPCs.[8]

The estimated coefficients on domestic output growth are positive and statistically siginificant in all cases. It means that a 1 percentage point rise in the GDP growth rate implies a increase of 0.19 (=0.16/(1-0.16)) percentage points in the current account deficits per GDP in the long run. Considering the impact of industrial growth rate on the current account deficit, we can find out the asymmetry only in the United States that if the domestic economy and the rest of the world grow the same rate, the current account deficit will continue to widen (Krugman[14],Krugman and Baldwin[15] and Obstfeld and Rogoff[22]). Private and public savings are used as explanatory variables for LDCs and the United States. Since we couldn't get similarly disaggregated data in African HIPCs, we substituted domestic savings for them. An increase of savings will reduce the current account deficits in all cases. Their role for correcting external imbalances is particularly noteworthy in view of the effectiveness of HIPC Initiative employing fiscal consolidation. The estimated coefficients in real exchange rate (the rise in this variable means real appreciation) are positive except in African HIPCs. The positive sign of this coefficient is consistent with Mundell-Fleming model. With respect to openness (=exports/GDP), the only coefficient of African HIPCs is statistically significant and has an expected sign. We should note that Mengistae and Pattillo[18] show that exporting boosts the productivity of three Sub-Sahara African (Ethiopia, Ghana, and Kenya) manufacturing firms because of international technology diffusion. This improvement of productivity, as Obstfeld and Rogoff[21] show, will lead to a reduction of current account deficit in the intertemporal setting. We should be cautious about the treatment of the effect of aid on current account. The model is estimated as a system with instrumental variables using GMM to address the potential endogeneity of aid, such as reverse causality from current account deficit to aid flows.[9] The effect of aid flows on closing current account deficits is equally evident in African HIPCs and LDCs. The current account deficit in African HIPCs is more sensitive with regard to the growth rate of industrial economies than LDCs. This result is in contrast to Calderon *et al.*[6].

The empirical results cited above have several implications with regard to

[8]Edwards[9] reports two final aspects of current account reversal process: "(i)whether current account reversals have historically been related to banking crises and (ii), the relationship between current account reversals and IMF programs." He also shows the probability of a country experiencing a reversal is captured by a lagged current account to GDP ratio, the external debt to GDP ratio, and so on.

[9]Aid often flows in response to current account deficits, especially in HIPCs.

current account deficit or external debt sustainability. First, for African HIPCs to achieve and maintain current account deficit or debt sustainability, they should improve productivity by way of trade.[10]

Second, for improvement in productivity, HIPCs' external debt should be reduced drastically by HIPC Initiative or other debt relief policies because excess burden of debt will cause a reduction in productivity through deterioration of macroeconomic policy environment, as pointed by Pattillo *et al.*[25] and Nakamura[20].

3 Current Account Sustainability

There are some debates over the most suitable indicator for sustainable external debt and current account. Krugman[14] developed a framework to analyze the extent to which external debt is sustainable and calculated the path of United States external debt under some plausible parameters. According to his simulations, it takes 23 years for the debt/GNP to stabilize and its ratio reaches 45.7 percent. He judged its ratio is too high to maintain the value of strong dollar. However, Obstfeld and Rogoff[23] shows the more deteriorating trajectory of the United States net indebtedness than Krugman expected, assuming continuing current account deficits of 5 percent of GDP and continuing 3.5 percent GDP growth. Recently a few industrial countries exceeds that ratio, 45.7 percent.[11]

The HIPC Initiative uses several measures of debt sustainability; debt to export ratio,[12] debt to GDP ratio, and so on. But these thresholds were criticized because of their arbitrariness and lacking a scientific base. OED[24] points out a threshold guaranteeing debt sustainability is a function of debt reduction, debt volume, pace, terms of new borrowing, economic and export performance.[13]

It is very difficult to assess whether current account deficit or external debt are sustainable, in terms of single indicator such as the ratio of net indebtedness to GDP. Since Krugman presented his seminal paper in 1985, several tools have been developed to analyze the sustainability of the current account deficit and government budget deficit. In the next section, we will introduce some tools to test statistically the sustainability of current account deficit, and will apply them for African HIPCs.

[10] Sun[27] points out HIPCs' reliance on narrow export bases which have left them vulnerable to terms of trade shocks.

[11] See Figure 3 in Obstfeld and Rogoff[23].

[12] Originally, the benchmark of debt to export ratio was set at 200%. It was reduced to 150% in order to provide countries a cushion to absorb negative exogenous shocks under the enhanced HIPC Initiative.

[13] Reinhart *et al.*[26] find that debt sustainability can be explained by variables such as; repayment history, indebtedness level, and history of macroeconomic stability.

3.1 Sustainability Model(1)

3.1.1 Model description

Hamilton and Flavin[12], Hakkio and Rush[11], and Haug[13] developed the framework to analyze government's solvency, or fiscal deficit sustainability using tools such as unit root and cointegration tests.

In this section, we apply their frameworks for current account sustainability and describe its model arithmetically. The starting point for the analysis of current account sustainability is the basic external accounting identity:

$$CA_t = D_{t+1} - D_t \tag{2}$$

where CA is current account deficit, D is net external debt.

Neglecting income and current transfers,

$$CA_t = rD_t - X_t + M_t \tag{3}$$

where r, X, and M denote interest rate, nominal exports and imports of goods and services respectively. Substituting (3) into (2), we get

$$D_{t+1} = M_t - X_t + (1+r)D_t \tag{4}$$

By recursive forward substitution, equation (4) is seen to imply

$$D_t = \sum_{i=1}^{T}(1+r)^{-i}(X_{t+i-1} - M_{t+i-1}) + (1+r)^{-T}D_{t+T} \tag{5}$$

Denote E_t as the expectations based on information available at date t, replacing the terminal point with infinity, we get

$$D_t = E_t \sum_{i=1}^{\infty}(1+r)^{-i}(X_{t+i-1} - M_{t+i-1}) + \beta(1+r)^t \tag{6}$$

where

$$\beta = E_t \lim_{T\to\infty}(1+r)^{-(t+T)}D_{t+T} \tag{7}$$

Hamilton and Flavin[12] use (6) to determine whether the current account deficit is sustainable. The sustainability condition (*i.e.*, no-Ponzi game condition) holds if and only if $\beta = 0$ in equation (7).

This condition can be interpreted as that debt stock is expected to grow no faster on average than the interest rate, or that external debt at date t must be balanced with present-value of net exports.

Hamilton and Flavin suggested the following empirically tractable formulation to test the null hypothesis that $\beta = 0$:

$$D_t = c_0 + \beta(1+r)^t + c_1 D_{t-1} + \cdots + c_p D_{t-p}$$

$$+b_0(X_t - M_t) + b_1(X_{t-1} - M_{t-1}) +$$

$$\cdots + b_{p-1}(X_{t-p+1} - M_{t-p+1}) + \varepsilon_t \tag{8}$$

where the expectation of future surplus of net exports is supposed to be based on information of past surplus, and lagged debt variables are included to eliminate the serial correlation. We applied the above methodology to test sustainability of current account deficits of African HIPCs.[14]

3.1.2 Data and empirical results

The data used in this section are extracted from the *World Development Indicators 2005*(CD-ROM) of the World Bank. Since we cannot get the data of net external debt theory requires, we construct it using equation (2), that is, by adding current account to net debt at the beginning of year.[15]

The empirical results are reported in Table 2. We obtained results based on the two assumptions in interest rate that r =(1)1%, (2)3%.[16] We also changed sample periods from start year to 1998 to 2003, to trace how the sustainability of current account deficits would vary as sample periods shift. As for Benin, Côte d'Ivoire, Ghana, and Madagascar, we cannot reject the null-hypothesis in most of periods regardless of two assumptions on interest rate. In other words, the tests show that all sample countries but four countries mentioned above have been falling short of the sustainability of its current account deficit over recent years. In case of Côte d'Ivoire, there are a few cases showing statistically significant coefficient, but we concluded she belonged to the sustainable group. Countries that have reached completion point as of July 2003 are just four countries in our sample, *i.e.*, Benin, Mali, Mozambique, and Tanzania.[17] Our tests show that just Benin's current account could be on a sustainable track of all countries that reached completion point! The other three countries, *i.e.,* Côte d'Ivoire, Ghana, and Madagascar, are countries that reached decision point as of the same date. This conclusion will be further strengthened by way of following another test.

3.2 Sustainability Model(2)

3.2.1 Model description

In this section, we apply the method employed by Ahmed and Rogers[1] to test the sustainability in the current account deficits of African HIPCs. Their method is essentially equivalent to that of Hamilton and Flavin[12] with regard

[14]Sample HIPC countries are selected from the view of data availablity: Benin, Congo, Rep., Côte d'Ivoire, Ethiopia, Ghana, Madagascar, Malawi, Mali, Mozambique, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, and Zambia.

[15]Benchmark year's gross debt is set to zero.

[16]Strictly speaking, the second term in the RHS of equation (8) is not $1+r$, but $1+r-n$(n denoted as growth rate of GDP) as we use the variables divided by nominal GDP in executing empirical estimation.

[17]The end year of in our estimation is almost 2003. That's why we slected July 2003 as completion point timing.

to laying emphasis on budget constraints. Both, however, differ in the econometric approach. Ahmed and Rogers[1] propose an alternative budget constraint to derive a testable formulation:

$$E_t \sum_{j=0}^{\infty}(s_t^{t+j} M_{t+j}) - E_t \sum_{j=0}^{\infty}(s_t^{t+j} X_{t+j}) + (1+r_t)D_t$$
$$= \lim_{N\to\infty} E_t(s_t^{t+N} D_{t+1+N}) \tag{9}$$

where s_t^{t+j} is the marginal rate of substitution between consumption in period t and $t+j$.[18] Taking the first difference of (9) and substituting for ΔD_t from (4), we get next testable implications of intertemporal external budget balance:

$$\Delta E_t \sum_{j=1}^{\infty}(s_t^{t+j} M_{t+j}) - \Delta E_t \sum_{j=1}^{\infty}(s_t^{t+j} X_{t+j}) + r_t D_t + M_t - X_t$$
$$= \lim_{N\to\infty} E_t(s_t^{t+N} D_{t+1+N}) - \lim_{N\to\infty} E_{t-1}(s_{t-1}^{t-1+N} D_{t+N}) \tag{10}$$

where Δ is first difference operator.

Ahmed and Rogers[1] propose the necessary and sufficient condition of current account deficit sustainability from equation (10). That is, three variables, r_tD_t, X_t,M_t are cointegrated with the cointegrating vector being (1,-1,1). If this condition holds, then the limit terms on the right-hand side of (10) are zero, that is, transversality condition, $\lim_{N\to\infty} E_t(s_t^{t+N} D_{t+1+N}) = 0$ holds. Ahmed and Rogers imposed some restrictions for the condition to hold. The main one is that each of three variables, r_tD_t, X_t, M_t is a nonstationary and unit root process (I(1)).[19] Before conducting the empirical test, we should note that the cointegration test of three variables (r_tD_t,X_t,M_t) is equivalent to the unit root test of one variable ($= r_tD_t - X_t + M_t$) as indicated by Miyao[19]. Therefore we test the sustainability of African HIPCs' current account deficits in two steps. First, we test whether each of three variables (r_tD_t,X_t,M_t) is a unit root process (I(1)). In this test, we employ augmented Dicky-Fuller (ADF) method (Dickey and Fuller[8]) as follows:

$$\Delta Y_t = \mu + \beta t - \theta Y_{t-1} + \sum_{i=1}^{m} \phi_i \Delta Y_{t-i} + \varepsilon_t \qquad Y = rD, X, M \tag{11}$$

$$H_0 : \theta = 0, \qquad H_1 : \theta > 0.$$

Second, we test whether one variable (=r_tD_t-X_t+M_t) is a unit root process (I(1)). If we can reject the null-hypothesis, we can judge that three variables,

[18] Equation (9) was derived by Bohn[5] using Euler equation, $E_t[(1+r_t)s_t^{t+j}] = 1$, where $s_t^{t+j} = \beta^j u'(C_{t+j})/u'(C_t)$. C_t is consumption at the date t

[19] The other conditions are as follows: (1)expectations are rational, (2)the marginal utility of consumption follows a random walk, (3)$cov_t(s_t^{t+j}, X_{t+j})$ and $cov_t(s_t^{t+j}, M_{t+j})$ are time-invariant, (4)D_t obeys to the next time series process: $D_{t+1} = \mu + D_t + \lambda^t + u_t$ where $|\lambda < 1$, $u_t$is zero-mean stationary.

r_tD_t, X_t,M_t are cointegrated with the cointegrating vector being (1,-1,1), in other words, the current account deficits are sustainable.

3.2.2 Data sources and empirical results

As before, the data used in this section are taken from the *World Development Indicators 2005*(CD-ROM) of the World Bank. As for net real interest payment ($= rD$), we construct it as approximation:

$$rD = TB + TR - CA$$

where TB is trade balance, TR is current transfer.

All variables are real (deflated by each country's GDP deflator).[20] The empirical results are summarized in Table 3. The estimation results show that we cannot reject the null-hypothesis that each of three variables in all cases but r_tD_t in Ghana is a unit root process (I(1)). Then, we can proceed to next step. Taking first difference of the three variables, we can confirm that all of them are subject to a unit root process (I(1)). These results are prerequisite condition for sustainability. Finally, we could reach the conclusion we cannot reject the null-hypothesis but the cases in Benin, Côte d'Ivoire, Ghana, and Madagascar. In other words, all countries but four ones remain in a trap of unsustainable current account deficits. This result coincides with one in the former approach. Do these results give a rationale for enhanced HIPC Initiative? Figure 1 shows the Net Present Value (NPV) of the debt-to-exports ratio for all sample countries. The target threshold of debt ratio (NPV of the debt-to-exports:150 percent) in enhanced HIPC Initiative is seen as the main instrument to assess whether HIPCs can maintain the future of debt burden at a sustainable level. The countries positioned above the target threshold (say, 200 percent in original HIPC Initiative) are the Congo, Rep., Ethiopia, Malawi, Rwanda, Siera Leone, Sudan, and Zambia.[21] All these countries fall in a trap of unsustainable current account deficits in light of our two empirical approaches. We can confirm all these countries except Ethiopia and Sudan have excessive current account deficits in figure 2. Ethiopia and Sudan, however, have so heavy burden of NPV of the debt-to-exports at which they are more likely to run into debt-servicing problems. How are the countries positioned below the target 200 percent NPV of the debt-to-exports such as Mali, Mozambique, Senegal and Tanzania? They are classified into unsustainable in light of our tests. Referring to figure 2, they are so excessive in current account deficit, while just Senegal is showing its improvement.

4 Conclusions

In this paper, we have analyzed the sustainability of African HIPCs' current accounts using econometric method. First, we have applied dynamic panel

[20] In case GDP deflator cannot be available, consumer price index is utilized.

[21] Cohen[7] estimates thresholds of 200 percent of NPV of debt-exports.

data approach to African HIPCs, LDCs, and the United States to analyze the determinants of current account. It is interesting to compare the structures of external sector between African HIPCs and the United States since both of them have large current account deficits and external debt problems. Empirical results show that there is a big difference in the persistence of current account deficits. The current account deficit for the United States shows a much higher persistence than that for African HIPCs. A weak persistence in African HIPCs might reflect current account reversals caused by IMF support. As pointed out by Edwards[9], current account reversals have a negative effect on real economic growth. A similarity lies in both of them. A domestic boom will increase the current account deficit in African HIPCs as well as the United States. But there exists the asymmetry in response to external demand.

Second, we have tested whether African HIPC countries have sustainable current accounts using two separate models (Hamilton and Flavin[12] and Ahmed and Rogers[1]). Both models treat the solvency condition derived from intertemporal budget constraints as the sustainability condition. Results of these tests show that all but four countries (Benin, Côte d'Ivoire, Ghana, and Madagascar) are unsustainable in both empirical tests. These four countries are a little different from those that reached completion point as of July 2003. Both tests are based on the times series data from the past and might be difficult to assess the sustainability at this point in time. But our results are plausible from the point of view of recent NPV of the debt-to-exports and the average current account deficit in each country.

Table 1. Determinants of Current Accounts

	African HIPCs	LDCs	US
Constant	-1.99**	0.03	3.87
	(0.45)	(0.059)	(8.86)
CAD[-1]	0.16**	0.519**	0.79**
	(0.06)	(0.061)	(0.23)
GDP Growth	0.16**	0.11*	0.24**
	(0.04)	(0.068)	(0.09)
Private Savings		-0.143**	-0.343**
		(0.066)	(0.182)
Public Savings		-0.20**	-0.127*
		(0.063)	(0.088)
Domestic Savings	-0.33**		
	(0.08)		
X/GDP	-0.11**	0.003	0.13
	(0.06)	(0.022)	(0.37)
REER	-0.033**	0.006	0.035**
	(0.019)	(0.012)	(0.01)
Terms of Trade	0.007	-0.03**	-0.025
	(0.01)	(0.005)	(0.043)
Black Market	-0.03**	0.010*	
Premium	(0.01)	(0.007)	
Aid Flow	-0.026**	-0.024**	
	(0.01)	(0.012)	
Industrial	-1.69**	-0.346**	-0.04
Economic Growth	(0.47)	(0.066)	(0.06)
LIBOR	0.45	-0.143*	-0.01
	(0.50)	(0.09)	(0.07)

(Notes)

- Standard errors on parentheses.
- * significant at a 10 percent confidence interval. ** significant at a 5 percent confidence interval.
- The estimation results in LDCs are cited from Calderon *et al.*[6].
- Sample periods are 1979 to 2002 for African HIPCs, 1975 to 1995 for LDCs, and 1975 to 2002 for the United States. GMM estimator method is applied for African HIPCs and LDCs, and Instrumental Variables method for United States.

Table 2. Tests for Null-hypothesis: $\beta = 0$: Case of African HIPCs

	(1)	(2)	(3)	(4)	(5)	(6)
Benin	1976-98	1976-99	1976-00	1976-01		
r=1%	-0.724	-0.679	-0.768*	-0.700*		
	(-1.089)	(-1.139)	(-1.432)	(-1.404)		
r=3%	-0.163	-0.152	-0.175*	-0.156		
	(-0.989)	(-1.039)	(-1.347)	(-1.306)		
Congo, Re.,	1980-98	1980-99	1980-00	1908-01	1980-02	1980-03
r =1%	-5.195*	-6.967**	-6.491**	-6.358**	-4.898**	-1.887
	(-1.662)	(-2.149)	(-1.841)	(-2.016)	(-1.875)	(-0.741)
r =3%	-1.854**	-2.333**	-1.974**	-1.813**	-1.252**	-0.325
	(-2.015)	(-2.389)	(-1.824)	(-1.970)	(-1.742)	(-0.488)
Côte d'Ivoire	1977-98	1977-99	1977-00	1977-01	1977-02	1977-03
r =1%	-1.035	-0.829	-1.658**	-1.513**	-0.993*	-0.870
	(-0.983)	(-0.955)	(-2.116)	(-2.1786)	(-1.393)	(-1.312)
r =3%	-0.204	-0.165	-0.374**	-0.337**	-0.208	-0.178
	(-0.797)	(-0.789)	(-1.986)	(-2.046)	(-1.241)	(-1.153)
Ethiopia	1983-98	1983-99	1983-00	1983-01	1983-02	1983-03
r =1%	-1.773***	-1.487***	-1.459***	-1.381***	-1.368***	-1.5212***
	(-4.988)	(-4.121)	(-4.198)	(-4.064)	(-4.184)	(-4.909)
r =3%	-0.508***	-0.414***	-0.397***	-0.384***	-0.382***	-0.428***
	(-4.774)	(-3.857)	(-3.836)	(-3.828)	(-3.958)	(-4.596)
Ghana	1977-98	1977-99	1977-00	1977-01	1977-02	1977-03
r =1%	0.335	0.431	2.109**	1.971*	0.043	-0.040
	(0.726)	(1.069)	(1.856)	(1.698)	(0.055)	(-0.052)
r =3%	0.148	0.176	0.675*	0.616*	-0.061	-0.075
	(0.941)	(1.253)	(1.619)	(1.452)	(-0.255)	(-0.315)
Madagascar	1977-98	1977-99	1977-00	1977-01	1977-02	1977-03
r =1%	-0.814	-0.762	-0.594	0.314	0.091	0.683
	(-0.522)	(-0.566)	(-0.501)	(0.280)	(0.096)	(0.832)
r =3%	-0.091	-0.098	-0.071	0.125	0.063	0.180
	(-0.257)	(-0.324)	(-0.271)	(0.519)	(0.305)	(1.026)
Malawi	1979-98	1979-99	1979-00	1979-01	1979-02	1979-03
r =1%	-5.037***	-3.938**	-4.152**	-4.236**	-4.249***	-4.6255***
	(-2.672)	(-2.201)	(-2.358)	(-2.501)	(-2.568)	(-2.773)
r =3%	-1.407***	-1.019**	-1.087**	-1.102**	-1.087***	-1.202***
	(-2.808)	(-2.168)	(-2.387)	(-2.553)	(-2.566)	(-2.892)
Mali	1977-98	1977-99	1977-00	1977-01	1977-02	
r =1%	-6.198***	-6.198***	-6.199***	-6.355***	-6.363***	
	(-3.126)	(-3.228)	(-3.328)	(-3.446)	(-3.566)	
r =3%	-1.576***	-1.572***	-1.625***	-1.627***	-1.675***	
	(-3.094)	(-3.188)	(-3.414)	(-3.497)	(-3.395)	

(table continues on following page)

Table 2.(continiued)

	(1)	(2)	(3)	(4)	(5)	(6)
Mozambique	1982-98	1982-99	1982-00	1982-01	1982-02	1982-03
r =1%	-5.914	-2.658	-5.548**	-6.829***	-6.748***	-6.568***
	(-1.116)	(-0.723)	(-2.489)	(-3.110)	(-3.207)	(-3.121)
r =3%	-1.521	-0.589	-1.390**	-1.726***	-1.723***	-1.629***
	(-1.025)	(-0.611)	(-2.416)	(-3.104)	(-3.218)	(-3.023)
Rwanda	1978-98	1978-99	1978-00	1978-01	1978-02	1978-03
r =1%	-1.948***	-1.892***	-2.015***	-1.939***	-1.795***	-1.492***
	(-2.751)	(-3.191)	(-3.520)	(-3.191)	(-3.174)	(-2.473)
r =3%	-0.391**	-0.381**	-0.414***	-0.428***	-0.424***	-0.401***
	(-1.911)	(-2.380)	(-2.817)	(-2.875)	(-2.970)	(-2.678)
Senegal	1976-98	1976-99	1976-00	1976-01	1976-02	1976-03
r =1%	-3.741***	-3.648***	-3.724***	-3.491***	-3.166***	-2.000*
	(-2.977)	(-3.014)	(-3.247)	(-3.089)	(-2.745)	(-1.548)
r =3%	-0.986***	-0.926***	-0.926***	-0.817***	-0.677**	-0.338
	(-3.034)	(-2.992)	(-3.242)	(-2.918)	(-2.389)	(-1.103)
Sierra Leone	1979-98	1979-99	1979-00	1979-01	1979-02	1979-03
r =1%	-6.005***	-4.206**	-2.719*	-3.415**	-3.376**	-3.373**
	(-2.705)	(-2.029)	(-1.561)	(-2.101)	(-2.187)	(-2.246)
r =3%	-1.688***	-1.217**	-0.788*	-0.973**	-0.968**	-0.963**
	(-2.839)	(-2.164)	(-1.659)	(-2.185)	(-2.275)	(-2.328)
Sudan	1979-98	1979-99	1979-00	1979-01	1979-02	1979-03
r =1%	-0.932*	-1.079**	-1.123**	-1.155**	-1.067**	-0.873**
	(-1.555)	(-1.873)	(-2.028)	(-2.161)	(-2.088)	(-1.862)
r =3%	-0.259*	-0.307**	-0.319**	-0.327**	-0.286**	-0.216**
	(-1.467)	(-1.848)	(-2.042)	(-2.207)	(-2.052)	(-1.737)
Tanzania	1983-98	1983-99	1983-00	1983-01	1983-02	1983-03
r =1%	0.210	-1.187	-5.292*	-1.821*	-1.873**	-1.734**
	(0.089)	(-0.818)	(-1.497)	(-1.695)	(-1.913)	(-1.886)
r =3%	7.71E-03	-0.342	-0.493*	-0.501*	-0.510**	-0.464**
	(0.012)	(-0.879)	(-1.561)	(-1.762)	(-1.984)	(-1.932)
Zambia	1977-98	1977-99	1977-00	1977-01	1977-02	
r =1%	5.952**	6.483**	6.433**	6.412**	6.646**	
	(2.069)	(2.159)	(2.257)	(2.327)	(2.497)	
r =3%	1.601**	1.551**	1.552**	1.592**	1.594**	
	(2.025)	(2.107)	(2.168)	(2.261)	(2.332)	

(Notes) t statistics is in parentheses.

* significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent. Lag length is 2 for debt variable and 1 for net exports.

Table 3. Unit Root Tests : Imports, Exports, Net Interest Payments, and Current Accounts

	Augmented Dickey-Fuller (ADF) Statistic						
Country	M_t	X_t	r_tD_t	ΔM_t	ΔX_t	Δr_tD_t	M_t-X_t+r_tD_t
Benin	-1.79(3)	-2.13(2)	-2.14(1)	-5.39(2)***	-5.05(1)***	-3.85(1)***	-4.58(0)***
Congo, Re.	-3.01(1)	-2.14(2)	-1.22(2)	-4.75(1)***	-4.82(1)***	-5.63(1)***	-1.85(2)
Côte d'Ivoire	-2.72(2)	-2.87(1)	-2.21(1)	-3.52(3)**	-3.70(0)**	-3.41(0)**	-4.06(2)**
Ethiopia	-1.31(1)	-1.76(1)	-1.76(1)	-3.65(1)**	-4.92(0)***	-2.90(0)*	-1.81(1)
Ghana	-2.20(3)	-2.12(3)	-4.33(0)**	-4.25(1)***	-4.15(1)***	-7.77(2)***	-4.54(2)***
Madagascar	-2.54(1)	-1.36(1)	-1.80(1)	-4.20(1)***	-3.28(6)**	-4.37(0)***	-3.84(1)**
Malawi	-2.29(4)	-2.48(1)	-1.31(2)	-4.87(1)***	-5.98(1)***	-5.32(2)***	-2.77(0)
Mali	-2.91(1)	-2.23(1)	0.72(1)	-4.80(0)***	-5.79(0)***	-3.67(0)**	-2.24(2)
Mozambique	-3.10(1)	-2.15(5)	-2.55(2)	-2.89(3)*	-4.28(1)***	-3.60(1)**	-0.97(1)
Rwanda	-2.81(3)	-2.68(1)	-2.31(0)	-4.09(1)***	-4.16(1)***	-4.52(1)***	-2.42(2)
Senegal	-1.96(0)	-2.46(0)	-2.74(1)	-5.68(0)***	-3.41(1)**	-4.06(1)***	-2.35(1)
Sierra Leone	-1.55(1)	-1.54(1)	-1.85(1)	-4.12(2)***	-3.72(0)**	-5.51(1)***	-1.65(1)
Sudan	-1.78(0)	-1.65(1)	-1.66(1)	-3.99(1)***	-4.33(0)***	-2.91(1)*	-2.11(1)
Tanzania	-1.50(1)	-1.87(1)	-2.86(0)	-4.38(1)***	-2.94(0)*	-3.48(2)**	-3.21(1)
Zambia	-1.60(0)	-0.70(1)	-1.18(0)	-3.91(1)***	-3.91(1)***	-3.16(1)**	-1.59(2)

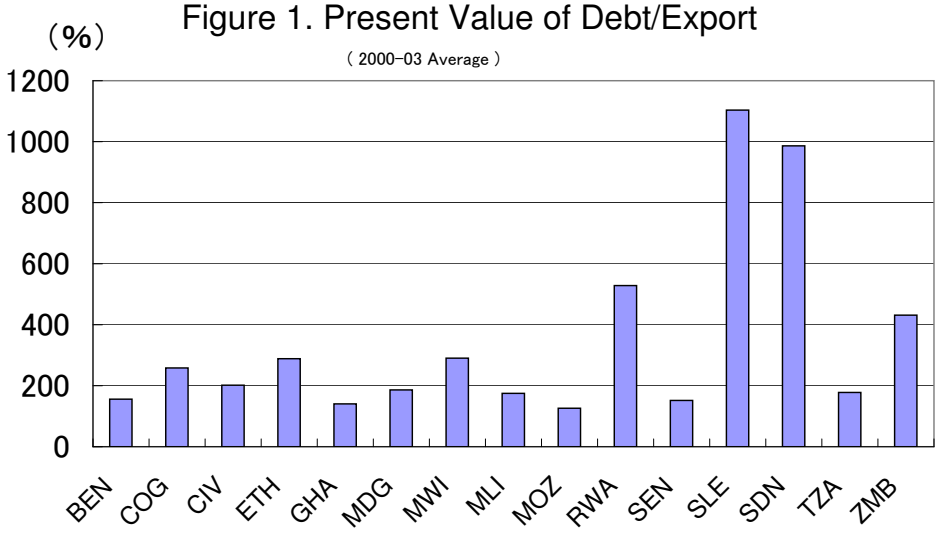
(Notes) Augmented Dickey-Fuller's t-type statistics are reported. We apply detrended test with a constant and time trend for "level" variable, and demeaned test with only constant for "first difference" variable and "M-X+rD." We choose the lag length in terms of no correlation of residuals and B.I.C. Lag length is in parentheses.
(*) significant 10 percent, (**) significant 5 percent, (***) significant 1 percent. Sample period is from 1975 to 2002.

APPENDIX: Data Description

Variables	Definition	Data Sources
CAD	the ratio of current account deficit to GDP. If CAD $>$ 0, it means deficit.	WDI
GDP	Gross Domestic Product.	IFS
Private Savings	See Loayza *et al.*[17]	Loayza *et al.*[17]
Public Savings	See Loayza *et al.*[17]	Loayza *et al.*[17]
Domestic Savings	Gross Domestic Savings /GDP	WDI
X	Exports of goods, and services	WDI
REER	Real effective exchange rate	WDI
Terms of Trade	1995=100	WDI
Black market premium	log(1+parallel market rate/official exchange rate)	WDI
Aid Flow	Official development assistance and official aid /gross capital formation	WDI
Industrial Economic Growth	Industrial countries' economic growth rate	IFS
LIBOR	London Interbank Offered Rate (One year) minus the rate of inflation in industrial countries	IFS
D	External debt	Authors' calculations
M	Imports of goods and services	WDI
rD	Net interest payments	Authors' calculations

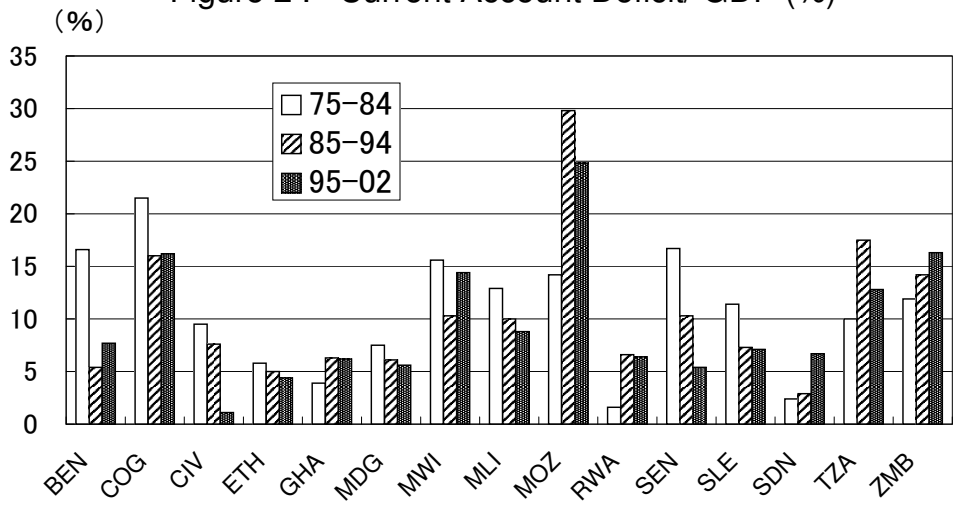
(Notes) WDI: World Development Indicators (World Bank CD-ROM)、IFS: International Financial Statistics (IMF)

Figure 1. Present Value of Debt/Export



Source) World development Indicators (2005)

Figure 2 . Current Account Deficit/ GDP (%)



Source) African Development Indicators (2004)

References

[1] Ahmed, S., and J. H. Rogers, 1995, "Government Budget Deficits and Trade Deficits: Are Present Value Constraints Satisfied in Long-term Data? " *Journal of Monetary Economics*, 36, pp.351-374.

[2] Anderson, T. W. and C. Hsiao, 1981, "Estimation of Dynamic Models with Error Components," *Journal of the American Statistical Association*, 76, pp.598-606.

[3] Arellano, M., 1989, "A Note on the Anderson-Hsiao Estimation for Panel Data," *Economic Letters*, 31, pp.337-341.

[4] Arellano, M. and S. Bond, 1991, "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58, pp.277-297.

[5] Bohn, H., 1995, "On Testing Sustainability of Government Deficits in a Stochastic Environment," *Journal of Money, Credit, and Banking*, 27, pp.257-271.

[6] Calderon, C., A. Chong and L. Zanforlin, 2001,"Are African Current Account Deficits Different? Stylized Facts, Transitory Shocks, and Decomposition Analysis," *IMF Working Paper*, WP/01/4.

[7] Cohen, D., 2001, "The HIPC Initiative : True and False Promises," *International Finance*, 4(3), pp363-80.

[8] Dickey, D. A. and W. A. Fuller, 1979, "Distribution of the Estimation for the Autoregressive Time Series with a Unit Root," *Journal of American Statistical Association*, 74, pp.427-431.

[9] Edwards, S., 2004, " Thirty Years of Current Account Imbalances, Current Account Reversals, and Sudden Stops," *IMF Staff Papers*, 51, pp.1-49.

[10] Gourinchas, P. and H. Rey, 2005, "International Financial Adjustment," *NBER Working Paper*, No. 11155.

[11] Hakkio, C. S. and M. Rush, 1991, "Is the Budget Deficit 'Too Large'?" *Economic Inquiry*, 29, pp.429-445.

[12] Hamilton, J. and M. Flavin, 1986, "On the Limitation of Government Borrowing: A Framework for Empirical Testing," *American Economic Review*, 76, pp.808-816.

[13] Haug, A., 1991, "Cointegration and Government Borrowing Constraints: Evidence for the United States," *Journal of Business and Economic Statistics*, 9, pp.97-101.

[14] Krugman, P., 1985, "Is the Strong Dollar Sustainable?" *NBER Working Paper*, No. 1644.

[15] Krugman, P., and R. Baldwin, 1987, "The persistence of the U.S. trade Deficit," *Brookings Paper on Economic Activity*, 1, pp1-43.

[16] Lane, P. R., and G. M. Milesi-Ferretti, 2004, "Financial Globalization and Exchange Rates," *CEP Discussion Paper*, no.662, London School of Economics and Political Science.

[17] Loayza, L., H. Lopez, K. Schmidt-Hebbel, and L. Serven, 1998, "The World Saving Database," Washington: The World Bank.

[18] Mengistae, T., and C. Pattillo, 2004, "Export orientation and Productivity in Sub-Saharan Africa." *IMF Staff Papers*, 51, pp.327-353.

[19] Miyao, R., 2003, "Another Look at Origins of the Asians Crisis: Tests of External Borrowing Constraints," presented at the international workshop "the Asian Crisis and After," Economic and Social Research Institute, Cabinet Office, June.

[20] Nakamura, T., 2003, "Debt Reduction Economics," in *Toward the Economics of Sub-Saharan Africa* ed. by Hirano, K., Institute of Developing Economies.

[21] Obstfeld, M. and K. Rogoff, 1995, "The Intertemporal Approach to the Current Account," *Handbook of International Economics*, Vol. 3, ed by G. Grossman and K. Rogoff, Amsterdam: North-Holland

[22] Obstfeld, M. and K. Rogoff, 2000, "Perspectives of on OECD Economic Integration: Implications for U.S. Current Account Adjustment," *Global Economic Integration: Opportunities and Challenges*, Kansas City: Federal Reserve Bank of Kansas City, pp. 168-209.

[23] Obstfeld, M. and K. Rogoff, 2004, "The Unsustainable US Current Account Position Revisited," prepared for NBER conference on "G-7 Current Account Imbalances" July 12-13, 2004.

[24] OED, 2003, *Debt Relief for the Poorest*, The World Bank, Washington, D.C.

[25] Pattillo, C., Poirson, H., and Ricci, L., 2004, "What Are the Channels Through Which External Debt Affects Growth?," *IMF Working Paper*, WP/04/15, International Monetary Fund.

[26] Reinhart, C., Rogoff, K., and Savastano, M., 2003, "Debt Intolerance," *Brookings Papers on Economic Activity*, 1, pp.1-71.

[27] Sun, Y.,2004. "External Debt Sustainability in HIPC Completion Point Countries," *IMF Working Paper*, WP/04/160, International Monetary Fund.