Aid Reversals, Credibility, and Macroeconomic Policy

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1. Introduction

To absorb and spend the aid would appear to be the appropriate response under “normal” circumstances. (Berg et al., 2006, p.19)

Surprisingly, a full absorb-and-spend response is not observed in any of the sample countries. (Berg et al., 2006, p.36)

In all countries, part of the aid increment was lost through reductions in the rate of capital inflow. In Ghana, the deterioration in the non-aid capital account exceeded the entire increment in the aid inflow. In Tanzania and Uganda, the reduction in the rate of non-aid capital inflows was comparable to the aid surge. (Berg et al., 2006, p.28)

The G8 countries have pledged to dramatically increase aid to Sub-Saharan Africa in an effort to meet the Millennium Development Goals. It is not clear, however, that a big aid push is realistic. Seven country studies recently completed at the IMF (Berg et al., 2006) and the ODI (Foster and Killick, 2006) found that the current account deficit usually increases by less than half of the rise in aid flows and that aid surges often coincide with large capital outflows. These are disconcerting correlations. If the current account deficit does not increase by the same amount as aid, the transfer of real resources is incomplete. A substantial part of aid ends up financing capital flight or reserve accumulation instead of worthy projects.

The IMF contends that these problems stem from misguided macroeconomic policies. Absorption is too low because central banks are reluctant to sell aid dollars and let the exchange rate appreciate. Indirectly, low absorption is also the source of capital outflows: aid is tied to increases in government spending; but when absorption rises less than the fiscal deficit, the money supply increases and excess liquidity flows out through the capital account.

In this paper we put forward a different explanation for the stylized facts based on aid volatility and institutional constraints. Although aid reversals are common, political realities limit the use of reserve buffer stocks (Adam and Bevan, 2003; Eifert and Gelb, 2005). (Donors object to aid dollars sitting in a rainy-day fund; they want to see their money spent doing good.) Consequently, expenditure has to be cut or taxes increased when aid declines to a normal level. This is easier said than done. Typically the ends of resource and aid
booms witness large and persistent financing gaps as governments struggle to reverse prior spending commitments. The public has ample grounds therefore to fear that today’s aid boom threatens future fiscal stability.

The upshot of these considerations is that policy makers face a potential credibility problem. The Fund’s preferred strategy of spending all the aid and floating the exchange rate (the absorb-and-spend approach) works well when the public believes the aid surge is permanent. It is a recipe for disaster, however, when aid volatility and fiscal inertia undermine credibility. In the numerical simulations we report, the government is committed to a full absorption policy and all extra public sector spending is financed by the sale of aid dollars. Nevertheless, capital flight claims 30-70% of the aid inflow and inflation soars from 25% to 40-50%.

Since absorb and spend fails badly, we investigate a variety of other policies. Previewing the bottom line, successful intervention requires a policy package. The right strategy combines a critical minimum degree of fiscal restraint with reverse sterilization. During the low-credibility phase, the government uses part of the aid inflow (≈25%) to cut the fiscal deficit and pay down the internal debt. Crucially, the reverse sterilization component of the package buys extra time to adjust to future adverse aid shocks. If private sector expectations prove correct and the aid boom subsequently collapses, then the central bank sells the bonds it purchased earlier, maintaining control of money growth and inflation while the fiscal authorities take steps to realign spending with revenue. Thus the fiscal time bomb is no longer an inflation time bomb. The resulting shift from pessimistic to neutral expectations in the private sector repairs much of the damage done by the naive absorb-and-spend strategy: inflation stays below its previous level, capital outflows decrease 25-60%, and the absorption rate rises 20-30 points. Temporary fiscal restraint + reverse sterilization is not a perfect solution to the credibility problem; it does, however, go a long way toward making the problem manageable.

The rest of the paper is organized into five sections. In Sections 2 and 3 we develop an optimizing model of a small open economy and calibrate it to the data for Ghana, a country that has long been on the receiving end of volatile aid flows. Section 4 demonstrates that the Fund’s absorb-and-spend approach is good advice when the aid boom is expected to
be permanent but bad advice when it is expected to be temporary. Section 5 examines alternative policy responses to the credibility problem and Section 6 concludes.

2. The Benchmark Model

We extend the model in Bu\'ffi et al.(2006) to allow for temporary aid shocks and fiscal inertia. The specification of the real economy is primitive. Competitive firms produce a nontraded good and a composite traded good. Real output is fixed in both sectors, the exchange rate system is a pure float, and the world price of the traded good equals unity. On the financial side, the private sector divides its wealth between domestic currency $M$, foreign currency $F$, and government bonds $B$. Bonds are indexed to the price level $P$, so $B = Pb$, where $b \equiv B/P$. Other notational conventions are as follows: $C_i$ and $Q_i$ are consumption and output in sector $i$; $e$ is the nominal exchange rate; and $P_n$ and $E$ are the relative price of the nontraded good and aggregate real expenditure measured in dollars (i.e., units of the traded good).

Preferences and the Private Agent’s Optimization Problem

All economic decisions in the private sector are controlled by a representative agent who derives utility from consumption of traded and nontraded goods and from the liquidity services generated by holdings of domestic and foreign currency. To obtain concrete results, we assume preferences take the form

$$U = \int_0^\infty \left[ \frac{C(C_n, C_T)^{1-1/\tau}}{1 - 1/\tau} + h\phi(M/P, eF/P)^{1-1/\tau} \right] e^{-\rho t} dt,$$

where

$$C(C_n, C_T) = \left[ k_0 C_T^{(\beta-1)/\beta} + k_1 C_n^{(\beta-1)/\beta} \right]^{\beta/(\beta-1)},$$

$$\phi(M/P, eF/P) = \left[ k_2 (M/P)^{(\sigma-1)/\sigma} + k_3 (eF/P)^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)},$$

are linearly homogeneous CES aggregator functions; $h$ and $k_0 - k_3$ are constants; $\rho$ is the pure time preference rate; $\tau$ is the intertemporal elasticity of substitution; $\beta$ is the elasticity of substitution between traded and nontraded consumer goods; and $\sigma$ is the elasticity of substitution between domestic and foreign currency.
The private agent solves his optimization problem in two stages. In the first stage, \( C_n \) and \( C_T \) are chosen to maximize \( C(C_n, C_T) \) subject to the constraint \( P_n C_n + C_T = E \). The optimal choices \( \bar{C}_n \) and \( \bar{C}_T \) are subsumed in the indirect utility function

\[
V(P_n, E) = C[\bar{C}_n(P_n, E), \bar{C}_T(P_n, E)] = E/c(P_n),
\]

where

\[
c(P_n) = \left( k_o^\beta + k_1^\beta P_n^{1-\beta} \right)^{1/(1-\beta)}.
\]

As a byproduct of optimization, we get the solution for the exact consumer price index:

\[
P = ec(P_n).
\]

For future use, note also that

\[
\pi = \chi + \gamma \hat{P}/P_n, \tag{3}
\]

where \( \pi = \hat{P}/P \) is the inflation rate; \( \chi = \dot{e}/e \) is the rate of currency depreciation; and \( \gamma = k_1^\beta P_n^{1-\beta}/[k_o^\beta + k_1^\beta P_n^{1-\beta}] \) is the consumption share of the nontraded good.

In the second stage of optimization, the private agent chooses asset holdings and expenditure to maximize

\[
U = \int_0^\infty \left[ \frac{E^{1-1/\tau}}{1-1/\tau} + \frac{h \phi(m, F)^{1-1/\tau}}{1-1/\tau} \right] c(P_n)^{(1-\tau)/\tau} e^{-\rho t} dt, \tag{4}
\]

subject to the budget constraint

\[
\dot{A} = P_n Q_n + Q_T + cg + (r + \pi - \chi)(\underbrace{A - m - F}_{(P/e)b}) - E - \chi m. \tag{5}
\]

where \( m \equiv M/e \) and \( A \equiv m + (P/e)b + F \) are real money balances and wealth measured in dollars. In equation (5), \( (\pi - \chi)(A - m - F) \) is an artificial capital gains term. It shows up because the traded good is the numeraire but bonds are indexed to the price level.

The Maximum Principle furnishes the necessary conditions for an optimum. These consist of

\[
E^{-1/\tau} c(P_n)^{(1-\tau)/\tau} = \omega, \tag{6}
\]
\[
\begin{align*}
  h\phi(m,F)^{-1/\tau} \phi_m(m,F) &= E^{-1/\tau}(r + \pi), \quad (7) \\
  h\phi(m,F)^{-1/\tau} \phi_F(m,F) &= E^{-1/\tau}(r + \pi - \chi), \quad (8) \\
  \dot{\omega} &= \omega(\rho + \chi - r - \pi) \quad (9)
\end{align*}
\]

where \( \omega \) is the multiplier attached to (5). Equations (6)-(8) hold no surprises. As expected, the marginal utility of consumption equals the shadow price of wealth and the marginal rate of substitution between consumption and \( m \) or \( F \) equals the income foregone from holding that type of money. The co-state equation (9) may look less familiar, but it is nothing more than a standard Euler equation. Differentiate (6) with respect to time and substitute for \( \dot{\omega} \). This gives

\[
\frac{\dot{E}}{E} - \gamma \dot{P}_n/P_n = \tau(r - \rho),
\]

where the term on the left side is the percentage change in aggregate real consumption.

**The Nontradables Sector**

\( P_n \) adjusts to clear the goods market in the nontradables sector. This requires

\[
C_n = Q_n,
\]

where \( C_n \) is retrieved from the indirect utility function by invoking Roy’s Identity

\[
C_n = -\frac{\partial V}{\partial P_n} \frac{\partial V}{\partial E} = E \frac{k_1^\beta P_n^{-\beta}}{k_0^\beta + k_1^\beta P_n^{1-\beta}}.
\]

**The Public Sector Budget Constraint**

Money is injected into the economy when the central bank runs the printing press to finance the fiscal deficit of the central government. For now, we ignore bond sales and open market operations. The consolidated public sector budget constraint is thus

\[
\dot{m} = g + c(P_n)rb - X - \chi m,
\]

where \( X \) is sale of aid dollars net of government imports.
Net Foreign Asset Accumulation

Summing the private and public sector budget constraints produces the accounting identity that foreign asset accumulation equals national saving or the current account surplus:

$$\dot{F} = P_n Q_n + Q_T + X - E. \quad (14)$$

In a pure float, the government does not hold foreign exchange reserves. Since the overall balance of payments is zero, the capital account deficit equals the current account surplus inclusive of aid.

Temporary Aid Surges and Fiscal Inertia

Aid flows jump from $X_o$ to $X_1$ at $t = 0$. The extra money finances an equal increase in transfer payments to the “poor” (i.e., the representative agent):

$$g_1 = g_o + X_1 - X_o. \quad (15)$$

The private sector does not believe the aid boom will last. It forecasts a full reversal at year $T$ with probability one:

$$X(t)_{\text{forecast}} = \begin{cases} X_1 & \text{for } 0 < t < T \\ X_o & \text{for } t > T \end{cases} \quad (16)$$

When private expectations prove correct and the aid boom is short-lived, the government must either curtail expenditure or tolerate a higher fiscal deficit and higher inflation. We assume policy makers are averse to higher inflation but find it difficult to dismantle spending programs initiated during the boom phase. After the aid boom collapses, transfer payments decrease at the rate

$$\dot{g} = v(g_o - g), \quad t > T, \quad (17)$$

where $v > 0$ determines the degree of fiscal inertia.

In all variants of the model, the government wishes to spend as much of the extra aid as price and exchange rate stability permit. There are two ways to justify this assumption. First, the government may believe donors when they aver that this time the jump in aid flows will last forever and that the country should immediately start spending much more
on anti-poverty programs.\textsuperscript{1} Alternatively, policy makers may harbor the same doubts as the private sector but feel compelled to spend heavily lest donors “decide to reallocate the aid to a more eager recipient” (Berg et al., 2006, p.51). The external pressure to spend will usually be reinforced by strong internal pressures — every ministry and department has “great unmet needs” (Berg et al, 2006).

One final point. We have not taken a position on whether the aid boom is truly permanent because it is not necessary to do so. The path the economy follows in the period \((0,T)\) depends only on private sector beliefs about what will happen at and after \(T\). The private sector may well be too pessimistic: in reality, the aid surge may be permanent or fiscal inertia may be less of a problem than expected. But this is not learned until \(T\) arrives. Regardless of what the future brings, the challenge for the government is to find a policy package that allows it to spend a large fraction of the aid without suffering adverse side effects.

To save space, we proceed directly to calibration of the model. A longer version of the paper (available upon request) describes the procedure used to solve for the economy’s equilibrium path.

3. Model Calibration

Ghana is a good example of a country that may soon face the problem of managing a non-credible aid boom. Starting in 2008, aid to the country is supposed to double for 15-20 years as part of the campaign to meet the Millenium Development Goals. But it is doubtful that donors’ pledge to sustain a massive increase in aid is credible to the Ghanaian public.\textsuperscript{2} For the past twenty years, aid flows have been extremely volatile. As recently as 2002, aid plunged 8\% of GDP.

Table 1 lists the parameter values used to calibrate the model. \(m_o, \pi_o, b_o, \gamma_o\) and \(X_o\) are close to the values seen in Ghana in 2003. Data for Ghana also informs our choices (albeit more loosely) for \(\rho, \psi\) and \(F_o\), but the values for the deep parameters \(\beta, \sigma\) and \(\tau\), are guesses based on econometric estimates for other LDCs. Below we comment briefly on the rationales for the numbers assigned to these parameters and to \(\rho, \psi\) and \(F_o\):

- \textit{Elasticity of substitution in consumption between traded and nontraded consumer goods}
Fixing $\beta$ at .50 implies that the compensated elasticity of demand for the nontraded good is .25 initially. This agrees with the finding in empirical studies that compensated elasticities of demand tend to be small at high levels of aggregation.

- **Elasticity of substitution between domestic and foreign currency ($\sigma$).** There are no reliable estimates of $\sigma$ for Ghana or any other country in Africa. For Latin America the numbers range from 1.5 to 7. Not trusting the high-end estimates (7??), we decided to let $\sigma$ vary from .30 to 2. We include runs for $\sigma = .30$ — a value that is probably much too low — to make the point that the results are robust to the diffusion of priors across informed observers.

- **Time preference rate ($\rho$).** Across steady states, the real interest rate is fixed by the time preference rate. The value assigned to $\rho$ (8%) is slightly less than the average real rate paid by short-term treasury bills since 1992 (8.25% according to IMF 2003, p.66).

- **Elasticity of intertemporal substitution ($\tau$).** Most estimates for LDCs place $\tau$ between .10 and .50 (Agenor and Montiel, 1999, Table 12.1). Given that Ghana is one of the poorer LDCs, we set $\tau$ equal to .25.

- **Ratio of foreign currency to national income ($F_o$).** Foreign currency deposits in the domestic banking sector are 60% of reserve money in Ghana. This suggests $F_o = .06$, but the true value is higher because a good deal of foreign currency is held outside of the domestic banking system. We arbitrarily set $F_o$ at .15. This is in line with dollarization ratios in other parts of the Third World.

- **Degree of fiscal inertia ($v$).** All runs assume $v = 1$. This implies an intermediate degree of fiscal inertia: 87% of spending increases introduced during the aid boom are reversed within two years. The results with a low or high degree of fiscal inertia are qualitatively similar. Runs for these cases ($v = .50, 2$) are available from the authors upon request.

We chose units so that $P_{no} = E_o = 1$ and carried out simulations for the case where aid inflows increase by 3% of national income.

### 4. Aid Booms With and Without Credibility

Absorption depends on the response of the central bank . . . The combination of absorption and spending chosen by the authorities defines the macroeconomic response to aid. (International Monetary Fund, 2006, p.2)

The Fund uses a *spend and absorb* framework to classify macroeconomic responses to an aid boom. *Spend* is defined to be the increase in the primary fiscal deficit and *absorb* the increase in the current account deficit, both measured as a percentage of the increase in aid. The Fund recommends that the central bank sell all the aid dollars and that the central government spend all the counterpart funds (i.e., the domestic currency proceeds of
the aid).\textsuperscript{3} It calls this the *absorb and spend* approach. *Absorb* is treated as a policy variable on the assumption that aggregate absorption is determined by the central bank’s willingness to sell aid dollars. This is a considerable stretch, if not altogether wrong. Since the current account depends on how private sector spending responds to the aid inflow, absorption is an endogenous variable, not a policy instrument.\textsuperscript{4} At the risk of violating the Fund’s property rights, we relabel their approach *float and full spend* (FFS hereafter).

In this section we conduct a counterfactual exercise to test the sensitivity of the Fund’s FFS strategy to credibility of the aid boom. The numerical simulations track the paths of inflation, the real exchange rate ($1/P_n$), the current account surplus inclusive of aid, and private capital flows. Since the goal is to find a policy package that steers the economy safely through the low-credibility period, we report results only up to year $T$; the period after $T$ is not of interest *per se*.

### 4.1 FFS With Full Credibility

Table 2 shows the outcome when the aid boom is permanent. The increase in expenditure raises the demand for nontraded goods and real money balances. Across steady states, this causes the real exchange rate to appreciate 11\% and the inflation rate to fall 2-3 percentage points. Lower inflation and higher expenditure exert conflicting effects on the demand for foreign currency. The two effects cancel out when domestic and foreign currency are close substitutes ($\sigma = 2$). In the other cases, the expenditure effect dominates and capital outflows cumulate to 1.1-1.4\% of GDP.

Consistent with the Fund view, adjustment is smooth and problem-free in this scenario. The real exchange rate appreciates immediately by 9-11\%. Aside from this necessary real adjustment, the aid shock is absorbed without macroeconomic volatility. Details differ depending on the value assigned to the currency substitution parameter $\sigma$, but the story is essentially the same in each case. At $t = 0$ both the inflation rate and the price level fall, as appreciation of the exchange rate and lower prices for traded goods more than offset upward pressure on nontraded goods prices. Private capital flows are small and the transfer of real resources occurs quickly: in the low currency substitution runs, the absorption rate rises from 84-89\% in the first year to 90-96\% in the second and third years; in the high currency substitution run, it is 100\% from the outset.\textsuperscript{5}
4.2 FFS Without Credibility

Over the medium and longer term, once a government scales up its expenditure program in response to more foreign aid, it faces the challenge of how to finance these programs if the new aid isn’t sustained by donors . . . Such obligations are not easily shed or reduced . . . If governments are not able to reduce expenditures . . . budgetary policy pressures may jeopardize the macroeconomic policy framework. (Heller, 2005, p.12)

Credibility is the Achilles’ heel of the FFS strategy. In Table 3 the aid surge is expected to last three years and retrenchment of spending in the post-boom period takes two years. The public now anticipates an aid collapse and a subsequent transitory phase of high fiscal deficits and high inflation. Naturally, this creates inflationary pressures during the boom period by reducing money demand. In the run for $\sigma = .30$, money demand is insensitive to its future return and inflation does not explode until the middle of year three when the aid collapse and fiscal instability are imminent. With a moderate or high degree of currency substitution, inflation increases earlier and much more: in the panel for $\sigma = 2$, inflation is 50-90% higher over the entire low-credibility period.6 Observe also that private capital outflows are very large and that absorption is far less than 100%. For $\sigma = .30 - .75$, the private sector spends only 50-70% of aid-generated income; this figure drops to 35% when domestic and foreign currency are close substitutes. Disturbingly, in a pure float, the flip side of low absorption and large current account surpluses (inclusive of aid) has to be extensive capital flight. In the worst-case scenario where $\sigma = 2$, 65% of aid is wasted in paying for capital flight. Not all of this is the fault of FFS. Some worsening in the capital account is unavoidable because the private sector saves to smooth the impact of the aid shock (perceived as temporary) on consumption. But the pure saving motive accounts for only 36% of the outflows.7 The rest — which is the fault of FFS — reflects the public’s desire to amass foreign currency as a hedge against inflation.

It would be easy to read these results as supporting the Fund’s contention that spending in excess of absorption fuels higher inflation and capital flight. The right conclusion, however, is quite different. The Fund’s conceptual framework and its interpretation of the empirical evidence rest on the dubious premises that (i) absorption is a policy variable and (ii) the money supply increases ex ante when the central bank does not allow absorption to rise
by the same amount as the fiscal deficit. Neither premise is valid in our model. There is
no increase in the money supply, ex ante or ex post, and absorption is endogenous because
foreign currency is a vehicle for private saving. The government aims for full absorption,
but this is not feasible when the private sector fears that the current aid boom portends
future fiscal and monetary instability. In Table 3, low absorption, capital flight, and high
inflation are symptoms of an unsolved credibility problem. Bad policy is not to blame.

5. Policy Options

The default policy, FFS, fares poorly when the aid boom is not credible. This raises the
question of whether other policies do better. Accordingly, we move on to examine tight
money, temporary fiscal restraint, and policy packages that combine modest fiscal restraint
with reverse sterilization. This list is not exhaustive but it includes a policy package that
wins the battle against weak credibility.\(^8\)

5.1 Tight Money

Weak credibility stokes inflationary pressure by depressing money demand. In this section,
the central bank reacts by selling securities to reduce money growth:

\[
\dot{b} = \alpha [b(t) - b_0], \quad \alpha > 0, \quad t < T. \tag{18}
\]

Let \(J \equiv b(0) - b_0\) denote bond sales at \(t = 0\). The path for \(b\) is then

\[
b(t) = b_0 + Je^{\alpha t}, \quad t < T. \tag{19}
\]

The values assigned to \(J\) and \(\alpha\) define the central bank’s tight money rule. We search over
these two parameters to find the policy rule that delivers the best results. This is not meant
to be realistic. It is rather a debating tactic: we want to demonstrate that tight money is
the wrong policy even under assumptions favorable to its success.

The introduction of bond sales alters a couple of equations in the model. During the
low-credibility period, part of the fiscal deficit is financed by issuing debt. The public sector
budget constraint changes to
\[
\dot{m} = g_1 + c(P_n)rb - X_1 - c(P_n)\alpha(b - b_o) - \chi m, \quad t < T.
\] (20)

After aid flows contract at \( T \), bond sales cease and the government reduces expenditure gradually to bring the fiscal deficit and inflation back to their original levels. This requires more fiscal adjustment than in the benchmark model. Transfer payments have to drop below \( g_o \) in order to offset higher interest payments on the internal debt:
\[
\dot{g} = v(\bar{g} - g), \quad v > 0,
\] (21)
where \( \bar{g} = g_o - \rho[b(T) - b_o] \).

Table 4 shows the limits of monetary policy acting on its own. Place this figure alongside Table 3, which provides the relevant counterfactuals. What stands out in the comparison is the remarkable similarity of the paths case-by-case, period-by-period. Tight money, in other words, is almost completely ineffective. There is only one achievement worthy of note. When \( \sigma = 2 \), the price level in the counterfactual jumps 11% at the start of the aid boom. In the run with tight money, the central bank eliminates the nasty spike by selling bonds equal to 1.2% of GDP at \( t = 0 \).

These results are not particularly surprising. Tight money tries to neutralize inflationary pressure and inhibit capital flight by aligning money growth with money demand. This is sensible, intuitive, and simplistic. Bond sales imply higher interest payments in the future and even larger fiscal deficits after the aid boom disappears. Viewed from this angle, the tight money strategy is ill-conceived; it slows money growth but exacerbates the credibility/fiscal inertia problem.

### 5.2 Temporary Fiscal Restraint

Under a policy of temporary fiscal restraint, the government spends less than 100% of the extra aid while credibility is low. That is
\[
g_1 = g_o + \psi(X_1 - X_o), \quad 0 < \psi < 1, \quad t < T.
\] (22)

The primary fiscal deficit decreases by \((1 - \psi)(X_1 - X_o)\), the portion of aid not spent. This
reduces money growth without compounding the difficulties of fiscal retrenchment when and if the aid boom collapses. In fact, since spending increases less during the boom phase, adjustment to a future negative aid shock is easier than in the counterfactual scenario.

This sounds nice, but there is a catch. Aid donors want to fund anti-poverty programs; they are not in the business of providing budget support. The critical issue therefore is whether temporary fiscal restraint preserves macroeconomic stability when the government spends enough to satisfy the donor community.

The answer in Table 5 is discouraging. Fiscal restraint helps, but only for a few years. For $\psi = .75$, there is not enough restraint to sustain aborption and inhibit capital outflows after year one or to stop inflation from rising to 34-38% in year three. Moreover, temporary control of inflation control is achieved by importing a new problem. Battered by incipient capital inflows, the nominal exchange rate appreciates 13-15% at $t = 0$. Consequently, to keep demand equal to supply, the nominal price of the nontraded has to decrease immediately by 5-7%. This a bit far-fetched. If prices are not exceptionally flexible in the downward direction, adjustment will be accompanied by a demand-switching recession in the nontradables sector (Buffie et al., 2004). Imposing more fiscal restraint makes the problem even worse. When 50% of aid is diverted to budget support, the nominal exchange rate depreciates 20-40% and the market-clearing price of the nontraded good declines 13-28% at $t = 0$.

5.3 Reverse Sterilization + Temporary Fiscal Restraint

Allocating 25-50% of aid flows to budget support causes excessive appreciation of the nominal exchange rate in the short run and fails to prevent higher inflation in the third year. This suggests that fiscal restraint combined with purchases of domestic debt will produce better paths for both the exchange rate and inflation. At $t = 0$, the central bank stabilizes the nominal exchange rate by purchasing bonds and pumping money into the economy. The initial purchase is followed either by further purchases or small sales, so the stock of internal debt is lower at the beginning of year four when all uncertainty is resolved. If aid falls, the central bank sells the bonds it purchased earlier to keep a firm grip on money growth during the difficult period of fiscal retrenchment. The logic behind the strategy is to attack the credibility problem at its source: paying down the internal debt mitigates inflationary
pressure during the boom phase by creating the perception that future money growth and inflation will remain low even if current high aid flows prove temporary.

For this variant of the model,

\[
g_1 = g_o + \psi(X_1 - X_o), \quad 0 < \psi < 1, \quad t < T, \quad (22)
\]

\[
\dot{b} = \alpha[b(t) - b_o], \quad \alpha > 0, \quad t < T, \quad (23)
\]

\[
b(t) = b_o + Je^{\alpha t}, \quad J < 0, \quad t < T, \quad (24)
\]

\[
\dot{m} = g_1 + c(P_n)rb - X_1 - c(P_n)\alpha(b - b_o) - \chi m, \quad t < T, \quad (25)
\]

\[
\dot{b} = \delta(b_o - b), \quad \delta > 0, \quad t > T, \quad (26)
\]

\[
\dot{m} = g + c(P_n)rb - X_o - c(P_n)\delta(b_o - b) - \chi m, \quad t > T. \quad (27)
\]

Reverse sterilization changes \( J \) in (24) from a positive to a negative number. In equations (26) and (27), the parameter \( \delta \) determines how fast the central bank sells bonds in an effort to prevent larger fiscal deficits from increasing money growth during the retrenchment phase. As in the simulations of tight money, the values for \( \alpha, J \) and \( \delta \) were chosen through a trial-and-error search for a good macroeconomic outcome.

This strategy works splendidly. In Table 6 the government spends 75% of the extra aid and central bank purchases of internal debt range from 1.8-4% of GDP. Thanks to the reverse sterilization component, the government can spend more of the aid money — the real objective — without running into macroeconomic problems during the low-credibility phase. Inflation stays below 16%, the initial jump in the CPI is negligible, and appreciation of the nominal exchange rate at \( t = 0 \) is reduced to 4.2-7.4%. Moreover, price and exchange rate stability promote absorption by lessening the incentives for capital flight. This effect is quantitatively substantial, assuming the currency substitution parameter is not unusually small. In the runs for \( \sigma = .75 - 2 \), the average absorption rate is a respectable 67-74%. By contrast, it is only 36-55% in the counterfactual (panels for \( \sigma = .75, 2 \) in Table 3).
6. Concluding Remarks

Aid flows are highly volatile. This would not be a source of macroeconomic trouble if donors were amenable to full-fledged buffer stock schemes or if African governments could quickly reduce spending when aid flows contract. More often than not, however, donors insist that aid be spent right away. When prior spending commitments are hard to reverse, the recipient country then faces a potentially serious credibility problem. If the public fears that the aid boom might be temporary, it also fears that the future might bring a period of large fiscal deficits and high inflation while the government struggles to curtail expenditure. According to our numerical simulations, the fear of a contingent fiscal time bomb leads to high inflation, capital outflows, and current account surpluses (inclusive of aid) during the aid boom. This is consistent with patterns in the data and with the general reluctance of governments in SSA to spend 100% of higher aid flows.

We investigated various policy responses to the credibility problem. Tight monetary policy and fiscal restraint are ineffective as they do nothing to counteract the fear that a sudden decline in aid flows will be inflationary. The right strategy is to dedicate a small fraction of aid (20-25%) to deficit reduction supported by purchases of internal debt. This policy package creates a financial cushion that enables the government to control money growth when aid flows contract and the fiscal deficit rises. Inflation stays low during the aid boom because the fiscal time bomb is no longer an inflation time bomb.
1. African governments are under pressure to act as if they believe that the G-8 commitment to double aid flows is firm: “Countries are being urged mount ambitious spending programs to achieve the MDGs, and to be more optimistic with respect to their medium-term spending programs than would seem warranted by immediate aid commitments (given that few donors are able to make long-term aid commitments).” (Heller et al., 2006, pp.1-2)

2. Foster and Killick (2006, p.1) observe that “The current donor promise to increase aid for the MDGs and sustain it thereafter would, if implemented, represent a sharp break from past experiences.”

3. In high-inflation economies, the Fund also endorses an absorb and partial spend approach in which part of the extra aid is used to reduce domestic financing of the fiscal deficit.

4. When the exchange rate floats and the capital account is closed, the trade deficit equals sales of foreign exchange by the central bank as assumed in the Fund’s absorb and spend framework (Mirzoev, 2006). This is a special and unrealistic case, however.

5. Since the integral of the current account surplus over the year equals the increase in holdings of foreign currency, the annual absorption rate is measured by $1 - [F(t) - F(t - 1)]/.03$. (National income equals unity initially, so the absolute increase in aid is .03.)

6. The inflation rate increases much more than twelve percentage points at $t = 0$ because there is a huge spike in the price level at the start of the aid boom. ($P$ jumps 10.8% at $t = 0$.)

7. The outflows attributable to the pure saving motive can be approximated by the solution in a run where $\sigma$ is close to zero. For $\sigma = .05$, $F$ increases by .0214. This value is 36% of the figure for private capital outflows reported in Table 3.

8. Heller et al.(2006) recognize the fiscal credibility problem. This section can be viewed as a response to their appeal for analysis of “self-protection” policies that “use aid inflows in a way to increase the resilience of the economy in the event of future aid shortfalls . . .” (p21).
References


Table 1: Calibration of the model.

<table>
<thead>
<tr>
<th>Parameter/Variable</th>
<th>Assigned Value</th>
<th>Source¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserve money (m)</td>
<td>10% of GDP²</td>
<td>Ghana 2003: 10.2%.</td>
</tr>
<tr>
<td>Inflation ((\pi))</td>
<td>25%</td>
<td>Ghana 2003: 23.6 % for Dec.-Dec.; 26.7% = period average.</td>
</tr>
<tr>
<td>Stock of internal debt (b)</td>
<td>20% of GDP</td>
<td>Ghana 2003: 18.3% of GDP.³</td>
</tr>
<tr>
<td>Consumption share of nontraded good ((\gamma))</td>
<td>50%</td>
<td>Ghana 2003: 50.8% weight in CPI.⁴</td>
</tr>
<tr>
<td>Aid (X)</td>
<td>10% of GDP</td>
<td>Ghana 2003: 9.44% (World Development Indicators).⁵</td>
</tr>
<tr>
<td>Degree of fiscal inertial ((v))</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Time preference rate ((\rho))</td>
<td>8%</td>
<td>See discussion in text.</td>
</tr>
<tr>
<td>Foreign currency (F)</td>
<td>15% of GDP</td>
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<tr>
<td>Elasticity of substitution between traded and nontraded consumer goods ((\beta))</td>
<td>.50</td>
<td>Estimates for other LDCs. See discussion in text.</td>
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<tr>
<td>Elasticity of substitution between domestic and foreign currency ((\sigma))</td>
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<td>Intertemporal elasticity of substitution ((\tau))</td>
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¹ Data for Ghana are from IMF Country Reports 05/286 and 05/292.

² Average of beginning and end-of-year money stock divided by nominal GDP.

³ Does not include debt of state-owned enterprises.

⁴ Half of the weight for food plus the weights for rent, fuel and power, medical care and health, transport and communication, and recreation. The guesstimate that half of food consumption is nontradable is based on the findings in Adam and Bevan (2003).

⁵ Net official development assistance less the estimate of government imports reported in the IMF’s Ghana Statistical Appendix 2005.
Table 2: Transition path when the aid boom is permanent.*

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<td>-.001</td>
<td>-.001</td>
<td>-.001</td>
<td>-.001</td>
<td>-.002</td>
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* Notation: π, RER, CA and F stand for the inflation rate, the real exchange rate, the current account surplus as a percentage of GNP, and cumulative capital flows as a percentage of GNP. The initial values for the inflation rate, the real exchange rate, and the current account are 25%, 1, and 0.
Table 3: Transition path when the aid boom is temporary.*

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<th></th>
<th>$t = 0$</th>
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<td>.020</td>
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<td>.017</td>
<td></td>
</tr>
<tr>
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<td>0</td>
<td>.021</td>
<td>.040</td>
<td>.058</td>
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</tbody>
</table>

* 87% of spending increases introduced during the aid boom are reversed within two years. In the far right column, $e$, $P_n$, and $P$ refer to the nominal exchange rate, the nominal price of the nontraded good, and the price level.
Table 4: Transition path when a tight money policy is followed during the aid boom.*

<table>
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<th>$\tau = .25$ and $\sigma = .30$</th>
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</tr>
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<td>.014</td>
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</tr>
<tr>
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<table>
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<td>.32</td>
<td>.44</td>
<td>$e = -6.2$, $P_n = -.1$, $P = -3.2$</td>
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<td>.94</td>
<td>.94</td>
<td>.95</td>
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</tr>
<tr>
<td>CA</td>
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<td>.013</td>
<td>.015</td>
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<td>$F$</td>
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<table>
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<th>$t = 2$</th>
<th>$t = 3$</th>
<th>Percent change in e, $P_n$ and $P$ at $t = 0$</th>
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<tbody>
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<td>.42</td>
<td>.48</td>
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<td>0</td>
<td>.022</td>
<td>.041</td>
<td>.058</td>
<td></td>
</tr>
</tbody>
</table>

* Cumulative bond sales are 1% of initial GDP in the first panel, 1.8% in the second panel, and 2.2% in the third panel.
Table 5: Transition path when 75% of extra aid is spent.

<table>
<thead>
<tr>
<th>( \tau = .25 ) and ( \sigma = .30 )</th>
<th>( t = 0 )</th>
<th>( t = 1 )</th>
<th>( t = 2 )</th>
<th>( t = 3 )</th>
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</thead>
<tbody>
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<td>.16</td>
<td>.20</td>
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<td>( e = -12.8 ), ( P_n = -5.5 ), ( P = -9.2 )</td>
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<td>.93</td>
<td>.94</td>
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<td>.009</td>
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</table>

\[
\tau = .25 \text{ and } \sigma = .75
\]

<table>
<thead>
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<th>( t = 0 )</th>
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<th>( t = 2 )</th>
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<tr>
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\[
\tau = .25 \text{ and } \sigma = 2
\]

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<td>( \pi )</td>
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</table>
Table 6: Transition path when 75% of extra aid is spent, and the central bank buys back internal debt during the boom.*

<table>
<thead>
<tr>
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<tr>
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* Cumulative bond purchases are 1.8% of GDP in the first panel, 2.2% in the second, and 4% in the third. In the second and third panels, all bond purchases are made at $t = 0$. 
