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Financial Liberalization and Inflation Dynamics: Some Evidence From Zambia

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Abstract

Reforms which include liberalization of the foreign exchange system and domestic asset markets impose direct fiscal costs on governments which are net purchasers of foreign currency from the rest of the economy and net borrowers from the domestic financial system. However if the liberalization measures also induce private agents to reduce their holdings of domestic money in favour of foreign currency or other interest bearing domestic assets, equilibrium seigniorage for any rate of money supply growth will also fall, exacerbating the direct fiscal costs of liberalization. This paper presents an adaptive expectations model of the response to financial liberalization applied to Zambia. A number of countries, including Zambia, have responded to incipient hyperinflationary pressures by instituting cash-budget provisions which enforce a zero rate of growth of base money. This produces a rapid reduction in inflation expectations and a period of negative actual inflation, but at the cost forgoing seigniorage revenue altogether. The cash-budget is shown to be inferior to higher inflation equilibria available to the government.

1. Introduction

The outcome of orthodox programmes of macroeconomic adjustment depends crucially on the private sector's asset demand for money, its holdings of domestic money prior to the adjustment programme and its expectations concerning the credibility of reform. For example, in economies such as Uganda, where prior to liberalization all financial controls had been evaded and real money balances were virtually eliminated, the stock-adjustment costs of stabilization measures (for example devaluation) were relatively small for holders of money. Moreover, expectations were high that the reform programme would be carried through successfully, so that liberalization seems to have led to an increase in the demand for local currency. Inflation reduction was thus achievable at a relatively low cost in terms of fiscal contraction. In contrast, in economies where the initial money stock is high and where credibility is incomplete, the reverse outcome may prevail as the private sector seeks to reduce their holdings of money stock in response to stabilization and liberalization measures. This latter case seems to have occurred in Zambia during its protracted period of macroeconomic stabilization which began in 1985. Only since mid 1993 has the extreme inflation of the previous two years moderated, but at the cost of a severe contraction in private and fiscal expenditure. The move towards macroeconomic balance has been subject to dramatic reversals, particularly during the period from 1991 to 1993. During this time total government expenditure fell from 23.5% of GDP to 11.8% while the primary budget balance improved by 8% of GDP over the same period. Despite this dramatic and virtually unprecedented improvement in the government's fiscal position, domestic inflation continued to rise, from an average of 50% per annum in 1985-1990 to 170% per annum in 1990-1993 (see Figure 1).[1]

In this paper I present an explanation of the recent dynamics of inflation in Zambia in terms of the adverse fiscal effects of financial liberalization measures taken in 1992 and early 1993. During this period the liberalization measures not only had direct fiscal costs in their own right but by removing the controls which supported the real monetary base also

[1] Reserve money, the assets of the Bank of Zambia, consists of net foreign assets plus central bank domestic credit to government and the parastatal sector. Since the beginning of the current reform programme the government adopted first a crawling peg arrangement for the Kwacha and then from mid 1992 a clean float. As a consequence, the principal monetary emission has been through change in domestic credit.

served to reduce the demand for real Kwacha balances and thus the seigniorage revenue capacity of the economy.[2] The result was that the fiscal squeeze required to ensure non-inflationary domestic deficit financing was greater than would have been necessary in the absence of the liberalization. So severe has the required fiscal squeeze been, that to ensure domestic price stability the government has introduced a cash-budget in which domestic deficit financing has been eliminated and government expenditure has become the residual financing item in the government's budget. The principal argument advanced in this paper is that while there may be important political arguments for rapid liberalization - not least in the need for government to signal to the private sector and its external creditors its commitment to reform - if agents adapt their expectations adaptively, then premature financial liberalization of this form generates significant additional fiscal costs.

The paper begins by discussing in more detail the evolution of the Zambian stabilization programme. I then present a simple model, which is an extension of the Bruno and Fischer (1987) model of hyper-inflation, to describe the dynamic relationship between inflation, the money supply and the demand for money (Section 3). Next I provide some econometric evidence on the structure of the demand for money in Zambia up to the current reform programme. These results are then used to illustrate the actual inflation and seigniorage dynamics arising as a result of the financial liberalizations of 1992 (Section 5). Finally in Section 6 I draw some conclusions from the Zambian experience for other liberalizing economies.

2. The Rights Accumulation Programme 1991-1993

By 1989 the Zambian "own-grown" economic recovery programme, established in 1987 as an alternative to the IMF programme of 1985-87, collapsed and the government of President Kaunda once again embarked on an orthodox adjustment programme supported by the IMF

[2] Seigniorage is defined as the real revenue flow enjoyed by government as a result of the issue and subsequent taxation of the primary liabilities of government. Fischer (1982) estimates that seigniorage accounts for an average of 0.5% of GDP for developed economies; Adam *et al* (1993) estimate that steady-state seigniorage in Kenya and Ghana during the period from 1971-1990 averaged around 2.5% , although in periods of disequilibrium the seigniorage could rise to up to 10% of GDP. The definition used here ignores the implicit revenue accruing from the issue of interest-bearing debt for which the interest rate is held below prevailing world markets as a result of capital controls (see Giovannini and de Melo 1993).

and World Bank.[3] Adjustment efforts were inconclusive during most of the first two years of the programme, although some progress was registered in dismantling many of the domestic price controls which had evolved over the previous quarter century, and in the liberalization of the foreign exchange and payments system.[4] Central to the post-1989 adjustment programme was the Rights Accumulation Programme (RAP) which was a sub-component of the Economic Recovery Programme designed to allow Zambia an accelerated repayment of arrears to the IMF. The RAP consisted of a series of quarterly targets for domestic credit to government and reserve money as well as a series of financial and exchange rate liberalization measures. The RAP has become the centrepiece of the overall recovery programme and has dominated the process of stabilization in the Third Republic, with the donor community in particular viewing to the attainment of RAP targets as the principal indication of the Government of Zambia's commitment to the broader adjustment programme. However, following the election of the government of President Chiluba in October 1991, macroeconomic stability worsened rather than improved (see Figure 2), and the RAP targets have been repeatedly missed. A number of contributory factors can be identified. The first is the loss of fiscal control in the middle of 1991, caused in part by a cessation in donor disbursements prior to the elections in October but more so by a boom in domestic financing emanating from a pre-election wage commitments by the incumbent UNIP government. However, as the figure indicates, from the moment of taking office, the MMD government has presided over a consistent and strong reduction in domestic credit to government. In the first 12 months total domestic credit fell by approximately 50% in real terms, while in the most recent 6 months net domestic credit to government has disappeared. Nonetheless, since mid 1992, the rate of domestic inflation has increased markedly.

An explanation can be found in the relationship between inflation, seigniorage and premature financial liberalization. In the next section I shall formalize the argument, but first I provide an intuitive explanation of the process. The demand for real money by the private sector is a function of real income, the expected rate of return to holding domestic money and

[3] Bates and Collier (1993) provide a good overview of the evolution of the political and economic control regime of the Second Republic and an analysis of the ultimately unsuccessful liberalization efforts of 1985-87 which led directly to the introduction of the "own-grown" programme.

[4] This included the introduction of an Open General Licence system for merchandise imports (February 1990) financed through a second exchange rate window which was eventually unified with the first window in April 1991. Licensing was abolished in November 1990, and a 50% export proceeds retention system was introduced. Parallel to these reforms ran a programme of tariff harmonization.

the rate of return on holding alternative financial assets. During periods of low growth and high uncertainty, money demand will be dominated by asset-market considerations. Liberalization reforms which increase the expected rate of return on alternative assets and/or increase their liquidity will result in a substitution out of money. In the medium term, as reforms feed back into lower inflation and higher income growth, liberalization may be expected to increase the volume of seigniorage. But in the short run, particularly when income is constant and before stabilization has been achieved, the demand for money will be lower for greater degrees of financial liberalization and, by extension, the volume of seigniorage revenue earned at that income and inflation level will be lower. In the terminology adopted in the next section, this corresponds to a downward shift in the seigniorage laffer curve. If, before the liberalization, the economy is operating at a high inflation configuration, liberalization will sharply reduce the demand for money and without offsetting changes in the money supply will be manifest in rapidly rising inflation and a fall in seigniorage. Unless draconian fiscal adjustments can be made, hyper-inflation is inevitable. The costs of premature liberalization are thus potentially high.

Two major financial liberalization measures occurred in Zambia while the economy was operating at high inflation levels. The first was the liberalization of the current account. Following the expansion of the export retention scheme to permit 100% retention, the exchange system was unified through the legalization of the bureau de change market in September 1992, and the full unification of the official exchange rate with the bureau rate in December 1992. This reform had a direct fiscal cost in as much as central government was a net purchaser of foreign exchange from the non-government sector (including the copper industry) so that unification of the official with the bureau rate eliminated the implicit tax on foreign currency receipts from the private sector.[5] Moreover the liberalization effectively removed the cost of holding illegal currency balances as domestic residents could, *de facto,* maintain foreign currency accounts. Consequently the effective rate of return on foreign currency holdings increased for any given expected rate of depreciation.[6] Finally, though the

[5] According to Bank of Zambia figures, central government is currently a net seller of foreign exchange. However a large proportion of this is due to the receipt of official aid flows, a large component of which is remitted by government by way of debt service. Excluding aid-financed official debt service, the government is a net purchaser from the rest of the economy.

[6] Suppose the rate of return to holding foreign currency is $r = i\gamma$ where i is the explicit return to foreign currency balances (the expected depreciation of the Kwacha against the dollar) and γ is a measure of the "cost" of dealing illegally and where $\gamma < 1$. This may be thought of in terms of the cost of fines or simply general transactions costs of dealing covertly. Thus if liberalization is accompanied by legalization of the parallel market then $\gamma \rightarrow 1$ and the rate of return to foreign currency holdings increases for any given level of expected depreciation.

measures did not include the liberalization of capital account transactions *per se*, the operating procedures of the bureau market permitted some capital account transactions.[7]

The second measure was the liberalization of the domestic asset markets and consisted of the development of a market in government debt, stimulated by the introduction in January 1993 of a tender system for the issue of 28 day Treasury Bills. As with the foreign payments system, the rationale for liberalization accorded with the broadly orthodox view that efficiency gains will accrue with a move to market determination of prices (ie the exchange rate and interest rates). More specifically, by creating a price-setting mechanism in liquid assets the government was establishing the basis for the development of an inter-bank market for government debt. However, in the short run, until domestic stabilization has been achieved, the effects of the liberalization were counterproductive. In the first quarter of 1993 the real value of debt outstanding rose by 25% but over the same period the interest charges on government securities rose by 285% in real terms (Figure 3). Initially this increased domestic debt service was financed directly by capitalizing the interest, and the non-bank private sector rapidly increased its domestic debt holdings. However by May 1993 the private sector demand for bills had fallen sharply, reflecting in part the rise in commercial bank interest rates which reduced the net return on holding bills, and in part the satiation of the market for Bills. The Central Bank was consequently unable to sell the entire stock of debt at its weekly auctions, and hence interest charges were met directly out of domestic government revenue, increasing the 1993 estimate for domestic debt service from 2.8% of GDP to 3.9%, a rise of over 1% of GDP, equivalent to approximately 8% of total government expenditure. In common with the current account liberalization, this early liberalization had a second impact on the fiscal balance. Aside from the direct impact, the liberalization dramatically increased the rate of return on monetary substitutes and simultaneously increased their liquidity. This caused a reduction in the demand for money and therefore seigniorage capacity.

Why would the government have an incentive to accelerate these liberalization measures before macroeconomic stabilization has been achieved? In the model proposed below where the private sector responds solely to actual inflation-premature liberalization seems unambiguously costly. However perhaps more important to government is the

[7] Individuals are allowed to purchase up to $2,000 per day for "travel and services" against production of only minimal documentation. Evidence from the Bank of Zambia suggests that during the first six months of operation this window was used extensively to facilitate capital flight.

government's reputation in the eyes of the donor community. The events of the second half of the 1980s left the government with a very poor record of commitment to adjustment programmes. Given this poor reputation it would be natural for external observers to conclude that the lack of success in controlling the growth in reserve money and inflation in the period from 1989 to 1991 indicated a lack of commitment on the part of government - even regardless of whether the targets were feasible. Although *ex post* the fiscal outturns for 1991 and 1992 suggest that after accounting for exceptional drought-related expenditure the government was maintaining a very tight fiscal stance, this information was not observed as rapidly as reserve money and inflation. In the absence of other mechanisms to signal its commitment to reform, the government chose to accelerate the implementation of the other elements of the RAP - namely the liberalization measures - even though this distorted the logical sequence of reforms and imposed significant costs on the economy later in the stabilization process as it emerged that the private sector was adopting a more cautious adaptive response to government policy reforms.

3. A Dynamic Model of Inflation and Seigniorage

The model presented here illustrates the steady-state comparative statics of seigniorage and the dynamic adjustment occurring as a result of changes in the demand for money function following programmes of financial liberalization. The model is similar to that of Bruno and Fischer (1987) but, whereas they concentrate on the dynamics of the money supply given a fixed level of seigniorage, we extend the model to let seigniorage be endogenous. This allows us to examine the dynamics of seigniorage and inflation expectations given a fixed money supply growth. This positive closure also has normative implications for the money supply and fiscal policy. The model is cast in terms of an adaptive expectations framework in which agents respond only to the past outcomes. This mechanism obviously lacks realism particularly since it does not allow for expectations to adjust in response to policy announcements or to changes in agents perceptions of the credibility of the government. While this is an obvious weakness, it seems a fair approximation to recent history in Zambia where frequent policy reversals has meant that the private sector adjusts its behaviour less to

announcements than to actual outcomes. As we shall indicate, this structure does capture the principal features of inflation dynamics in Zambia.[8]

We start with the definition of seigniorage, for a constant level of real income, where a dot ($\dot{}$) denotes a time derivative and a hat (^) a proportional change,

$$S = \frac{\dot{M}}{P} = \frac{\dot{M}}{M}.\frac{M}{P} = \hat{M}.m \tag{1}$$

For convenience, note that

$$\hat{M}.m = (\hat{m}+\pi)m = \dot{m}+\pi m \tag{2}$$

Letting σ be the proportional growth in nominal money supply and noting that in the steady state $\sigma = \pi$ then the steady state seigniorage is given by the condition that $S^{SS} = \pi m$. Using (2) we note that this holds along the locus where $\dot{m} = 0$. I shall refer to this locus as the steady-state equilibrium seigniorage laffer curve (see equation (8) below).

The principal behavioural equations in the model are the demand for money (equation (3)) and the expectations mechanism (equation (4)). Elsewhere I have concentrated on an extended specification of the asset market determinants of the demand for money to consider the effect of differing degrees of proscription on the asset portfolio (see Adam, Ndulu and Sowa (1993)). I shall return to the more comprehensive specification of money demand below in considering the empirical evidence, but for exposition I employ the Cagan formulation of the demand for money of the form

[8] The obvious alternative treatment of expectations formation is to assume rational expectations.In principal this allows for the treatment of questions such as credibility. In fact, the rational expectations solution to the model presented here is not particularly illuminating in the case of the variable seigniorage case since the economy will always be on the steady-state equilibrium (but see Bruno and Fischer for the case where seigniorage is fixed and expectations are formed rationally). Ultimately, therefore, a hybrid approach which combines the process of learning by agents of the government's true commitment to deflation with signalling on the part of government would be a more appropriate structure for economies in transition such as Zambia (see for example Cuickerman and Liviatan (1992)).

(3) $$\frac{M}{P} = m = y\exp^{-\alpha\pi^*} \qquad \alpha>0$$

where y is a constant level of real income, π^* expected inflation and α the semi-elasticity of the demand for money. In this version of the model we assume that the money market is in equilibrium throughout. Expectations are formed adaptively as follows:

(4) $$\dot{\pi}^*=\beta(\pi-\pi^*)$$

where $0 < \beta < 1$ measures the speed of response. These three equations complete the model. The same basic structure can be obtained using a model which allows for a perfect foresight determination of inflation expectations but which allows for disequilibrium in the money market. This is the implicit framework used in the empirical model in Section 4. Taking the log of the demand for money function and then its time derivative, and noting that the time derivative of ln m is $\hat{m}$, and that the growth rate of income is zero. we can derive the following expression for inflation

(5) $$\begin{aligned} \ln m &= \ln y-\alpha\pi^* \\ \Rightarrow \quad \hat{m} &= -\alpha\dot{\pi}^* \\ \Rightarrow \quad \pi &= \hat{M} + \alpha\dot{\pi}^* \end{aligned}$$

Finally, using this expression we can solve for dynamic equations in expected inflation, π^* and the growth rate of nominal money $\hat{M} = \sigma$. By substituting (5) into (4) and re-arranging (1) and (3) we get the following pair of equations

(6) $$\dot{\pi}^* = \frac{\beta}{(1-\alpha\beta)}[\hat{M}-\pi^*]$$

and

(7) $$\hat{M} = \frac{S}{m} = \frac{S}{y}\exp^{\alpha\pi^*}$$

These two equations define the dynamics of the model. The steady state implies that $\sigma = \pi = \pi^*$ so that $\dot{\pi}^* = 0$, and thus

$$S^{ss} = \pi^* \, y \, \exp^{-\alpha\pi^*} \Big|_{\pi^* = \pi} \tag{8}$$

which has a slope $dS^{ss}/d\pi = (1-\alpha\pi)m$ and has a maximum where $\pi = \pi^* = 1/\alpha$. At the maximum point the value of seigniorage is $S^{ss}_{max} = (y/\alpha)\exp^{-1}$. In general there will exist either zero one or two equilibrium values of π which will generate a given level of seigniorage conditional on the demand for money function. Equilibrium levels of seigniorage revenue greater than S^{ss}_{max} are obviously not feasible.

The two equations (6) and (7) are, however, defined over three unknowns, S, $\hat{M}$ and π^*, and some arbitrary closure must be employed to solve the model. We consider two closure rules. The first is that adopted by Bruno and Fischer (1987) who close the model by examining the case where seigniorage is always honoured. The alternative case sets $\hat{M}$ as fixed to examine the model in terms of the evolution of seigniorage and inflation expectations.

Fixed seigniorage and endogenous money growth: Bruno and Fischer (1987)

The Bruno and Fischer closure entails the condition $S = S_0$ so that

$$\dot{\pi}^* = \frac{\beta}{(1-\alpha\beta)} \left[\frac{S_0}{y}\exp^{\alpha\pi^*} - \pi^*\right] \tag{9}$$

and

$$\hat{M} = \sigma = \frac{S_0}{m} = \frac{S_0}{y} \exp^{\alpha\pi^*} \tag{10}$$

Figures 4a and 4b, which are reproduced from Bruno and Fischer (1987), illustrate the results for the two cases of $\beta < 1/\alpha$ and $\beta > 1/\alpha$. In the former case when expectations adjust relatively slowly the low-inflation, high-money-balances equilibrium is stable, and the high-inflation, low-money-balances equilibrium is unstable. Thus if a shock results in the rate of

growth of nominal money exceeding the expected inflation rate the latter must rise to restore the required equilibrium level of seigniorage. However, since $\alpha < 1$ real money balances will fall by less than the rise in expected inflation and thus to maintain the level of seigniorage the rate of growth of money needs to rise by less than the rise in expected inflation. Conversely, when $(\sigma-\pi^{*}) < 0$ money growth must fall by less than the fall in expected inflation. This generates the direction of motion in figure 4a which in the case of the two-equilibrium seigniorage level S_1 implies that the economy converges to A, the low-inflation equilibrium. An important implication of this result is that for an economy which is initially at the high inflation steady-state, B, money supply shocks will be destabilizing as attempts to maintain S will be achieved only by accelerating money supply and inflation expectations (and thus actual inflation).

As Bruno and Fischer (1987) show, however, when the semi-elasticity of the demand for money is high, and/or the rate of expectations adjustment is high, the stability conditions will reverse. Thus when $\beta > 1/\alpha$ the high-inflation low-money-balances equilibrium becomes stable and the low-inflation equilibrium is unstable. Figure 4b illustrates the case, where the mechanism is as follows: if the rate of growth of money is 1% above expected inflation, expected inflation will rise initially by β%. Since $\alpha > 1/\beta$ seigniorage will fall by more than β%, and therefore S can be kept constant only if the rate of money growth also falls. Hence, the dynamics around the two equilibria are reversed.

It is clearly very important whether β is greater or less than $1/\alpha$. In his original 1956 paper Cagan suggests that across the range of countries he studied, β was less than $1/\alpha$, indicating that the hyper-inflations occurred in spite of stable expectations dynamics. As Cagan noted then, the dynamics of these hyper-inflationary process are clearly more interesting than hyper-inflations arising from unstable dynamic processes. Evidence from African economies would confirm this finding (see for example Adam *et al.*(1993) and Ndung'u (1993)).[9] The following discussion will therefore generally assume that expectations are stable.

[9] Values of α derived from empirical estimates of money demand typically lie between 0.8 and 1.5 for annual data. There are obviously no direct estimates of β, but indirect evidence from estimated inflation equations would suggest values in the region of 0.25 to 0.50.

We can summarise the results from the Bruno and Fischer model as follows:

Proposition 1 For any given level of seigniorage conditional on income and the real demand for money, there will be zero one or two inflation equilibria. In the general case of two equilibria there will be a low-inflation high money balances configuration and a high-inflation low money balances configuration yielding the same seigniorage.

Proposition 2 When seigniorage is pre-determined (ie it must be fully honoured), and when expectations are formed adaptively and adjustment is relatively slow (in the sense that $\beta < 1/\alpha$) the low-inflation equilibrium will be stable and the high inflation equilibrium will be unstable. When the rate of growth of money (and hence actual inflation) exceeds expected inflation, expected inflation will rise to offset the additional seigniorage flowing from the higher monetary growth, and vice versa.

Proposition 3. When the speed of adjustment of expectations is rapid (in the sense that $\beta > 1/\alpha$), the direction of motion switches with the high-inflation equilibrium becoming stable and the low inflation equilibrium unstable.

Variable Seigniorage and Exogenous Monetary Growth

Although the Bruno and Fischer model yields specific results in terms of the dynamics of money and inflation, it assumes that seigniorage is constant through time. This is clearly not the case in most economies where seigniorage varies, often quite dramatically. It may therefore be more useful to consider the case where seigniorage revenue is variable (ie endogenous) and the rate of growth of the money supply is exogenous. In this case we can consider the dynamics of the system in seigniorage, expected inflation space as shown in Figure 5, where SS is equation (8) and traces the locus of all values of equilibrium seigniorage for the condition $\dot{m}=0$, given (constant) income and the parameters of the demand for money function. Points A and B thus correspond to the low- and high-inflation equilibria from the previous section. If government has a utility function, U_g, which is increasing in seigniorage and non-increasing in expected inflation this will generate positively sloped government indifference curves in S,π^* space which will produce an optimal inflation rate of $\pi^{\cdot}$, lower than π^{max}.[10]

[10]A persistent question in this literature is why, given this utility function, the economy could ever settle at a position B rather than A? Sargent and Wallace (1981) and (1986) in similar rational expectations work use an arbitrary "sunspot equilibrium" to generate a series of stochastic events (the sunspots) which causes agents to move to the high-inflation equilibrium simply because agents believe that this equilibrium will prevail under those stochastic events.

Thus the dynamic equations under the variable seigniorage closure are given by the following equations for a given growth rate of the money supply σ

$$\dot{\pi}^* = \frac{\beta}{(1-\alpha\beta)} [\sigma - \pi^*] \tag{11}$$

and

$$S = \sigma\, y\, \exp^{-\alpha\pi^*} \tag{12}$$

Note first that there is only one differential process at work in this model, namely that for inflation expectations. Second, note also that whereas in the Bruno and Fischer closure there can be two steady state equilibria for any given level of seigniorage (one on either side of the maximum of the laffer curve), in the variable seigniorage case there can be only one unique steady state for each rate of growth of the money supply. The steady state is defined as the point where inflation expectations are not changing so that $\sigma = \pi = \pi^*$, and $S = S^{ss}$. This is shown as a vertical line in Figure 5, where point B represents the unique steady state defined on the rate of money growth σ_1.

The dynamics of this system around the $\dot{\pi}^* = 0$ locus are very simple. In the case of adaptive expectations which are sufficiently slow (in the sense that $\beta < 1/\alpha$), if expected inflation is above the rate of monetary growth, the expected inflation rate will decline, and vice versa. In other words, the equilibrium is stable. When expectations adjust rapidly ($\beta > 1/\alpha$) the converse holds. Equation (12) traces the dynamics of actual seigniorage for each level of real income in the same S,π^* space. The locus is downward sloping, asymptotic to zero in expected inflation and intercepting the y axis at $S=\sigma y$. The curve crosses the equilibrium laffer curve at the steady state equilibrium where $\sigma = \pi = \pi^*$. The S curve intersects the steady-state laffer curve only once and always from above, regardless of where

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Alternatively, the B equilibrium is consistent with a non-cooperative outcome in which the time-inconsistent incentives of government cause agents to anticipate and therefore validate the high-inflation outcome. This particular outcome is increasingly likely when the government's utility is not strongly decreasing in inflation so that the government optimum is close to the maximum of the laffer curve. If the top of the laffer curve is at all flat then government could easily find itself on the wrong side such as at B.

on the laffer curve the steady state is: both loci are asymptotic to the x axis.[11] Thus when adjustment is stable shocks which place the economy to the right of the steady state (ie when expected inflation exceeds the rate of growth of money) generate dynamics which takes inflation expectations back to equilibrium, along a rising seigniorage path. The adjustment locus is shown in Figure 5. Unlike under the Bruno and Fischer closure, the dynamics are not a function of where on the laffer curve the steady state is situated.

We can now consider the dynamics around the steady-state laffer curve. We consider a one-off shock (ie unanticipated) increase in the growth of the money supply, say emanating from a fiscal expansion. By equation (11) this will increase inflation above the expected inflation. Given that the private sector's demand for money is based on expected rather than actual inflation, any value of $\sigma > \pi^*$ will raise the instantaneous level of seigniorage and the economy will be above the equilibrium configuration outside the laffer curve. As expected, inflation rises the economy moves back towards the inflation equilibrium, but as long as $\sigma-\pi^*$ is positive seigniorage will be falling. The same reasoning operates within the laffer curve in response to negative shocks. Consequently the direction of motion from within the laffer curve is to the north-west, and outside the curve to the south-east, as illustrated. When the speed of adjustment rises so that $\beta > 1/\alpha$ the polarity reverses and hyper-inflationary and hyper-deflationary dynamics again emerge. For both positive and negative money supply shocks the dynamics of inflation and seigniorage are dominated by the expectations adjustment process and not by the growth in the money supply. Finally, notice what is happening to actual inflation in these cases. Inflation is given by equation (5) as a linear combination of a constant rate of growth of money and the rate of change of expected inflation

$$\pi = \sigma + \alpha\dot{\pi}^* \tag{13}$$

Thus when inflation expectations are rising, inflation exceeds the rate of money growth and *vice versa* for falling inflation expectations.

[11] The slope of the SS curve is $(1-\alpha\pi^*)m$ and that for the S curve is $-\alpha\sigma m$

We can again summarize these results as follows:

> ***Proposition 4.*** When seigniorage is endogenous (ie variable) the dynamic adjustment of the economy will be characterized by rising seigniorage and falling inflation when initially $\pi^* > \sigma$, and by falling seigniorage and rising inflation when $\pi^* < \sigma$ for relatively slow adjustment. When the speed of adjustment rises to the point that it is greater than the inverse of the semi-elasticity of the demand for money, the adjustment process switches direction.
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> ***Proposition 5.*** In the steady state actual inflation will equal the rate of growth of the money supply, but when the economy is not in a steady state, actual inflation will over (under) shoot money supply growth when inflation expectations are increasing (decreasing).

An important consequence of this result is that a deficit financed fiscal expansion engineered when the economy is operating above the revenue maximizing level will be self defeating. Seigniorage will initially jump, from point B to C, following the increased rate of growth of the money supply from σ_0 to σ_1 , but will decline towards a lower seigniorage, higher inflation equilibrium at D (see Figure 5).

Liberalization and the Laffer Curve

We can now translate these two general cases into the specific problem of the implications for fiscal policy of programmes of financial liberalization. Suppose the economy is initially in a phase where the income elasticity of the demand for money, α, is relatively low and the speed of adjustment is low enough so that $\beta<1/\alpha$. The economy would be at either point A or B in Figure 4a or Figure 5. We can envisage liberalization as having two effects: first, it lowers the average value of seigniorage at every point on the SS locus, and second it lowers the marginal seigniorage gain from a change in inflation. This occurs because of both the greater presence of alternative assets and also lower transactions costs. These effects are consistent with a rise in the value of α (and a concomitant fall in the value of $\pi^{max} = 1/\alpha$) and also with a rise in β. The result of the increase in α is a shift down and to the right of the laffer curve, as is shown in Figure 7. This will ensure that the original S_{max} and any previous value of seigniorage greater than the revised S_{max} will no longer be feasible, and that every remaining feasible deficit is sustainable at an inflation level higher than the previous low-

inflation equilibrium but lower than the high inflation equilibrium.[12] The increase in the value of β does not affect the shape or position of the laffer curve, but will rather affect the dynamic properties of the economy.

Responses to Liberalization

Consider the case where the economy is initially at the steady state configuration B with a money supply growth rate σ_1 and expectations formed adaptively and relatively slowly. This is a common position for economies to be in at the beginning of stabilization programmes. Following the liberalization the original configuration is no longer sustainable. We examine three cases.

The first is the "no-response" stance where the government may attempt to maintain the same level of seigniorage as before the liberalization. This may be the case when there are rigidifies in revenue and expenditure so that commitments must be honoured. This is the case discussed by Bruno Fischer model. The original configuration is now to the right of the new laffer curve and is in a disequilibrium position. This results in rapidly rising inflation expectations and rising inflation as indicated by a move to point C. The end result in this case is hyper-inflation with prices rising at an accelerating rate.

The second response is for seigniorage to drop instantaneously to the steady state level consistent with the new lower laffer curve given the current rate of growth of the money supply (a jump from B to B'). Since neither the rate of growth of money nor money demand adjusts (since expectations do not change) this adjustment occurs through a one-off jump in prices, instantaneously reducing the real level of seigniorage. Note that this requires that government can also adjust its expenditure (or raise revenue from other sources) instantly.

The third case - the one that has been followed in Zambia - describes the situation where prices do not adjust immediately, and therefore to avoid hyper-inflation and restore price stability, the government must move the economy below the new laffer and onto a convergent stable path back to a lower inflation equilibrium. Since there is an infinite number of convergent paths, in principal government need only choose the (lower) money supply growth rate that is consistent with the optimal inflation, seigniorage configuration on the new

[12] Note from (8), $dS^*_{max}/d\alpha = -\phi/\alpha^2$ where $\phi = c\exp^{-1}$

lower laffer curve. In the case illustrated in Figure 7 this would be achieved by setting the growth rate of money to σ^* and letting the economy converge to the point E. However, in practice, governments have not followed this strategy. Instead the option employed by both the governments of Zambia and Uganda has been to aim for exactly zero seigniorage through the institution of a cash budget which eliminates any growth in base money. This is equivalent to setting the $\dot{\pi}^* = 0$ locus at the origin. From (12), actual seigniorage jumps instantaneously to zero and remains at that level as inflation expectations converge to the origin.

Two important results emerge. The first concerns actual inflation. As we noted above actual inflation will be less than the growth in the money supply while expectations are falling. In this case since the growth rate of money is zero, prices will fall during this transition, before price stability is achieved, which is exactly the outturn in both Zambia and Uganda following the introduction of the cash budget. Second it is clear from the figure that the cash-budget solution is fiscally more expensive than if government could set the growth rate of money to σ^* which would be consistent with the optimal inflation-seigniorage equilibrium at E. In this model, where expectations are formed adaptively issues of credibility does not arise and therefore the cash-budget outturn is not optimal. Why it has been adopted, however, may be that the cash-budget represents a change in budgetary process rather than simply setting a low (or even zero) rate of growth for money. Given considerable uncertainty as to the exact location of the new steady-state seigniorage laffer curve, the cash-budget, zero-seigniorage outcome is thus a feasible if second-best solution. Again, however, in a model in which inflation expectations do include some learning and signalling the importance of the cash-budget as a strategy is more important as it may provide a strong government with an instrument to signal its commitment to a deflationary stance. Finally, if the process of liberalization combines increases in both β and α to the point that the polarity is reversed, then even the cash-budget will not bring price stability since if π^* is above σ even instantaneously, a hyper-inflationary path will develop.

4. Some Evidence on the Demand for Money in Zambia

We now illustrate these features by examining the demand for base money in Zambia. The results reported in this section summarize a much more extensive examination of the money demand process in Zambia (see Adam (1994)). We depart from the Cagan model used in the previous section to concentrate on a more detailed specification of the money demand structure which also allows for disequilibrium in the money market. The basic approach used here is to defined a generalized log linear model of the form

$$(13) \qquad (m-p) = m(\ (y-p),\ \pi^e,\ \Delta b^e)$$

where (m-p) is real base money in circulation, (y-p) real gross national income, π^e expected inflation, b^e the expected depreciation of the parallel market rate. The data are all taken from the IMF's International Financial Statistics with the exception of the parallel market exchange rate which is from Picks' Currency yearbook. Real gross national income has been interpolated from annual to quarterly data using the method described in Adam *et al* (1993). Table 1 reports Dickey-Fuller and Durbin Watson tests against the null that the series are non-stationary with a drift. The results indicate that the variables are generally non-stationary over the full sample period, but that the first differences are stationary. There is a slight ambiguity concerning the order of integration of the parallel market exchange rate but we proceed by assuming that the null of non-stationarity of Δb cannot be conclusively rejected. Thus we assume that both prices and the parallel market rate are I(2) so that the vector elements in (13) are probably distributed individually I(1).[13] Evidence form elsewhere (see Adam *et al* (1993)) suggests that an error-correction structure may then provide a valid characterization of the data. To examine this possibility we must test for cointegration between the variables in (13) which can be done using the Johansen procedure (1992) to estimate an error correction, I(1) VAR of the form

[13] It is unclear whether the aggregate data are best described as genuinely I(1) series or trend stationary (see Perron (1989)). This issue is examined in some detail in Adam (1994) .

(14) $$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{k-1} \Delta X_{t-k-1} + \Pi X_{t-k} + \epsilon_t$$

The parameter vector Π contains the information on the long-run cointegrating relationships within the VAR, and is summarised in Table 2.

The estimation of (14) presents a number of difficulties. Aside from measurement error problems - which are particularly severe in the data for inflation which for substantial period recorded controlled rather than official prices - the main problem concerns the structural break in the underlying behavioural model. The cointegration/error correction approach implicitly assumes an adjustment process which is adaptive so that real money balances adjust to correct the error in the previous periods outturn relative to the long-run trajectory for money demand. However, as we shall indicate below the data suggest that the long-run demand function, which we have argued above corresponds to the seigniorage laffer curve, is not constant. Rather, since the country embarked on the first IMF liberalization programme and the introduction of the "own-grown" programme from 1987 to 1989, the long-run relationship has begun to break down. This is consistent with our theoretical model, which anticipates a downward shift in the laffer curve. Given that the structural break occurs late in the sample, the data are not extensive enough to estimate the new equilibrium laffer curve accurately since the economy is clearly in a state of transition from one equilibrium to another. As a consequence it is not possible to draw conclusive evidence from the full sample error-correction model. However by using recursive estimation methods we can illustrate the shift in the model corresponding to the liberalization-induced shift in the steady-state laffer curve. Evidence concerning the location of the new equilibrium is thus only indicative.

Table 1:
Unit Root Tests 1973(1) to 1993(3)

Variable	ADF(6)	DF	DW	Order of Integration
(m-p)	0.660	-1.332	0.187	≥ I(1)
Δ(m-p)	-3.224**	-9.863**	2.223	I(0)
(y-p)	-2.014	-2.370	0.195	≥ I(1)
Δ(y-p)	-5.298**	-9.453**	2.113	I(0)
π	0.282	-3.904	0.660	≥ I(1)
Δπ	-4.420**	-15.79**	2.912	I(0)
b	1.119	1.625	0.013	I(2)/I(1)
Δb	-1.997*	-8.375**	0.617	I(1)/I(0)

Note: ** = significant at 5% , * = significant at 10%.

Table 2:
Cointegration analysis 1973 (1) to 1993 (3)

Eigenvalue μi	**-T.log(1-μi)**	**-T.Σlog(1-μi)**	**Critical Values 5% (unrestricted constant)**	
			-T.log(1-μi)	**-T.Σlog(1-μi)**
0.345022	35.121	47.574	23.80	28.82
0.081259	7.034	12.452	17.89	22.99
0.060491	5.179	5.418	11.44	15.69
0.002879	0.239	0.239	3.84	6.51

	Standardized ß eigenvectors				Standardized α coefficients			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(m0-p)	1.000	-3.337	0.201	-2.534	-0.210	0.028	-0.114	-0.002
(y-p)	-0.510	1.000	0.358	1.212	0.085	-0.001	-0.211	0.000
π	4.716	-11.240	1.000	1.047	-0.012	-0.009	-0.001	0.003
Δb	-1.420	-3.973	-0.154	1.000	0.435	0.046	-0.074	0.007

The equilibrium vectors are reported as the columns in the eigenvector matrix starting with the most significant vector with the corresponding feedback/adjustment coefficients reported to the right (see Banerjee *et al* (1993)). Since the matrix of cointegrating vectors is identified only up to the space its vector combinations span, it is possible to renormalize the significant vectors to render economic intuition more meaningful. Based on the critical values for the significance of the eigenvalue statistics (and hence the cointegrating vectors) we can conclude, however, that there is only one strongly significant long run economic relationship in the system.

The first vector in the table, representing the only significant cointegrating combination between the variables does seem to be consistent with a straightforward money demand relationship. First, the income elasticity of demand is positive and around 0.5 which is consistent with the pure transactions models of the Baumol-Tobin class, but somewhat lower than has been recorded elsewhere for sub-saharan Africa which find an income elasticity of demand closer to unity even for base money (see, for example Adam,Ndulu and Sowa (1993)). The elasticity of money balances is, however, strongly negative with respect with inflation, and the order of magnitude is again comparable with other studies. One slightly surprising result seems to be with the interpretation of the coefficient of the parallel market depreciation which seems to be in contrast to the basic assumption of the currency substitution model. There are three possible explanations for this result. The first is that currency substitution ought to be viewed in a broader asset portfolio context in which agents substitute out of domestic money into foreign balances. However when currency substitution

is illegal (as was the case during the period up to 1992 in Zambia) participation in the illegal parallel market requires an increase in liquid balances. Thus while currency substitution induces a switch out of *aggregate* domestic financial assets, within total money there seems to be a switch into the only domestic asset which permits participation in actual currency substitution, namely cash. An alternative explanation for this perverse sign is that if parallel market depreciations signal increased shortages of goods then precautionary cash balances may be expected to increase to facilitate opportunistic purchases. Third, there is a strong positive correlation between domestic inflation and the parallel market depreciation. As a consequence, the portfolio component of the currency substitution effect is captured by the strong negative inflation elasticity of demand.

Since the cointegrating vectors are only unique in their linear combination, there may be another interpretation which is superior to the money-demand interpretation. One possible re-normalization which is consistent with theory would involve a normalization on inflation to argue that the vector represents a long-run inflation equation in which inflation is determined positively by the parallel market depreciation rate and negatively by the level of real money balances, subject to the identifying restriction that the normalized coefficient on income is zero (again, see Banerjee *et al* (1993)). The normalized vector of coefficients would be (0.20, 0.0, 1, -0.3)'. Since both interpretations are statistically valid long-run interpretations the choice between them must lie in their theoretical consistency and consistency with the dynamic model. As shall be indicated below, both criteria are met for the money demand interpretation.

Model Stability

The Johansen results conclusively reject the hypothesis that there are multiple cointegrating vectors between the variables in favour of one single cointegrating vector which can be reasonably interpreted as a demand for money function. What this analysis does not indicate however is whether this long-run relationship has remained stable over the liberalization period. We can examine this question in two ways. Initially we estimate the model to the beginning of 1987 - when the government abandoned the IMF programme and then project the long-run relationship forward over the subsequent six years. Figure 8 plots the projected deviation of actual real money balances from the long run equilibrium based on estimated

model to 1987 (equivalent to the long-run forecast residuals of the model). The most striking feature of the plot is the dramatic increase in the one-step residuals indicating a structural break in the long-run relationship. This could be explained solely by the increased volatility of the money stock over the period - which measured by the monthly standard deviation of the money stock doubled from 15% per month in the period to 1987 to 37% per month in the six years from 1987 to 1993. However this argument only holds if the other explanatory variables retained a constant variance. Since the variance of inflation, income and the exchange rate depreciation also increased to the same magnitude, then the large increase in the variance of the error must indicate that the underlying money demand relationship has also changed. In order to examine the stability of the long-run relationship further, the demand for money function can then be directly estimated within a single-equation dynamic specification and testing for cointegration using the standard Dickey-Fuller types of test.[14]

Table 3 reports the long-run equation estimated sequentially over a number of sub-samples starting with the period from 1973 to 1987 when the government abandoned its first IMF programme in favour of the "own grown" programme. From there the sample is extended to 1989 when the own grown programme and relations with the IMF were re-opened, to 1991 and the change in political regime, and finally to the end of the sample in September 1993 (which corresponds to the cointegrating vector reported above).

Table 3:
The Long Run Cointegrating Relationship

Dependent Variable (m0-p) Sample	1973-87(1)	-89(1)	-91(2)	-93(3)
(y-p)	0.509**	0.538**	0.472**	0.510**
π	-3.678**	-2.696**	-3.935**	-4.712**
Δb	0.927*	1.034**	1.118*	1.421*
s.e	3.94%	4.66%	5.34%	7.71%

Notes: s.e is equation standard error; ** implies significant at 5%, * significant at 10%. Equations are long-run solution to an ADL(4,4) model.

Table 3 illustrates quite dramatically the strong monotonic changes occurring in the underlying long-run demand for money. The income elasticity of demand has remained almost constant throughout the period, indicating that any changes in the demand for money are determined principally by asset market considerations rather than transactions. Of note in this

[14] See Banerjee *et al* (1992) for a discussion of multivariate cointegration.

respect s the significant increase in the inflation elasticity, particularly during the liberalization period 1989 to 1993, and the corresponding increase in the elasticity with respect to the parallel market rate. Moreover the equation standard error of the model almost doubles between the first and last models. This long-run model is clearly unstable, but the instability is systematic and conforms to the theoretical discussion of the previous section. The empirical evidence is thus consistent with a downward and inward shift of the seigniorage laffer curve.

Finally, in this section we examining the full sample dynamic error-correction model of the form of equation (14) where the vector X is as above, except for ϕb which measures the parallel market premium. Si are seasonal dummy variables. Following transformation and reduction of the I(0) variables a reasonably robust equation was found (Table 4). However as with the long-run relationship the model does not exhibit parameter constancy. The full sample results are presented in Table 4 where ECM is the deviation of actual money balances from the long-run equilibrium trajectory represented by the cointegrating vector from Table 2. The model is estimated by recursive least squares and Figure 9 illustrates the full sample fit of the model and the recursive dynamics of the individual coefficients.

Table 4:
Dynamic Demand Model

Modelling Δ(m-p) by RLS

The present sample is: 1973 (2) to 1993(3)

Variable	**Coefficient**	**Std.Error**	**t-value**
Constant	0.0087	0.0176	0.495
$\Delta 3\Delta$(y-p)	0.1868	0.0826	2.260
$\Delta\pi$	-1.3878	0.2881	-4.817
$\Delta 3\Delta$b	-0.0826	0.0345	2.401
$\Delta\Delta\phi$b	0.0438	0.0068	6.446
ECM_1	-0.6386	0.1434	-4.453
S1	-0.0685	0.0200	-3.426
S2	0.0854	0.0202	4.220

$R^2 = 0.767881$ F(9, 72) = 26.465 [0.0000] $\sigma = 0.072346$ DW = 1.69
Residual Autocorrelation from lags 1 to 5
$CHI^2(5) = 10.175$ and F-Form(5, 67) = 1.89889 [0.1062]
ARCH from lags 1 to 4
$CHI^2(4) = 3.5216$ and F-Form(4, 64) = 0.75654 [0.5574]
Testing for Heteroscedastic errors
$CHI^2(15) = 17.245$ and F-Form(15, 56) = 0.9942 [0.4739]
Normality test
Normality $Chi^2(2)$= 2.1206

These full sample results suggest an apparently robust demand function. The diagnostic statistics indicate that the error term is *i.i.d*, and the model again broadly confirms our theoretical priors and the evidence from the long-run solution. The most striking result is that the short run is dominated by inflation, while there is strong evidence of the adaptive expectations process, with actual money adjusting by approximately 64% per quarter to the previous period's error. The main difference in the dynamic model is that while the increase in expected parallel depreciation increased the long run propensity to hold cash (the liquidity effect mentioned above), the rate of change in the depreciation rate has a weak but opposite effect. Judging by the dramatic instability of this coefficient, however, it does not lend itself to a straightforward interpretation.

Despite the apparently good performance of the model over the full sample, parameter stability of the short-run dynamic model cannot be inferred. One of the striking features of the recursive plot however is the dramatic *increase* in the speed of adjustment in response to deviations from the long-run equilibrium following the commencement of the liberalization process - a result which is directly analogous with the increase in β in the theoretical model. Were we able to assume that the long-run equilibrium relationship was itself a stable function this result would be sufficient to support our claim earlier that liberalization is accompanied by increased speed of or adjustment by the private sector. However, since we have already concluded that the long-run relationship has altered we cannot draw such strong implications since this coefficient is, in fact, measuring the adjustment of actual money balances to an "incorrect" long-run relationship - one imposed by the researcher. However we may note that the value of the ECM term has almost doubled in the period since 1987 which is a larger move than in the long-run relationship itself and thus is not inconsistent with the notion that adjustment speeds themselves are higher than pre-liberalization.

5. The Laffer Curve in Zambia

Although we still face uncertainties about the stability of the model, we can use these estimates to calculate the notional revenue maximizing inflation rate, ie the maximum point

of the long run seigniorage laffer curve, at least over the period to 1987. As we showed in our previous paper (see Adam *et al* (1993)) the revenue maximizing rate can be defined as

$$\pi^* = -\frac{1}{\eta_{m\pi}} - (\eta_{my} g_y + \eta_{mb} g_b) \tag{15}$$

where η_{mj} is the elasticity of money demand with respect to j and g_j is the growth rate of j. Although we know from the recursive estimates that these elasticities are not constant over the period as a whole we can take the value over the period to 1987 as describing the pre-liberalization demand function. Over this period, the average growth in real gross national income was -1.6% per annum (-0.4% per quarter) and the average annual depreciation of the parallel market exchange rate was 14% per annum (3.5% per quarter). Over the full period to 1993 the corresponding values were -1% and 27% respectively. Applying these rates to the long-run estimates for the demand for money function we get a notional long-run revenue maximizing rate of inflation of approximately 28% per annum up to 1987 and 12% for the sample period as a whole. Since the equation coefficients were relatively stable up to 1987 we may regard the 28% estimate as a fair approximation to the true revenue maximizing rate, and using the equation standard error as a composite measure of variation around this point estimate, we may conclude that the revenue - maximizing rate of inflation was in the range 20% - 36% per annum. Given that the full sample coefficients were not derived from a constant parameter model, the new laffer curve cannot be inferred accurately, although we do have strong evidence of a downward shift as the model of section 4 suggested.

Figures 10 and 11 describe the evolution of the laffer curve relationship in Zambia over the last 25 years. Figure 10 first plots actual seigniorage against inflation for the period from 1967-89 which indicates the theoretical relationship clearly. From the cross-plot, it seems that the maximum seigniorage seems to have been achieved at an annual inflation rate of between 15% and 20% - slightly below our econometric estimates - which historically yielded around 6% of GDP per annum. Figure 11 on the other hand indicates how, during the 1980s, the economy moved from a low-inflation high money balances to the high-inflation low money balances seigniorage configuration. For example in 1983 a seigniorage of just less than 2% of GDP was yielded from a domestic rate of inflation of approximately 18%, while in 1988 the same level of seigniorage required a 50% inflation rate. This is equivalent to a

move from A to B in figure 5. The most dramatic effects, however, have occurred since 1990. From 1988 to end 1991 there began a process of apparent monetary disequilibrium. Initially seigniorage was held at around 1% to 1.5% of GDP, but at the cost of an accelerating rate of inflation which rose to over 100%. Towards the end of the period seigniorage had fallen to approximately 0.5% of GDP. By early 1991 we can assume that the economy was already operating around (but possibly off to the right of) the unstable equilibrium point on the laffer curve.

The dynamics of inflation and seigniorage from that point on are illustrated in Figure 12 which commences with the first months of 1991. By this time there was some evidence that a relatively orthodox, if slow, fiscal-led monetary contraction had begun. This produced an annualized level of 1%-2% seigniorage for an inflation rate of around 50% - 75% per annum [point A]. However the economy was then shocked by an enormous monetary expansion due to the combination of the pre-election spending boom and concurrent cessation of aid disbursements. This phase is consistent with the expansionary monetary shock described in Figure 5 above.The monetary expansion forced the private sector off its demand for money schedule and seigniorage revenue jumped precipitously. As inflation expectations adjusted and prices rose, the seigniorage level fell and the system settled back to an equilibrium which was a higher inflation, lower-seigniorage position further down to the SE on the (original) laffer curve SS [Point B].

The second phase occurred in the period from September to December 1992 during which time the two liberalizations occurred and saw a sharp rightwards movement [to point C], although in this case the high-seigniorage loop did not occur: adjustment of prices was rapid and the economy moved towards higher inflation without any rise in seigniorage. Following this shift the original high-inflation equilibrium was no longer feasible and the actual inflation-seigniorage point is a position of even greater disequilibrium relative to the new laffer curve. This phase is therefore analogous to the Bruno and Fischer closure where as the government seeks to maintain the same seigniorage level inflation expectations accelerate to the right of the high-inflation equilibrium.

By May 1993, however, an effective cash budget mechanism was put in place and a severe fiscal squeeze was instituted, which pulled the economy down towards the zero-seigniorage axis below the new lower laffer curve [points D and E]. One on the zero-inflation locus with a zero money supply growth, inflation dropped, and from October 1993 until

December prices also fell (ie inflation was negative). Once stability has been achieved in expectations the government may seek to slowly raise the rate of growth of the money supply to a level consistent with the new optimal level of inflation on the new laffer curve. Notice that during this phase inflation will again exceed the rate of growth of the money supply.

6 Conclusions and Extensions

The results from the forgoing sections confirm the basic argument from the model that when agents hold adaptive expectations, the premature liberalization of the foreign exchange and domestic asset markets caused a significant shift in the underlying willingness of the domestic private sector to hold Zambian money balances and as a consequence served to offset the thrust of the stabilization efforts being undertaken. One interesting question that arises from this is whether this sequence of events is inevitable especially when a similar pattern of liberalization has occurred in other economies without the same adverse consequences. The most striking example would seem to be Uganda where inflation fell significantly more rapidly under similar policy conditions. There are two possible explanations which may reconcile these apparently conflicting outcomes. The first concerns the nature of the demand for money function prior to the liberalization and the second concerns the nature of expectations and the extent to which the implementation of liberalization measures are taken to signal the commitment of government to the macroeconomic reform programme.

Consider first the question of the demand for money and the impact of the liberalization of the current and capital account. In Uganda, for example, the demand for money had been so eroded and any controls on currency substitution so easily evaded that the pre-liberalization demand function may be taken to be in an unconstrained equilibrium with respect to individuals asset portfolio. Consequently any reduction in the official controls would not impact on the demand for money function. Indeed it may even work in the opposite direction. If liberalization somehow raised the relative transactions costs of currency substitution faced by agents then the portfolio may then adjust in favour of the domestic money.[15] Under such circumstances the laffer curve would shift outwards rather than inwards.

[15] Collier (1993) describes the situation in Uganda where the transactions costs associated with operations within the legal foreign exchange market have increased due to the audit requirements of the donor community.

In Zambia however, despite the presence of a significant degree of illegal currency substitution, there is evidence that controls have been binding and that there is a significant degree of repressed currency substitution. This is particularly so for the large parastatal and commercial banking sectors which have remained substantially within the government's control. For this sector, many of which operate in tradable sectors, the opportunity for legal currency substitution will be an important factor determining the shift in the post-liberalization laffer curve. A similar effect would be experienced if the domestic currency became a regional numeraire which again has been seen in Uganda where the Uganda Shilling has supplanted the Kenyan Shilling as the principal currency for trade between Kenya, Uganda, Tanzania and Zaire. The second key factor concerns the situation when there is uncertainty about the government's commitment to reform and liberalization. In such circumstances delays in the speed of liberalization, either in absolute terms or relative to some pre-agreed timetable (such as the Economic Recovery Programme), may indicate a lack of commitment and a more rapid shift out of domestic money balances. This may be in anticipation of future tightening of the control regime, or a rational expectation of a reversal in, say, fiscal contraction. Under such circumstances, rapid liberalization will, by signalling commitment, strengthen domestic money demand and again lead to an outward shift in the laffer curve and be self-reinforcing. This is in contrast to the situation in Zambia where the premature liberalization has engendered a fiscal stance which is so severe that while it indicates commitment it is increasingly viewed as being inconsistent in the sense that the private sector know it cannot be held. Future research in this area must therefore concentrate on the treatment of expectation formation and in particular the role of signalling and credibility, possibly following the lines developed by Cuikerman and Livitian (1992)).

While it is clear that premature liberalization may not necessarily have adverse fiscal effects, this paper has considered the case where the fiscal costs may be high and may, by requiring severe short-term fiscal adjustment, ultimately jeopardise stabilization efforts. This will be so in economies in which controls on currency substitution still have some effect and where credibility of reform does not depend on the speed of financial liberalization. This kind of structure seems applicable not only to Zambia, but also to Ethiopia and perhaps Zimbabwe, two economies where financial controls have been substantially binding and have supported a large monetary base.

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