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Capital Flows and Current Account Sustainability: The Ghanaian Experience

M. Opoku-Afari
Head of Special Studies Unit
Research Department
Bank of Ghana

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CAPITAL FLOWS AND CURRENT ACCOUNT SUSTAINABILITY: THE GHANAIAN EXPERIENCE

by

M. Opoku-Afari¹

Abstract

Trends in trade and current account balances in Ghana show a consistent and excessive deficit (but for brief episodes of surpluses). This has constantly created a financing gap in the Ghanaian economy. It is interesting that this financing gap has mostly been filled by depending on capital inflows, in particular, aid inflows, as foreign direct investments (FDI) and other components of the capital accounts have not been significant in contributing towards the perennial financing gap. It is observed that even as Ghana depends to a large extent on aid inflows, it has tended to be pro-cyclical.

Both theoretical and operational definitions of current account sustainability show a persistent and fragile current account balance (deficit) for Ghana. It is evident from all these analysis that current account sustainability in Ghana is very sensitive to donor flow dynamics rather than gains from trade. It is not hard to conclude that to make Ghanaian current account deficits sustainable, the economy would need to alter its current structure (which has changed very little over the past four decades), to make trade gains a predominant pivot of current account dynamics. In addition, worker and private remittances from abroad is gaining increasing importance over the past 5 years and since that has been shown to be relatively stable and counter-cyclical, all efforts should be made to channel the greater percentage currently in the informal sector to the formal sector through reducing both implicit and explicit cost of remitting both from the source and at the receiving point in Ghana.

JEL Classifications: F32, F35, F41,

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¹ Maxwell Opoku-Afari is the Head of the Special Studies Unit in the Research Department of the Bank of Ghana. He acknowledges useful comments from Dr. E.K.Y Addison (Director of Research, Bank of Ghana) and research assistance from Messrs Emmanuel kinful and Ibrahim Abdulai. However, all errors are entirely his own. Author's contact: mopokuafari@bog.gov.gh

1. Introduction

As the Ghanaian economy positions itself on the path to move the economy from stability to growth, policy makers and international community as a whole have been concerned with identifying the drivers of growth and whether these sources of growth would lead to a sustainable growth needed to plunge the economy to that much awaited sustainable growth path towards middle income status by 2015.

Right from the days of Structural Adjustment Programme (SAP) till now, Ghana has benefited immensely from significant capital inflows, mostly in the form of donor assistance. More recently, Ghana has also identified another form of inflow, remittances, as a significant component of the current accounts². While these developments have been seen as crucial to the current trend of stability, people have questioned the sustainability of this trend and how important this is in terms of promoting growth. Over the past two decades, current account balance in Ghana has consistently been in the deficit reaching a peak of **12.5** percent of GDP in 1999. However, in recent years while positive economic growth has returned in Ghana, large and increasing current account deficits have become common making the question of sustainability imperative.

On the one hand, a current account deficit is a reflection of the strength of a developing economy, insofar as it measures underlying financing of investment demand in excess of national savings. On the other hand, a current account deficit can reflect a dangerous and unsustainable imbalance between national savings and investment and the accumulation of debt. It would be extremely important and interesting to know which of these two scenarios represent the situation in Ghana. Given the first scenario, if current account deficits in Ghana represent the underlying driver of growth, then it would reflect in major structural changes that have led to an inflow of capital causing investment and economic growth. These in most cases have been viewed in the case of a developing country as representing the transition process from stability to growth. We could also have the situation where the deficit results in the accumulation of unsustainable debt.

Looking at it differently, the deficit could be seen as a performance criterion of the Ghanaian economy. That is, given that the current account deficit is closely related to fiscal balance (public savings) and private savings, it has important implications for overall growth. Similarly, it would have implications for the exchange rate and competitiveness, which could prove counter-cyclical to growth efforts being pursued. Hence, our exploring the dynamics of the current account and its underlying drivers would illuminate our understanding on the overall performance and prospects of the Ghanaian economy. This is a huge task especially in developing economies, which are perceived to have a very prolonged transition trajectory. This if not properly understood and managed could make the economy more susceptible to large and unpredictable shocks, the consequences of which cannot be overemphasized.

This paper attempts to identify the underlying structure of current account deficits in Ghana, and specifically assess the sustainability of the Ghanaian current account using a multi faceted suite of models and indicators. We have particularly been motivated to investigate the current account sustainability in Ghana due to the following:

² In addition to significant increases over recent years in remittances, improvement in recordings at the recipient banks following new guidelines released by the Bank of Ghana accounts for the sudden surge. Implying some of the increase are not new remittances flows. It is also believed that about two-thirds of remittances are in the informal sector (see Addison, 2004).

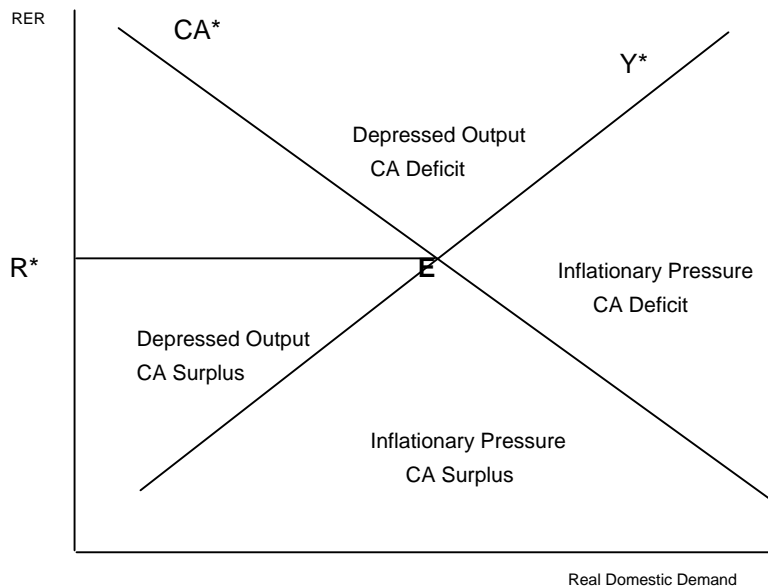
- the size of the deficit relative to GDP in recent years (rising as high as 12.5% in 1999)
- the relatively poor income and savings rate indicating that deficits are the result of high consumption and low savings
- unsustainability of external debt plunging the country into the HIPC status
- real appreciation of the exchange rate posing threats to our external competitiveness
- relatively unchanged structure of the Ghanaian economy over the past two decades questioning the sources of growth.

The paper begins with a review of background and trends in current account balance in Ghana. Section two discusses the concept of current account sustainability. Section three looks at criteria for sustainability of current accounts deficits. Section four presents a detailed assessment of current account sustainability in Ghana, while section five presents suggestions to improve sustainability. Section six concludes the paper.

2. The Concept of Sustainability

Simultaneous achievement of domestic and external macroeconomic equilibrium is considered to be driving macroeconomic management in both developed and developing economies. Domestic balance can be defined as the condition where non-tradables goods clears in the current period and is expected to be in equilibrium in the future. External balance is mostly defined as the current account balance that is compatible with long-run sustainable capital inflows (Opoku-Afari *et al*, 2004). A simultaneous achievement of internal and external balances result in a correspondent optimal real exchange rate and consumption (or domestic demand) consistent with both external and internal balances. The figure below represents different scenarios of both internal and external (dis) equilibrium.

Chart 1: Macroeconomic (Dis) Equilibrium



The above clearly demonstrates the different stages of macroeconomic (dis)equilibrium particularly for developing economies which are always in transition. The right side of the CA* line represent a situation of current account deficit. An economy showing chronic deficit would persistently be on the right side of CA* line. Similarly, an economy showing depressed output would be on the left side of internal balance (that is the Y* line). We can have four different scenarios, a current account deficit with internal balance (labeled inflationary pressured current account deficit), or a current account surplus with internal balance (inflationary pressured current account surplus). We can also have situations where there is internal disequilibrium (depressed output) with a current account surplus or depressed output with a current account deficit.

Which of these four scenarios is preferable and which of them characterize the present situation in Ghana? It is not hard to see that the Ghanaian economy has suffered persistent current account deficits and thus putting us on the right side of the CA* line. In addition, growth in Ghana has not been sustainable (until recently) and this is coupled with the fact that unemployment levels are extremely high (there are no formal estimates), credit to the private sector is depressed. Given these characteristics, one can convincingly say that output in Ghana has been significantly depressed, resulting in an internal imbalance. This comfortably puts Ghana above the point E in chart 1, an indication that Ghana's macroeconomic condition could be classified as a situation of "***depressed output with current account deficit***". One can also say that judging from high inflationary levels (until recently when the economy started disinflation), Ghana's economy is believed to be tilting towards the right side of point E, an indication of the underlying inflationary pressures.

Following from the macroeconomic analysis above and concentrating our paper on the external balance, we decompose the current account into trade balance including net of exports of goods and services ($TB = X - M$), net factor income which includes net investment income (NIC) and net transfers including remittances (NT).

$$CA = X - M + NIC + NT \quad (1.1)$$

Similarly, the current account can be defined as the difference between savings (S) and investment (I) for the whole economy, which reflects the power of a developing economy albeit with some danger if the negative difference is unsustainable and hits the external economy. This is represented below as³:

$$CA = (S_p - I_g) + (S_g - I_p) = S - I \quad (1.2)$$

Equation (1.2) shows the underlying structure of the current account. It is not hard to see that a deficit could either result from dissaving either by the private or public sector. Conventionally, it is expected that a current account deficit resulting from low domestic savings is likely to be unsustainable than one resulting from high investment. Obviously, high investment has the potential of increasing production capacity and thus future output and trade surpluses⁴, an indication that in dynamic analysis high investment is preferable even though in static analysis both may have the same impact.

³ Subscripts p and g denotes private and government respectively.

⁴ We are mindful of the fact that the composition of investment to a large extent determines the extent of translation into trade surpluses.

3. Current Account (Un)Sustainability Criteria

Recent financial crisis in Asia and Latin America have made it clear that there is not a simple method of assessing the sustainability or otherwise of current account deficits. This is due mainly to the fact that foreign exchange crisis that occurred proved to be counter-intuitive in certain countries given the trends in the current account deficits. Having said this, there are however, commonly held views that have been used throughout the literature to assess the health of the current accounts balances. We note that these criteria have rather tended to be necessary but *not sufficient* conditions for assessing the health of current accounts. In this section we will discuss various measures available to policy makers to make a judgment on the health of the external sector and to use as early warning signals for imminent crisis.

As noted by Roubini and Wachtel (1998), a country is solvent as long as the discounted value of the country's foreign debt is non-zero in the infinite limit. This implicitly means that the country is not in the position of increasing its foreign debt faster than the real interest rate on this debt. They therefore concluded that any path of current account that returns the infinite sum of all current accounts to be equal to the initial foreign debt is consistent with solvency. They concluded by saying that "a country could then run a large current account deficit for a long period of time and remain solvent as long as there are surpluses at some point in the future". This also has an obvious implication of running a large foreign debt as long as the rate of increase is lower than the real interest rate. The above obviously has very loose implications of solvency and with the benefit of hindsight it is no longer a surprise that some countries in Asia and Latin America experienced financial crisis under the watch of solvency.

The looseness of the above has prompted analysts to look at a more practical aspect of sustainability. According to Summers (1996), current account deficit in excess of **5 percent of GDP** should be seen as uncomfortable. He maintained that it is even more critical if this deficit is particularly financed in a way that leads to rapid reversals or through a "*ponzi-type of game*". This even became more prominent when empirical studies after the Asian crisis concluded that countries that were hit hard were those with large deficit/GDP ratios throughout the 1990s (Corsetti and Roubini, 1997; Radelet and Sachs, 2000).

Similarly, Milesi-Ferretti and Razin (1996) have maintained that sustainability depended on the country's willingness to pay and creditors willingness to borrow, making it even more difficult to use standard measures to predict sustainability. In this light they suggested certain key issues to observe in sustainability assessments such as large imbalances relative to GDP, reduction in domestic savings rather than increasing in national savings rate and extremely low national savings rate.

Further to these measures, others have also developed empirical models to assess the vulnerability of developing and emerging economies to external shocks in addition to assessing the sustainability of the current accounts deficits⁵. What became obvious from these empirical models is the fact that there was no unique sustainable trajectory of the current account deficits (existence of multiple optimal paths).

⁵ See GS-SCAD model in 1997 developed by Goldman and Sachs and the Deutsch Bank model developed in 2000.

3.1 Fundamental Determinants of (Un)Sustainability

Granted that current account is equal to the difference between national savings and investment, we could comfortably define a current account deficit as resulting mainly from either a fall in savings or increase in investment. In this case, the (un) sustainability of a given deficit will depend to a large extent on the source as explained above. This involves real sector dynamics to reveal the underlying sources of the current account deficit. This brings into question the concepts of private consumption, government expenditures, investment and net exports in addition to national income (or commonly referred to as growth or net cashflow). How these variables interact would determine whether the economy would be running a current account deficit or surplus and whether this deficit is sustainable or not. It is well established that a current account deficit that is caused by a fall in national savings could either be due to a fall in private savings or in public savings (higher budget deficits) as established in equation (1.2). It is potentially worrying if lower public savings is driving the deficit. It is also riskier than private savings as private savings reduction could be seen as a transitory phenomenon in the dynamic sense while structural public sector deficits have the tendency of becoming endemic⁶ (Roubini and Wachtel, 1998).

To be able to track the underlying real sector sources of the current account deficit in Ghana, we employed the framework initially developed by Obstfeld and Rogoff (1995), called the *Inter-Temporal Model of Optimal Benchmark*. This model is used to forecast the optimal time path of current account balances and that is compared with the actual balances to assess whether there are huge deviations and whether these deviations are systemic. This approach has been used widely by Ghosh and Ostry (1994) for a host of developing countries, Adedeji (2001) for Nigeria, Hudson and Stennett (2003) for Jamaica, Cashin and McDermott (1996) and Makrydakis (1999).

For the purposes of this paper, we outline below a very brief restatement of the framework (see appendix for detail analysis and empirical estimations of the model for Ghana). The main thrust of the framework using the intertemporal utility function of a representative individual (exhibiting rational expectations) in a small open economy without liquidity constraints (ability to borrow and lend to smoothen out consumption), is that a consumption smoothing component of the current account is given as:

$$ca_t^* = -E_t \left(\sum_{j=0}^{\infty} (1+r)^{-j} \Delta z_{t+j} \right) \quad (1.3)$$

This shows the extent of movement in the current accounts as a decreasing function of the persistence of temporary shocks in net cashflow (or output), as permanent shocks with no implications on net output would have no impact on the current account. This implies that an economy would register a current account surplus if it expects its net cashflow to be falling temporarily in the future (the converse holds). This follows from the intuition that households tend to save when they expect their future labour income to fall in the future. Obviously savings would reflect in current accounts and labour income would reflect in net cashflow.

Equation (1.3) is very informative and one could draw a number of useful policy implications from it. For instance current account deficits on its own may not necessarily

⁶ Potential of unsustainable build-up of debt

signal imminent crisis or structural problems. It could be that there is a temporary increase in government expenditure, in investment or a decline in productivity, which would obviously lead to a deficit. This should not necessitate drastic exchange rate policy measures aimed at devaluation to correct the problem. Also if the observed current account deficit represents consumption smoothing of private agents then such deficits may not necessarily result in external debt build up. Finally, observed deficit may be a wake up call on the economy to accelerate growth in the future to repay borrowed savings used to smoothen out consumption. These are important policy implications making the study of underlying causes of current accounts deficits imperative.

To arrive at the consumption smoothing component of the current accounts one needs to estimate Equation (1.3), however, this would prove to be quite challenging. However, Campbell and Schiller (1987)⁷ introduced an innovative way of doing this, which is restated below⁸ as:

$$\begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} = \begin{bmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{bmatrix} \begin{bmatrix} \Delta z_{t-1} \\ CA_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (1.4)$$

where in this case CA_t is the detrended consumption smoothing current account balance and Δz is the changes in net cashflow or output.

Given the above, we could perform a number of tests. In particular, it should be possible to evaluate and test the fact that should equation (1.3) be true, the behaviour of economic agents must be such that changes in the current account should predict future changes in the net private cashflow (that is expected temporary shocks in cashflow should reflect in movements in the current account). Also as noted in Hudson and Stennett (2003), we could test formally for (un)sustainability base on whether or not the predicted value equals the actual current account balance. This implies that $\varphi_{11} = \varphi_{21}$ and $\varphi_{22} - \varphi_{12} = (1+r)$. Finally we could test whether the current account Granger-causes subsequent movements in net cashflow which implies that $\varphi_{12} < 0$ and significant.

3.1.2.1 Data and results

Using annual data from 1960 to 2002, we attempt an empirical analysis of the dynamics of the Ghanaian current accounts by estimating the present value model. Similar to Adedeji (2001) and in line with Hudson and Stennett (2003) we use private consumption, government consumption, national investment, gross domestic product (GDP) and gross national income (GNI). These variables are in nominal terms so we divided by GDP deflator for Ghana (1995 as base) and total population to transform the variables into real per capita terms.

Instead of using the current account as per the balance of payments accounts, we rather derived the current accounts from the national accounts by subtracting private and government consumption as well as investment from GNI. These transformations gave us real per capita private consumption expenditures (c_t) and net cashflow (which is

⁷ The basic insight of Campbell-Schiller's methodology is that as long as the information set used does not contain all the information available to private agents, then past values of current account contain information useful in constructing estimates of agents' expectations of future values of z .

⁸ See appendix for detailed derivation of Campbell and Schiller (1987)'s innovation.

estimated as GDP less investment and government consumption expenditures and adjusted for net factor payments). This is denoted as z_t . The consumption smoothing current account balance (adjusted for consumption tilting) is derived by using DECOMP⁹ to decompose total current account balance into trend and residual and the residual in this instance used to represent consumption smoothing current account balance while the trend represents the consumption tilting component. All our data were taken from World Development Indicators of the World Bank.

In line with standard practice and more specifically for the purposes of the theoretical underpinnings of this paper, we determined the (non)stationarity properties of these variables used in testing the intertemporal model. As noted by Campbell and Schiller (1987), the consumption smoothing component of the current account balance (ca_t^{sm}) and the changes in net private cashflow (Δz_t) must be stationary (that is I(0)). We also needed to establish, in order to support the underlying theory that there exists a long run relationship between z_t and c_t (implying they should be integrated of order one). We tested for both unit roots and cointegration using both the Augmented Dickey Fuller (ADF) and the Philip-Perron (PP) procedures¹⁰ for the unit root analysis and the Johansen procedure for the cointegration test establishing the long run properties (see Table 1 in appendix for results).

Using the Johansen methodology, we are able to establish a long run cointegration relation between net cashflow and private consumption¹¹. In addition the error correction model following the establishment of the cointegration relation showed a significant error correction term albeit with very small adjustment coefficient. This goes to confirm that the Ghanaian external position satisfies the intertemporal solvency condition. Unlike the case for Nigeria (which is in the same sub-region as Ghana and shares common characteristics with Ghana), the long-run coefficient between net cashflow (z) and private consumption (c) is **1.92** (with a t-statistic of **-2.4**). It is obviously larger than **0.87** and **0.95** for Nigeria (Adedeji, 2001) and larger compared to Ghosh and Ostry (1995) for most developing countries and **1.05** for Jamaica (see Hudson and Stennet (2003)). The obvious implication of the **1.92** long run coefficient is that Ghanaians tend to postpone current consumption for the future. This result is quite counter-intuitive to what the general low savings rate in Ghana predicts. In effect, it implies Ghanaians tend to smoothen their consumption more than adjusting (tilting) their consumption to reflect long-term trends.

We estimated the optimal current account model for Ghana using the framework discussed above (see Table 2 in appendix for estimation results)¹². Chart 2 plots the optimal and actual current account balances for Ghana as implied by the model¹³. It is obvious that the optimal current account forecasted from the model is able to track significantly the actual current account (correlation of **0.5**). However, it is not hard to see

⁹ See Opoku-Afari *et al* (2004) for detail analysis of DECOMP and other univariate decomposition methodologies.

¹⁰ We included a constant and a trend term in both procedures.

¹¹ Using a model with a constant in the cointegration equation but no deterministic trend and with an optimal lag length of 3, we are able to establish a cointegrating vector.

¹² Results are presented in the appendix.

¹³ To ease the pictorial analysis and also to reflect the transformations done in our data by converting everything to real values using GDP deflator (1995 as base), we rebased both the optimal current account series and the actual current account series to 1995.

why Ghana has consistently had a negative current account balance as the optimal in most years have been below the actual reflecting in persistent negative deviations with sharp spikes in 1974 and 2000¹⁴, reflecting the oil price shock and the adverse terms of trade shock in Ghana respectively.

Chart 2: Ghana-Actual and Optimal Current Account Balance (1995=100)

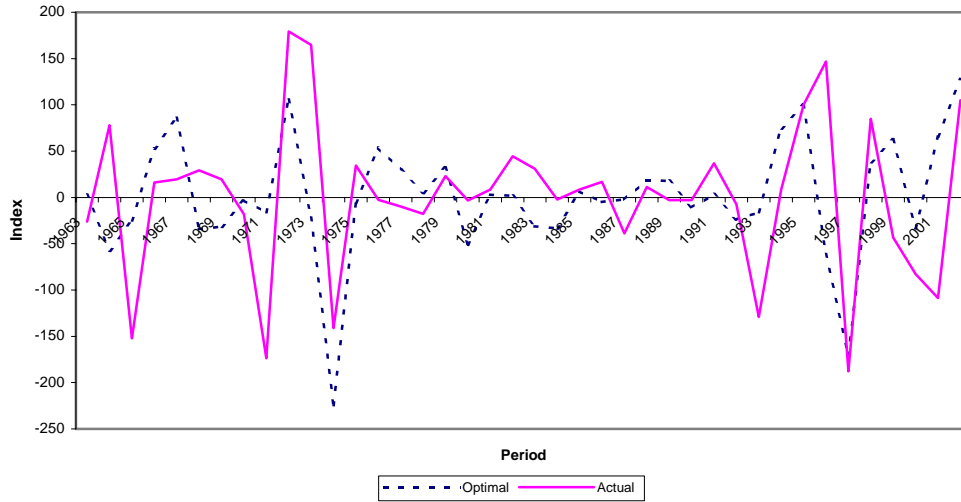
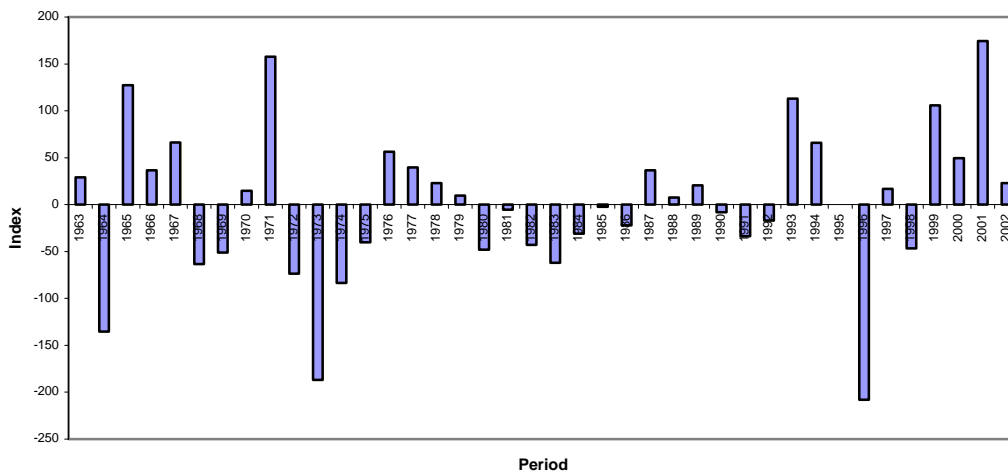


Chart 3: Ghana-Deviation Between Optimal and Actual Current Accounts



For most of the period up to 2000 the actual current account was in excess of the optimal current account and this resulted in a persistent deficit in the current accounts. However, one can easily see a reversal of trends for a greater part of the period after 2000. The actual current account tends to lag behind the optimal current account, an indication of contained external balances. This trend could easily be explained. In addition to effective policies put in place during this period, Ghana benefited from HIPC debt relief and also

¹⁴ See chart 3 plotting the deviations

considerable increase in net transfers of which remittances forms a greater part. This has obviously translated the sustainability dynamics of the current account balance in Ghana in recent years¹⁵. One question to ask is whether the underlying fundamentals of the dynamics in current account balances in recent years are sustainable. This question goes beyond this model. One needs to specifically assess the sustainability of donor inflows into Ghana at this juncture and also the dynamics of remittances into Ghana to assess whether they could sustain the current account balances.

3.2 The Role of External Debt in Current Account (Un) Sustainability

The current account deficit could be seen as a mismatch between national savings and investment derived from current resources generated within the economy and this deviation could be financed either by debt creating capital inflows. An existing large burden of debt compromises the country's credit worthiness as it affects their ability to service this debt, affecting the country's ability to meet its current account imbalance. The above is derived from the understanding that a large debt burden will put excessive pressure on export revenues, which competes with imports of investment goods that are needed for growth. In most cases (and typical of Ghana), this created a debt trap, which culminated in the rescheduling of debt servicing and ultimately some developing countries opting for the HIPC initiative (including Ghana). Following from the above, it would be interesting to assess Ghana's current account (un) sustainability taking into consideration the role of external debt.

To achieve the above, we adopted the **accounting approach to current account sustainability**, which focuses on debt ratio analysis¹⁶. As discussed in Hudson and Stennett (2003), this framework defines a sustainable current account as the one that does not generate increases in the debt to GDP ratio. This is drawn from the general understanding that external indebtedness evolves from the trade balance as well as interest payments. In this light, the framework defines the external financing constraint as:

$$\frac{B_t}{B_{t-1}} = (1 + i_t) - \frac{(X - M)_t}{B_{t-1}} \quad (1.5)$$

where B denotes the debt stock, i represent the interest rate payable on the debt and $X - M$ represent the trade balance. Equation (1.5) can be re-written as:

$$B_t = (1 + i_t)B_{t-1} - (X - M)_t \quad (1.6)$$

Given the time paths for i_t and $(X - M)_t$, equation (1.6) describes the time path of the net external liabilities. One could infer from the above that if trade is exactly balanced (i.e $X - M = 0$), the country's net external indebtedness would grow exactly as the rate of interest (i_t). It follows from this same logic that should the economy run a trade deficit, the debt stock would grow at a rate that exceeds the interest rate.

Having set the above line of logic, we derive the (un) sustainability condition by setting equation (1.6) in growth terms by dividing through by Y_t on the assumption that

$\frac{Y_t}{Y_{t-1}} = (1 + g_t)$, where g_t is the growth rate of GDP. This would return equation (1.6) as:

¹⁵ We note that not all increases in net transfers and hence remittances are new money. Some proportion of it represents improved recordings by banks following revision of reporting procedures by Bank of Ghana.

¹⁶ Typically debt to GDP ratio.

$$\frac{B_t}{Y_t} = (1+i_t) \frac{B_{t-1}}{Y_t} - \frac{(X-M)_t}{Y_t} = \frac{(1+i_t)B_{t-1}}{(1+g_t)Y_{t-1}} - \frac{(X-M)_t}{Y_t} \quad (1.7)$$

For simplicity we denote the ratios as lower case letters and recast equation (1.7) as:

$$b_t = \left[\frac{1+i_t}{1+g_t} \right] b_{t-1} - (x-m)_t$$

subtracting b_{t-1} from both sides

$$\begin{aligned} \Delta b_t &= \left[\frac{1+i_t}{1+g_t} \right] b_{t-1} - \left[\frac{1+g_t}{1+g_t} \right] b_{t-1} - (x-m)_t \\ &= \left[\frac{i_t - g_t}{1+g_t} \right] b_{t-1} - (x-m)_t \end{aligned} \quad (1.8)$$

therefore the condition for sustainability would be given by the relation below:

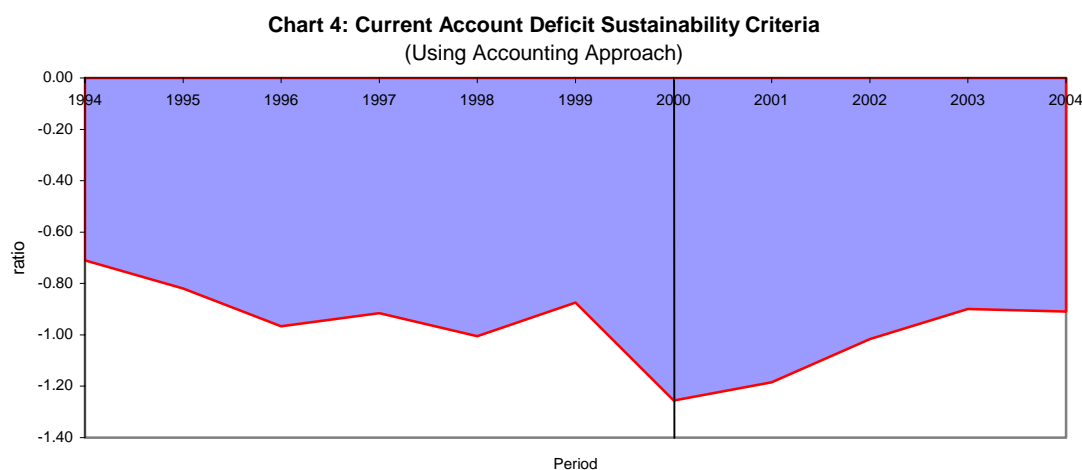
$$\left[\frac{i_t - g_t}{1+g_t} \right] b_{t-1} - (x-m)_t = 0 \quad (1.9)$$

In effect what equation (1.9) implies is that should the trade be exactly balanced, the change in the debt to GDP ratio would depend on the deviation between the interest rate on the economy's net external liabilities and the growth of GDP¹⁷. That is if $g < i$, then the debt to GDP ratio would increase. Obviously, a preferable situation is where $g > i$, an indication that growth is enough to counter increases in debt build-up.

With a general agreement that current account is sustainable if it does not generate debt build-up (that is to maintain a particular debt to GDP ratio), it implies that trade must generate surpluses sufficient to offset the growth in the debt stock as a result of pure interest rate/GDP growth differential. Negative values of equation (1.9) imply the trade deficit and for that matter current account deficit has the potential of increasing the debt stock, implying an early signal of the potential unsustainability of the current account deficits¹⁸.

¹⁷ The obvious literal implication of equation (1.9) is that the sustainable trade balance and for that matter current account balance is the one that does not result in a change in the stock of debt.

¹⁸ The main shortcoming of this approach is the fact that it does not take into account the role of lenders and investors in determining evolution of debt.



Source: Author's own Derivation from The Account Approach Model

Chart 4 above clearly shows an interesting picture of trends in current account balance in Ghana. It is obvious that this corroborates other findings and the existing data in Ghana. It is clear that the position in Ghana over the past decade supports the unsustainability criteria discussed in the model (that is it has consistently been in the negative). This is an indication that trade deficit had potentially increased external debt in Ghana and has compromised the sustainability of current account deficits. However, one notices an interesting pattern. From 1994 till 2000 there was a steady increase in the negative trend¹⁹. This trend however reversed after 2000 showing a steady reduction in the negative trend. This is an indication of a reversal of the worsening current account deficit²⁰.

3.3 Other Institutional Measures of (Un) Sustainability

In addition to the two models presented above (that is the intertemporal model and the account approach), there are other sets of criteria, which are used simultaneously to determine the health status of external balances. It must be noted that no particular criteria is sufficient in determining the (un) sustainability of current account deficits. As noted by Roubini and Wachtel (1998), there is no simple way of finding out whether the current account deficit in a particular economy is sustainable or not, even though theoretically an economy's sustainability of international financial obligations (solvency) can be considered as a "proxy indicator" of sustainability of the current account deficit²¹.

Due to the inconclusiveness associated with standard models and indicators of sustainability, a number of practical criteria that obviously support the theoretical underpinnings discussed earlier have been used and we discuss a few of them for the purposes of assessing the sustainability of Ghana's current account deficit.

¹⁹ Ghana experienced the worst current account shock between 1999 and 2000.

²⁰ It is possible for one to attribute the reversal in 2000 to Ghana's adoption of HIPC, and thus a reduction in the debt stock, but a look at the debt stock figures show that it only started reducing from 2004. Given that this dismisses that line of argument, one could confidently attribute this reversal to improved private and public sector savings (see chart 8).

²¹ As we have noted earlier this indicator is problematic due to a certain level of indefiniteness associate with the intertemporal budget limitation and real interest rates.

- Increasing external debt to GDP ratio is an indication of unsustainability. As discussed in the accounting approach model, a current account balance that leads to increasing external liabilities is an indication of unsustainability of the deficit.
- As noted by Summers (1996), a current account deficit to GDP ratio higher than **5 percent** sends a strong signal for an evaluation of (un)sustainability of the current account deficit. However, it is noted that one needs to uncover the source of the higher deficit as a deficit driven by investment growth is more likely to be more sustainable in a dynamic concept²² than a deficit driven mainly by falling national savings (higher budget deficits).
- It is obvious following from the above that a fall in national savings is problematic for current account deficit sustainability. Inasmuch as we associate fall in the public component of national savings with higher budget deficits, trends in fiscal deficits then become an automatic indicator of (un)sustainability of current account deficits.
- Composition of the current account is very important in determining whether it is sustainable or not. Given that it could be broadly broken down into trade deficit and net factor income, these two sub-components become a source of deficit (un)sustainability. A current account deficit may be less sustainable if it is derived from a large trade deficit than from a large negative net factor income (Roubini and Wachtel (1998). Large and persistent trade deficits indicate a structural competitiveness problems while large and negative factor incomes may be a fall out of higher external debt profile. In this context the level of exports to GDP ratio could be a good indicator of structural competitiveness. In addition, we could use the real exchange rate as a measure of structural competitiveness and trends in the real exchange rate could be a good indicator of competitiveness and thus (un)sustainability of deficits.
- Gross international reserves have been used widely to measure the sustainability of current account deficits. It is believed that higher gross international reserves to debt stock indicate sustainability of current accounts (in some instances the number of months of imports these reserves could support is also used).
- The sustainability of current account deficits is believed to be contingent upon a sound and stable domestic financial system with strong supervisory and regulatory role.
- Since the financing gap created by current account deficits are filled by foreign capital inflows, then the state of political stability of the economy and predictability of economic policies which hinges on continuity of the system of government is an important indicator of attracting foreign inflows and hence important for current account sustainability.
- Last but not least, and in fact very important is the role of capital inflows. Since the financing gap generated by current account deficits are normally filled through foreign capital inflows, its composition and size is very crucial. As the general notion still holds, short-term inflows are more dangerous in financing the current account deficits than long term inflows. Even though long term inflows in the long term may enhance the current account, in the long run it is expected to

²² Higher current account deficits are more likely to be sustainable under conditions of higher economic growth.

have real effects as the real exchange rate would tend to appreciate and compromise the competitiveness of the economy and consequently re-introduce structural trade deficits, which would worsen the initial current account deficits, making it unsustainable.

4. Is the Ghanaian Current Account Deficit Sustainable?

The current account in Ghana has persistently been in a deficit since early 1975²³, but with significant variation over the period. The average deficit for the period 1975 to 2004 is about **3.4** percent of GDP. It can be said that the trend has worsened over time until recently where one can positively identify a reversal of the trend (see Chart 5). For the period 1970-79, the current account registered an average deficit of **0.32** percent of GDP. This modest average worsened significantly in the 1980s where a deficit of **1.87** percent was posted. The 1990s saw the worst period of high deficits with an average of **6.1** percent of GDP and a peak of **12.5** percent in 1999. However, this trend has reversed with a modest average of **1.87** percent of GDP registered between 2000 and 2004.

According to Chart 6, it is not hard to see that Ghana's current account path has mainly been driven by developments in the goods and services component. This has dictated the slope and turning points of the current accounts deficit trajectory in Ghana until 2001 where one can see a significant departure from trends in goods and services as against current account balances.

Given the narrowness of the export base in Ghana, one is not mistaken to say that the goods and services component has been driven mainly by imports which available data indicates that not until recently, a greater percentage (about 30%) of the goods component is dominated by consumption goods. This obviously is a conservative estimated given that "others" in that sub-component is mainly made up of consumption goods but due to improper classifications has been left out of this estimation. In addition about 50 percent of the goods and service component is made up of capital goods, which underscores the country's effort to increase investment to drive growth. Notwithstanding, 30 percent of goods and services driving current account deficits is quite a substantial amount raising concerning as to whether Ghana's current accounts are sustainable. This is coming from the fact that if current account deficits indicate dominance of consumption then it underscores lack of domestic savings, which is an important recipe for unsustainability and financial crisis.

²³ With the exception of 2003 where a surplus of 2.89% of GDP was recorded.

Chart 5: Ghana-Trade and Current Account Balances

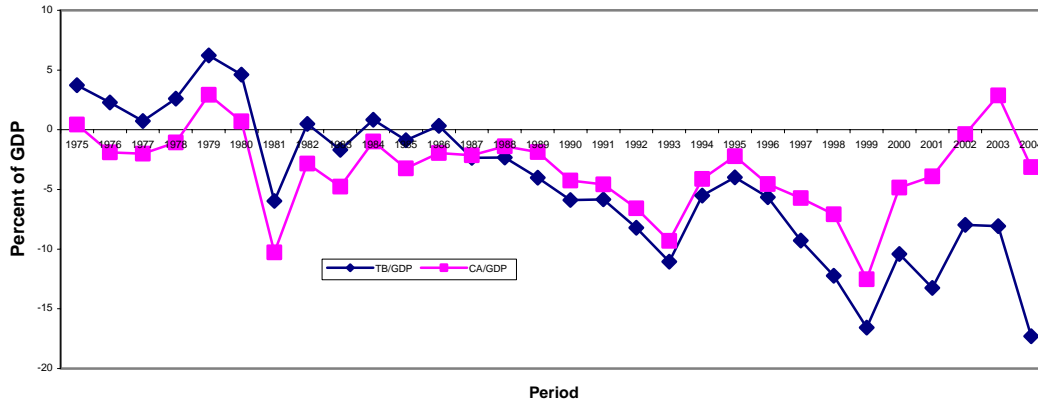


Chart 6: Ghana-Current Account and Fiscal Balances

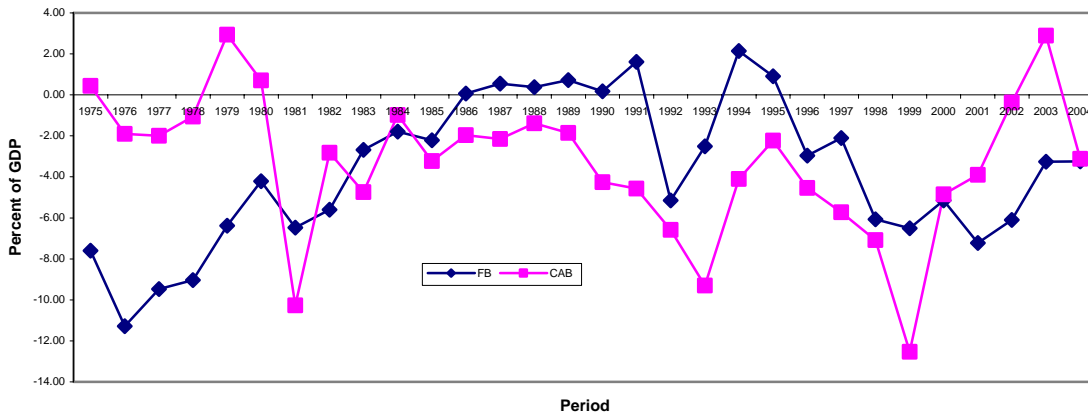
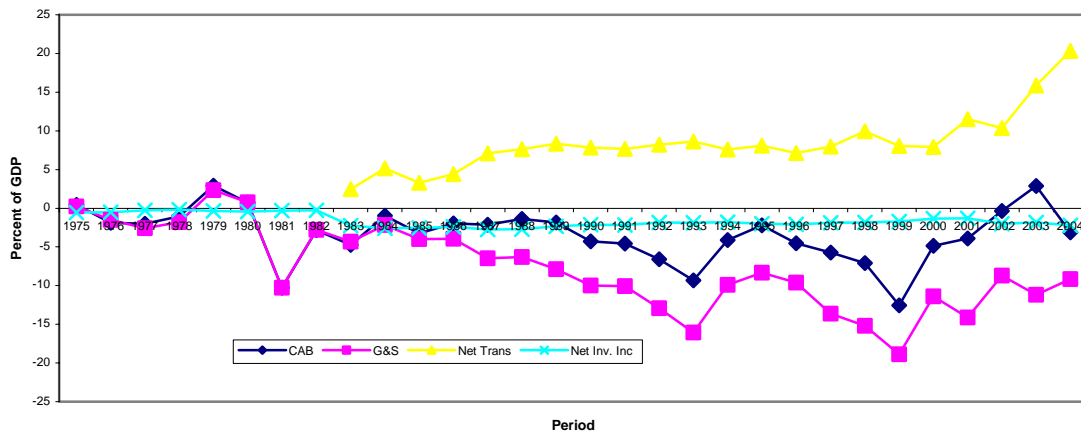


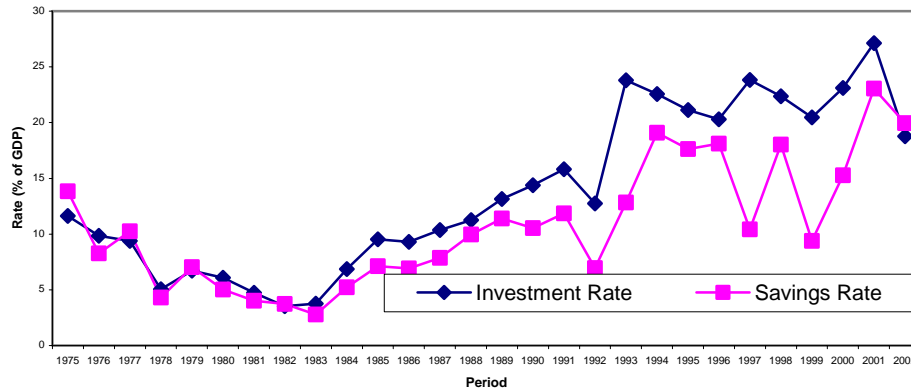
Chart 7: Ghana-Current Account and Principal Components



It is obvious from chart 6 that current account deficits have shared a stochastic trend with the level of public sector savings (measured as fiscal deficits). Deteriorating public savings, which is also reflected in national savings (see chart 8 below), have in most cases dictated the trend of current account deficits in Ghana, with turning points in

current account deficits dictated by public savings. This is an interesting development, as worsening public savings tend to lead worsening current account deficits. As explained earlier, if current account deficits emanate from fall in public savings and for that matter national savings, then that is troubling as it stands the chance of becoming endemic and making the current account deficit unsustainable. It is obvious from chart 8 that national savings have persistently lagged behind investment since 1983 and while investment is increasing on average, savings is falling, a clear sign that the consequent current account deficit is also driven by falling savings²⁴, bringing to the fore the unsustainability of the Ghanaian current account deficits over the period²⁵.

Chart 8: Ghana-Savings and Investment Rates



It is also obvious from the intertemporal model which assesses the extent of the deficit from the real sector of the economy. As noted in chart 2, the actual current account in Ghana has in most cases been above the optimal current account forecasted from the model. Given that the model tracks movements in the Ghanaian current accounts balances, we are convinced that the deviations measured gives a clear indication of persistent deficits in Ghana with brief episodes of actual being below optimal. It is however, concluded that over the period covered in this study, the deficit has been persistent and raises questions of unsustainability.

Looking at it from external liabilities dynamics, we also developed the accounting model which looked at the foreign debt consequences of current account deficits. It is obvious from chart 4 that the persistent current account deficit in Ghana has resulted in increasing foreign debt²⁶. This tallies very well with the available balance of payments (BOP) data for Ghana as the worst scenario was in 1999/2000 where we had the largest negative number and in practice had the largest deficit to GDP ratio (12.5%)²⁷. This obviously necessitated the adoption of the IMF/World Bank HIPC initiative which was unavoidable, an indication of insolvency due to problems with meeting debt repayment schedules. The obvious conclusion is that debt-creating financing of the deficit is not

²⁴ Rising investment is dominated by foreign capital inflows.

²⁵ Once again it is important to note that over the past three years or so that gap has started closing up, also due to increases in savings rate on the one hand and fall in investment rate on the other. The latter is not good though for the economy but the former is a welcome development.

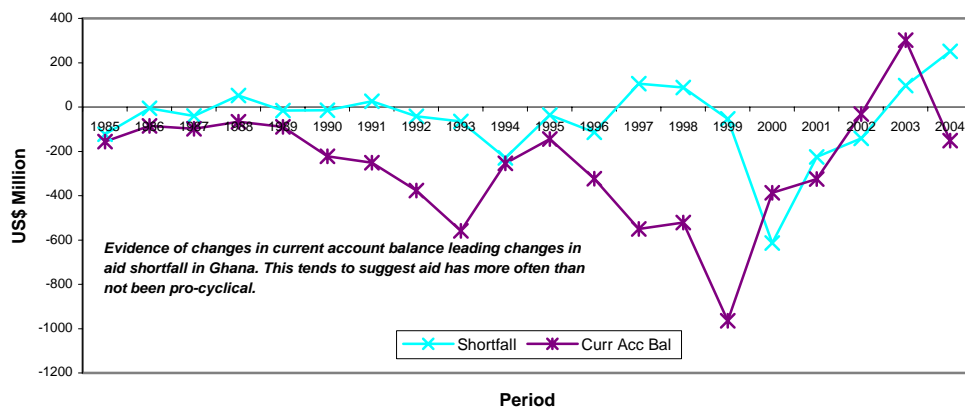
²⁶ As the model dictates that a negative sign implies the trade balance would lead to increases in foreign debt and thus a sign of unsustainability.

²⁷ This development necessitated the adoption of HIPC which was obviously unavoidable

compensated for by increasing growth, and thus a sign of unsustainability. It is clear that the situation has started improving starting from 2001.

Given that foreign capital inflows is very crucial in determining the sustainability of current account deficits, it is important to look at how capital inflows in general impact on Ghanaian current account deficits. From chart 7 above, it is obvious that net transfers of which remittances forms a greater percentage serves as a huge moderating factor in supporting the current account deficits in Ghana. While the pro-cyclical nature of aid inflows and it being highly volatile engender the sustainability of the deficit, remittances are seen to be relatively stable and using that as a pivot of current account dynamics in Ghana has the potential of improving upon its degree of sustainability. As demonstrated in chart 9 below, aid shock (volatility) has influenced the extent of current account deficit in Ghana (see Addison and Opoku-Afari, 2005 for details).

Chart 9: Aid Shortfall (Shock) and Current Account Balance

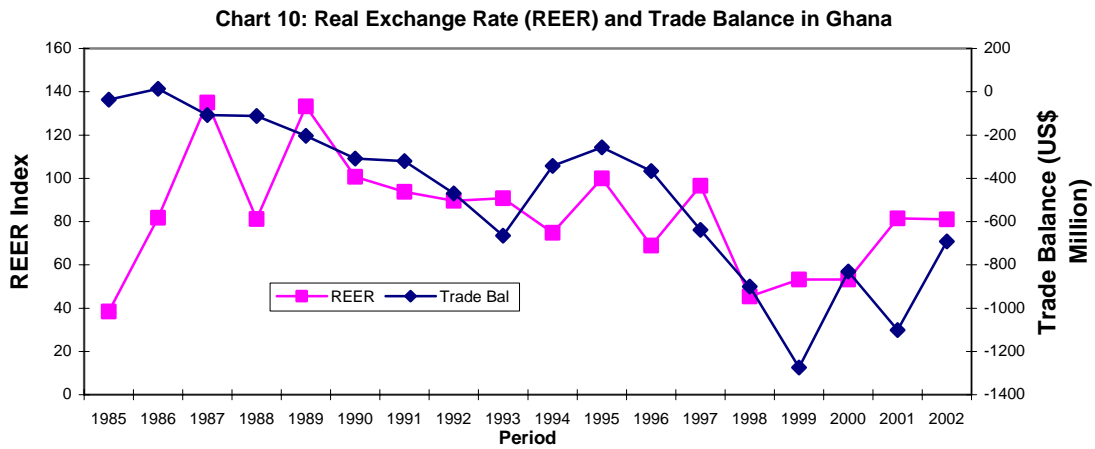


One easily observes two periods representing an internal shock (aftermath of democratization and the wait and see attitude of donors) and severe terms of trade shock in 1999. The first shock is a result of high cost of democratization which came along with significant falls in donor inflows (aid shock) due to the “wait and see” attitude of development partners as that was the first democratic elections after a long period of military rule and observers were not sure what the outcome was going to be given the instability of the sub-region. This obviously slowed down the economy and resulted in high fiscal deficits as a way of closing the gap. The second shock represents a terms of trade shock, as Ghana’s major exports cocoa and gold suffered a sharp fall in world prices in addition to rising crude oil prices on the international market. This terms of trade shock was further aggravated by an “aid shock”²⁸ forcing the government to once again rely on domestic borrowing to accommodate the gap (indicated by high domestic borrowing to GDP ratio over that period).

These two episodes underscores how unsustainable a current account deficit pivoted on aid inflows and fragile trade balances could be. It is clear from the above that a more structural change in favour of trade balanced based on diversified exports to alter the current composition of GDP is more favourable to the current dependence on primary commodities which makes the trade gains rather susceptible to international market developments of which Ghana has very little (if no) control.

²⁸ This is measured by the difference between projected and actual aid into Ghana.

It is generally expected that large capital inflows have the potential of causing real exchange rate appreciation. That is the downside risk of over depending on capital inflows to fill the current account deficit gap. The appreciation in real exchange rate could cause a loss of competitiveness²⁹ and further structural worsening of the trade balance, which in most developing economies tends to drive the current account deficit. Once the source of the trade deficit is structural, it is likely the ensuing current account deficit would be unsustainable. Roubini and Wachtel (1998) noted that although the cause of the current account deficit is due mainly to investment and savings gap, if it is accompanied by a real appreciation of the exchange rate, the deficit could become less sustainable³⁰. The obvious question is how has real exchange rate appreciation affected the current account balance dynamics in Ghana. As indicated in the plots in charts 10 and 11 below, movements in real exchange rate in Ghana have tracked and both trade balance and current account balance movements consistently. In both cases appreciating real exchange rate³¹ have consistently driven trade deficits and current account deficits. This period of appreciating real exchange rate coincide with periods of massive capital inflows into Ghana³² (period after the Structural Adjustment Programme in 1983)³³. This has consequently driven trade deficits, which in turn has driven current account deficits in Ghana.



Note: REER is defined in such a way that an upward movement denotes depreciation and a downward movement denotes appreciation

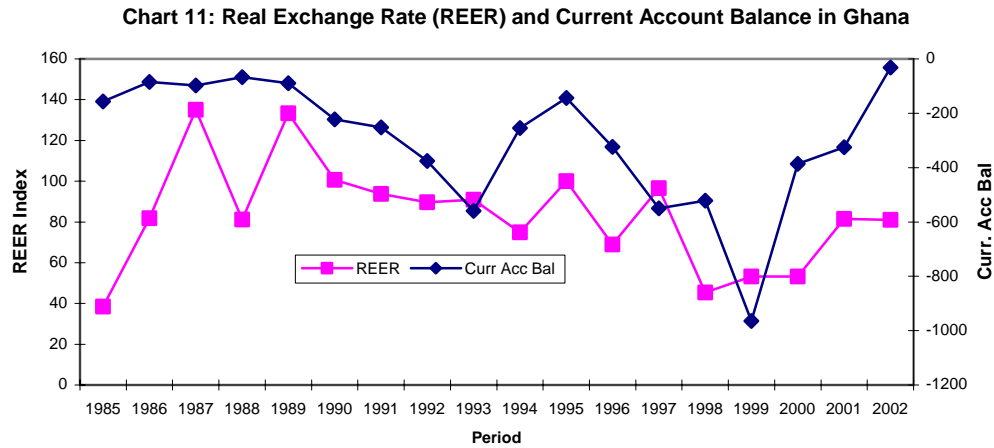
²⁹ See Opoku-Afari *et al* (2004) for detailed analysis of the role of capital inflows on real exchange rate appreciation and consequently loss of competitiveness.

³⁰ We note that not all real exchange rate appreciation could lead to current account deficit worsening as some real exchange rate appreciation would be in response to changing fundamentals and not necessarily misalignment.

³¹ Real exchange rate has been defined in such a way that downward movement represent appreciation and upward movements represent depreciation. See Opoku-Afari (2004) for derivation of Real Effective Exchange Rate for Ghana.

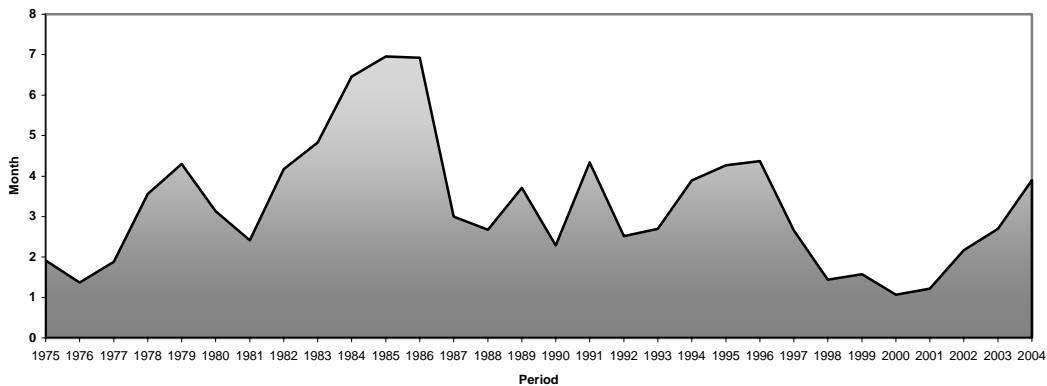
³² For detailed analysis of impact of Capital Inflows on real Exchange Rate in Ghana, see Opoku-Afari *et al* (2004)

³³ A perfect example of the impact of large capital inflows on real exchange rate appreciation.



Finally we look at the level of international reserves as another indicator of Ghana’s current account deficit sustainability. An increase level of international reserves ensures higher sustainability of the economy’s liabilities than a decreasing level of international reserves. It is not hard to see the deteriorating nature of international reserves as the Ghanaian economy recorded as low as less than a month’s imports by 1999/2000. However, the situation has improved significantly moving to about **4.0** months of imports which is considered close to the optimal level of **4.5** months of imports. Obviously, the improvement in the international reserves is not due mainly to trade gains as during this period of improvement the trade balance has rather worsened. It is not hard to see that the recent improvement in international reserves is mainly due to implicit savings from debt relief as well as increases in remittances. The latter is a welcome development and relatively stable but the former (implicit savings from debt relief) is unsustainable, raising doubts about the sustainability of current account deficits looked at from international reserves perspective.

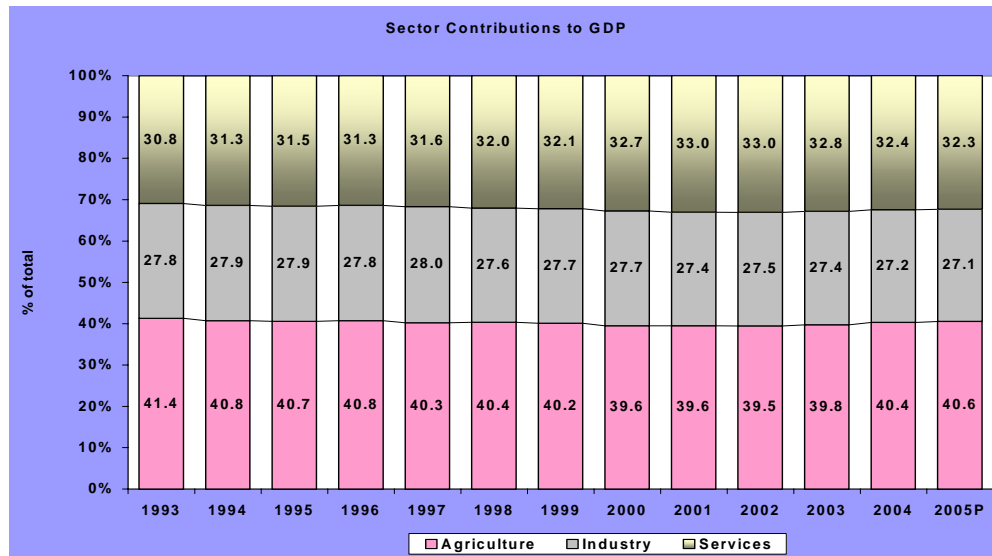
Chart 12: Ghana-International Reserves (in Months of Imports)



5. Suggestions for Improving Current Account Deficit Sustainability in Ghana

A number of important issues came up during the analysis above. It was obvious that the current account deficit in Ghana has been driven by a few fundamental structural problems. Important among them is the fact that the structure of the economy has virtually remained the same for the past two decades and over (see chart 13 below).

Chart 13: Sectoral Contribution to GDP Growth in Ghana



Source: Data obtained from Bank of Ghana and various issues of budget statements

This confirms that Ghana has been relying on the same sources of export revenues, as has been the case since independence. It is not surprising that trade deficits have driven current account deficits over the period making it evident the critical importance of trade in ensuring current account deficit sustainability. Thus we could confidently state that Ghanaian current account deficit sustainability in the long run is contingent upon trade deficit sustainability. This calls for a complete structural change in the Ghanaian economy, since the shorter route of reducing imports to make the trade deficit appear sustainable is not plausible. Inasmuch as capital goods and intermediate goods make up about 75 percent of total imports of goods and services, then one can say that the source of trade deficit unsustainability is from the export sub-component.

We are however not underplaying the potential of the economy’s ability to substitute import goods with similar quality of locally produced goods. As this has got to do with taste and generally taste changes slowly, we are proposing that a conscious effort is made to drive up exports to ensure sustainability of trade balance. This calls for measures to improve our competitiveness in the international market. Here, it is not only the policy measure of depreciating real exchange rate that would increase our competitiveness, but here are issues with access to international markets which is lacking in Ghana. This is a result of poor quality packaging of Ghanaian exports, as well as marketing strategies to penetrate foreign markets (starting from the sub-region). In short we say that export promotion with special emphasis on meeting international quality standards is a sure way of improving our trade balance in the long run and making it sustainable, as the pivot of the current account deficit would be gains from trade.

Secondly, it is believed that competitiveness of an economy depends to a large extent of the competitiveness of its firms and that also depend on stable macroeconomic conditions defining the general environment of economic activity in an economy. It is obvious from our analysis that most of the indicators even though worsened over the period, began to recover after 2000. That is not coincidental as this period also began the disinflationary process in Ghana underpinned by stable political environment, which are

all necessary ingredients for sustainability. What is needed in Ghana is to sustain gains made on the front of both political and macroeconomic stability and encouraging private sector participation. This would reduce public deficits (thus increase public savings) as well as increase private savings and from the real sector close the savings and investment gap, thus ensuring sustainability. The Ghanaian Government should however not relax on its policy objective of reducing public sector borrowing requirements and thus pushing interest rates down to crowd in the private sector through a reduction in cost of loanable funds.

Also remittances from Ghanaians abroad are gaining relevance over the past years as shown by chart 7. Since this is viewed as relatively more stable than aid inflows, efforts should be made to channel the greater percentage of these remittances outside the formal sector into the formal sector (it is estimated that about two-thirds of remittances into Ghana are through informal sectors)³⁴. This could be done by reducing both the implicit and explicit cost of remittances into Ghana both from within and from the sending point³⁵.

Last but not least is policy makers ability to manage the massive capital inflows in order not to harm the real sector as a result of real exchange rate appreciation since evidence from Ghana shows a close correlation between real exchange rate appreciation and trade deficit (see chart 10).

6. Conclusion

Using the various criteria for measuring sustainability of Ghana's current account deficit, we are able to conclude that Ghanaian current account deficit has been excessively high over the past decade peaking around 1999/2000 period. In addition to it being excessively high, it has been driven mainly by trade deficit emanating mainly from falling exports, underscoring the structural problems in the Ghanaian economy. One obvious conclusion is that whereas the macroeconomic policy indicators have improved, the real sector has not responded by way of the needed growth in both tradables and non-tradables.

The trade deficit driven current account deficit has been financed mainly by foreign capital inflows, which in the Ghanaian case has been shown to be highly volatile and pro-cyclical. This further makes the excessive deficit also fragile and dependent on aid inflows. The paper argues that a way forward is a complete structural change aimed at improving trade deficit, particularly export drive aimed at increasing access to international markets. This the paper argues is only possible through improvement in competitiveness through properly aligned real exchange rate as well as quality standards acceptable on the international markets. This in conjunction with improved local firm level competitiveness as a result of stable and enabling macroeconomic and political environment is the needed recipe for a structural change aimed at improving exports and correcting the worsening trade deficit driving the current account deficit. Ultimately, it would make current account deficits in Ghana relatively sustainable and not fragile (over-dependence on aid inflows).

³⁴ See Addison, 2004 for dynamics of remittances into Ghana.

³⁵ This has proved successful in Mexico as a result of Bilateral arrangements between Mexican Government and the American Government.

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APPENDIX 1

Inter-Temporal Model of Optimal Benchmark

Following the initial work of Obstfeld and Rogoff (1995), Inter-temporal Benchmark Models have been used widely to predict the optimal path of current account balances. The optimal path helps to assess whether a particular balance shares a stochastic trend with the underlying equilibrium or whether there is a huge deviation³⁶. Presented below is a brief overview of the inter-temporal model that yields the optimal current accounts balance.

Given a small open economy without liquidity constraints (ability to borrow and lend to smoothen out consumption), with an infinitely lived representative consumer exhibiting rational expectations and producing a single good, one can write the expected inter-temporal utility function as:

$$U = E_t \left\{ \sum_{t=r}^{\infty} \beta^{t-r} [U(C_t)] \right\}, \quad U'(C_t) > 0; \quad U''(C_t) < 0; \quad 0 < \beta < 1$$

subject to a budget constraint given as: (1.10)

$$\Delta b_{t+1} = r b_t - (y_t - c_t - i_t - g_t).$$

where β is the subjective discount factor; E is the expectation operator; $U(\cdot)$ represents the period or temporary utility function; and C_t represents the consumption of the single good in period t . In addition, b_t denotes the economy's stock of net foreign assets brought forward in period t ; y_t denotes real gross national income; i_t represents real investment; g_t denotes real government consumption and r_t is the interest rate on the economy's foreign debt (this is exogenously determined and assumed to be constant). Equation (1.10) is solved on the assumption that there are no *ponzi games* and the transversality conditions are all met.

Imposing the above assumptions on the budget constrain and optimizing the utility function subject to the revised budget constraint yields an optimal level of consumption (c_t^*) given as:

$$c_t^* = (r/\Theta) \left[-b + (1+r)^{-1} E_t \left(\sum_{j=0}^{\infty} (1+r)^{-j} z_{t+j} \right) \right] \quad (1.11)$$

where $\Theta = \frac{\beta r(1+r)}{\beta(1+r)^2} [\forall \Theta > 0]$, assuming a quadratic utility function, and $z_t = y_t - i_t - g_t$ represents the net national cashflow³⁷.

On the understanding that along the optimal path private consumption is driven mainly by net wealth which in turn is influenced by the present discounted value of the expected

³⁶ See Adedeji (2001), Hudson and Stennett (2003), Cashin and McDermott (1996) and Makrydakis (1999) for details.

³⁷ This is also interpreted as net private non-interest cashflow

future stream of cashflow and the stock of assets and/or liabilities, the optimal current account is given as:

$$ca_t^* = y_t - i_t - g_t - \Theta c_t^* \quad (1.12)$$

In this instance, the consumption equilibrating parameter (Θ) determines the current account levels consistent with fundamental national cashflows (that is long run trends of cashflows). This more or less denotes the adjustment parameter that moves the short run dynamics in consumption to be consistent with the long run equilibrium cashflow. As it stands, we can have three different scenarios, that is, where $\Theta = 1$, indicating that no adjustments in consumption ($\beta = 1/(1+r)$); $\Theta > 1$, a situation where the economy is tilting consumption towards the future ($\beta > 1/(1+r)$) and finally where $\Theta < 1$, a situation where the economy is tilting consumption towards the present (that is consuming more than equilibrium cashflow).

We assume that it is extremely difficult for consumption tilting parameter to be unity in developing economies. This is on the basis that intuition alone prescribes that there are a lot of cyclical movements in consumption in most developing countries. Following from this assumption, it would be erroneous to use the current account balance as it stands as consumption tilting has implications and could not be confused with consumption smoothing. To arrive at the optimal level of current accounts, one needs to detrend the current account series to ensure that the component of current account is consistent with those relating to consumption smoothing which is consistent with Hall's (1988) permanent income hypothesis. This would result in a stationary current account series which obviously has a lot of econometric advantages.

A few steps of algebra on the budget constraint and incorporating the results into equation (1.11) yields the consumption smoothing component of the current account given as:

$$ca_t^* = -E_t \left(\sum_{j=0}^{\infty} (1+r)^{-j} \Delta z_{t+j} \right) \quad (1.13)$$

We follow Campbell and Schiller (1987) to arrive at the consumption smoothing component of the current accounts. The basic insight of Campbell-Schiller's methodology is that as long as the information set used does not contain all the information available to private agents, then past values of current account contain information useful in constructing estimates of agents' expectations of future values of z .

Following this methodology and incorporating modifications by Ghosh and Ostry (1995), this requires one to estimate an unrestricted VAR of the form³⁸:

$$\begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} = \begin{bmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{bmatrix} \begin{bmatrix} \Delta z_{t-1} \\ CA_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (1.14)$$

where in this case CA_t is the detrended consumption smoothing current account balance.

³⁸ This can be generalized to a higher order in a straightforward extension.

According to Obstfeld and Rogoff (1994), to arrive at the estimated current account balance (\hat{CA}_t) we make use of the implications from equation (1.4) as:

$$E_t \begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} = \begin{bmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{bmatrix}^{t-\tau} \begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} \quad (1.15)$$

Given that I is an identity matrix and ψ the matrix of the φ 's, then we arrive at

$$\begin{aligned} \hat{CA}_t &= -[0 \quad 1] \left[(1+r)^{-1} \psi \right] \left[I - (1+r)^{-1} \psi \right]^{-1} \begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} \\ &\equiv [\phi_{\Delta z} \quad \phi_{CA}] \begin{bmatrix} \Delta z_t \\ CA_t \end{bmatrix} \end{aligned} \quad (1.16)$$

Appendix 2

Table 1: Test of Unit Roots

Variable	ADF	PP
CA^{sm}	-7.26	-18.54
z	-2.11	-2.11
Δz	-5.75	-5.68
c	-1.97	-1.97
Δc	-8.19	-9.15

NB: Critical values for both PP and ADF are -4.19* and -3.52** (** = 5% and *** = 1%)**

Table 2: Optimal Current Account Model for Ghana

	Δz	CA^{sm}
Δz	1	0
CA^{sm}	0	1
Δz_{t-1}	0.02 (0.12)	0.01 (0.08)
Δz_{t-2}	-0.03 (-0.19)	-0.06 (-0.71)
CA^{sm}_{t-1}	-0.51 (-2.08)	-0.37 (-2.32)
CA^{sm}_{t-2}	-0.69 (-2.02)	-0.32 (-1.98)
$Const$	-9.82 (-0.28)	0.06 (0.00)
Vector AR 1-2 Test $F(8,60)=0.84[0.57]$		
Vector Normality Test $\chi^2=7.25[0.08]$		

Table 3: Pairwise Granger Causality Tests³⁹

Null Hypothesis:	Obs	F-Statistic	Probability
CA^{sm} does not Granger Cause Δz	40	2.53173	0.09399
Δz does not Granger Cause CA^{sm}		0.26558	0.76829

³⁹ Using a lag length of 2.