Pakistan Journal of Applied Economics (1982) vol.I, no.2 (193–222).

CREDIT POLICY AND FOREIGN ASSETS IN SELECTED AFRICAN ECONOMIES

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This paper is concerned with examining the usefulness of the monetary approach to the balance of payments for a number of African economies. A model is developed to estimate the relationship between domestic credit and changes in foreign assets in order to guide policymakers in implementing credit policies aimed at reaching a given balance of payments objective. The general conclusions of the study are that the monetary approach does have some applicability to developing countries and that excessive increases in credit are a major cause of external disequilibria in many African economies.

I. Introduction

Over the last few years, several papers have been written on the applicability of the monetary approach to the balance of payments in industrialized market economies, but relatively little is known on the relevance of this methodology for less developed countries (LDCs), especially African economies.[1] Yet, this model forms the basis of many stabilization programs which are being adopted by LDCs to correct balance of payments disequilibria which may be either of a temporary or of a structural nature. The degree of success of these programs has varied from country to country. In certain economies the adjustment mechanism has been relatively smooth and

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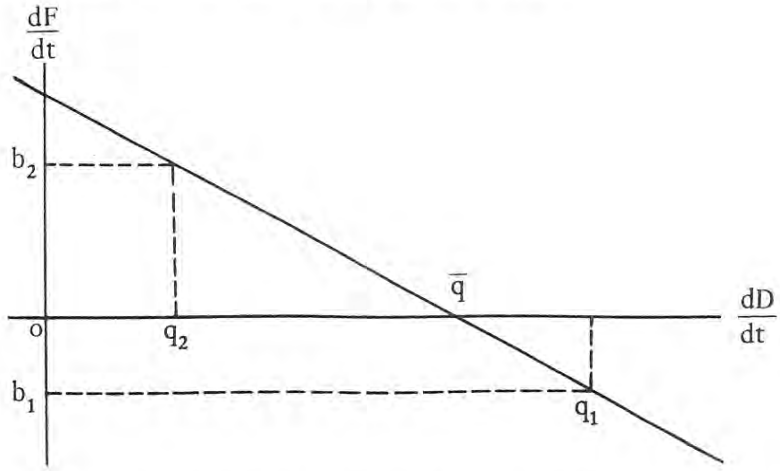
[1] Among the better known papers dealing with the relationships between domestic credit and the balance of payments are: Polak, J. J., and L. Boissonneault, (1960); Fleming, J. M., and L. Boissonneault, (1961); and Argy, V., (1979). For the African area, there are Bhatia, R. J., G. Szapary, B. Quinn, (1969); Kimaro, S. N., (1975); and Franco, G. R., (1979).

speedy, while in others, it has been difficult and lengthy.[2] Thus, further analyses, especially empirical investigation, are needed to identify the relationship between credit and the balance of payments in LDCs in order to determine the usefulness of this approach in facilitating the adjustment process.

At a theoretical level, the relationship between changes in domestic credit and changes in net foreign assets is well defined for a developing economy, where a sizeable proportion of government expenditure is used to finance development budgets with high import components. In this context, an expansionary monetary policy by the monetary authorities to the public sector can affect adversely the balance of trade, thereby imposing pressures on the balance of payments. In addition, an increase in credit by the deposit money banks to the private sector may exacerbate pressures on the balance of payments, as such credit can be used to finance imports, often consumer goods which do not enhance the economy's production base and its export potential. The monetary authorities who are interested in achieving a given balance of payments objective in the context of a stabilization program must also consider carefully the legitimate credit requirements of the economy. Thus, they would want to know the adequacy of credit policies in fostering economic growth, and also the magnitude of the change in credit needed to bring about a balance of payments objective. More specifically, they would be interested in the value of the multiplier of domestic credit on the balance of payments.

Graphically, the multiplier can be shown as follows:



[2] Of the 26 stabilization programs that have been implemented by the nine African counrties considered in this paper during the period 1965-80, only about three have been successful in terms of strengthening the balance of payments. For comprehensive discussions of several of these programs, see Johnson and Salop, (n.d.); and Reichmann, T., and R. T. Stillson, (1978).

where F represents net foreign assets; D domestic credit; and $\bar{q}$, a statistically determined value of the change in domestic credit per time period, needed to bring about and maintain balance of payments equilibrium. If the monetary authorities increase credit by more than $\bar{q}$, such as, for example, by q_1, then the balance of payments will register a deficit of b_1; on the other hand, if the change in credit is less than $\bar{q}$, e.g., q_2, then the balance of payments will register a surplus of b_2.

This paper is concerned with testing the hypothesis that there is a significant relationship between changes in credit and the balance of payments in a number of African countries, and also with estimating the relationship statistically. The countries considered in the analysis are the following: The Gambia, Ghana, Kenya, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda, and Zambia. The paper will seek to inquire into the incidence of credit policies on the balance of payments of these countries during the period since 1965 in order to determine whether their monetary authorities can bring about external equilibrium through the manipulation of monetary variables. The paper is divided into three sections. Part I presents a summary of the recent balance of payments experience of each country, and the credit policies that have been adopted thus far; part II presents a macroeconomic model which is used to estimate, for each country, the values of the multiplier of domestic credit on the balance of payments, and the relationship between domestic credit, exports, imports, capital flows, and net foreign assets, within a constraint imposing balance of payments equilibrium. In part III, the model is tested empirically, and the conclusions of the investigation are presented, as well as a balance of payments simulation for each country. This will permit a comparison of the credit policies pursued by the monetary authorities with the policies that would have been necessary to achieve a particular balance of payments objective.

II. Balance of Payments and Credit Policies in the African Context

Since independence in the early sixties, many African countries have experienced severe difficulties with their balance of payments. A principal cause of these problems has been excessive monetary demand generated by the need to finance budgetary deficits and by the credit requirements of public enterprises and of the private sector. Admittedly, nevertheless, external developments such as imported inflation and export price instability have also had an important role in causing balance of payments disequilibria. Foreign trade registered, increasingly, larger deficits reflecting slow growth of exports, greater imports of consumer and capital goods, and a deterioration in the terms of trade. Concurrently, with a weakening in their balance of

payments, their overall economic and financial situation deteriorated sharply during the period since 1965, with worsening rates of economic growth, higher rates of domestic inflation, and increasing internal imbalances. These interrelated problems have gathered momentum in recent years, and have aggravated the world economic situation.

Of the sample of nine African countries considered in the analysis during the sixteen year period (1965-80), three, Kenya, Malawi, and Sierra Leone, had external current account deficits in all years; two, the Gambia and Tanzania, had deficits in all years except in 1975 and 1969 respectively; Ghana had deficits in thirteen of the sixteen years; Nigeria in eleven of those years; Uganda in ten; and Zambia in seven. By 1980, the combined current account deficit of the aforementioned countries, excluding Nigeria with petroleum receipts in excess of US$25 billion, totaled $4.7 billion, representing over 100 per cent of their export earnings. However, in many of the years, net capital inflows were sufficient to cover the current account deficits. Thus Nigeria experienced overall balance of payments surpluses in ten of the sixteen years; Kenya, Malawi, Tanzania and Uganda had surpluses in nine of the years; The Gambia and Ghana in eight; and Sierra Leone and Zambia in seven. The combined overall balance of payments deficit in 1980 amounted to US$380 million compared to US$60 million in 1965.[3] These increased difficulties in the balance of payments were reflected in the higher debt service burden which absorbed larger proportions of export receipts.[4]

For the countries considered in the analysis, as well as in most countries, the formulation of credit policies is the responsibility of the monetary authorities. Traditionally, domestic credit to the private sector and to the public enterprises is extended by the deposit money banks, while the extension of credit to the governments is primarily the responsibility of central banks. At the beginning of each year, the monetary authorities prescribe credit guidelines and set the conditions under which loans and advances may be made to the economy by the deposit money banks. The guidelines which usually lay down end of year ceilings without stipulating targets within each period are designed to influence the distribution of credit, so that increasing amounts of resources are oriented towards those economic activities considered most beneficial to the economy. Often, however the guidelines are changed in mid-year, making their enforcement difficult. Nevertheless,

[3] Balance of payments data, as well as credit data for the nine countries considered, are presented in the appendix in Tables 4 through 12. The data are expressed in domestic currencies. They have been converted into U.S. dollars for the above purposes using monthly averages for the years 1965-80.

[4] In 1965, the total external debt of eight of the sample countries (Nigeria excluded) amounted to US$1.3 billion, with an average debt service ratio of 8.1 per cent. The respective figures for 1979 were US$9.3 billion, and 13.2 percent, World Bank, World Debt Tables; various issues.

during the period considered, the expansion of credit in most of the sample countries has moved in the direction of the guidelines, but the composition and the total credit allocated has often diverged from the prescribed ceilings. The magnitude of the credit extended by the monetary authorities to the government is determined to a large extent by the budgetary position of the treasury. In years in which the central government budget is weak, there is recourse to heavy central bank financing; on the other hand, government resort to the central bank diminishes in years in which its fiscal position is strong.

During the period 1965-80, domestic credit in all the sample countries (except for Zambia), grew at relatively similar rates in the range of 20-28 per cent yearly. Thus, the annual growth of credit in Kenya was 20 per cent, in Sierra Leone it was 23 per cent, in Nigeria 24 per cent, in Ghana and Uganda 25 per cent, in The Gambia and Tanzania 26 per cent, and in Malawi 28 per cent. In Zambia domestic credit in the base year 1965 was negative, as there were net claims on the banking system totaling kwacha 46.4 million. The annual growth rate of credit in that country during the thirteen year period beginning in 1967, the first year in which domestic credit was positive equaled 38 per cent. In the Gambia changes in domestic credit were positive for all years, except for 1966-67 when total credit outstanding declined by about 26 per cent in response to a stabilization program which the authorities had adopted following independence. In Ghana, the change in domestic credit was positive in all the years, while in Kenya it declined by 4 per cent in 1966, as the authorities strived to reverse a balance of payments deficit which had emerged in 1965. In Malawi, domestic credit declined in 1973 when the government adopted restrictive measures. In Nigeria, the change in credit was negative in 1971 and in 1974 as claims on the banking system became positive. In Sierra Leone, domestic credit declined in 1968 and 1969 by about 8 and 13 per cent respectively, as the authorities attempted to reverse large current account deficits which were experienced in 1967-69. In spite of large external disequilibria in many of the years, the Tanzanian and Ugandan authorities pursued expansionary credit policies and changes in credit were positive throughout the 1965-80 period. For Zambia, there was a decline in credit in 1969-70, the result of a rise in claims on the banking system by the economy.

The largest proportion of central government deficits in the sample countries was financed domestically, most importantly through advances from central banks. The balance was financed through foreign borrowing, either directly or through the accumulation of external arrears. Of the nine countries considered, five countries (Ghana, Nigeria, Uganda, Sierra Leone and Zambia) financed over 75 per cent of their budgetary deficit internally, with

the central bank contributing the largest proportion of the resources. Thus in Ghana, the central bank financed about 60 per cent on average of the cumulative deficit during the period 1965-80; in Sierra Leone the corresponding figure was 55 per cent; and in Nigeria, Zambia and Uganda about 50 per cent. The other sample countries, Malawi, The Gambia, Tanzania, and Kenya, resorted to heavy foreign borrowing to finance their budgetary deficits. Malawi financed about 72 per cent on average of its deficits abroad, The Gambia 47 per cent, Tanzania 43 per cent and Kenya about 41 per cent.

With regard to the relationship between domestic credit and the size of budgetary deficits, there are several indications that they were positively related. Thus for Ghana in 1978, when the fiscal deficit totaled cedis 1.4 billion, one of the highest levels for the period considered, domestic credit increased by 68 per cent over 1977. On the other hand in 1970, when the government deficit was cedis 50 million, domestic credit rose by only 4 per cent. Similarly, for the other countries for which a large proportion of the fiscal deficit was financed domestically, large deficits were accompanied by relatively important increases in domestic credit and vice versa. Thus, in Nigeria in 1977, when the budget deficit reached a record level of naira 2.1 billion, domestic credit during the twelve months ended in December 1977 rose by almost 100 per cent. Similarly, for Sierra Leone, when the budget deficit equaled leones 60 million in 1975 (186 per cent higher than in 1974), domestic credit rose by 50 per cent. For Zambia, the fiscal deficit amounted to kwacha 341 million in 1975, and domestic credit rose by over 70 per cent.

While central banks have financed the credit requirements of government budgets, they have also financed in certain instances deficits of quasi-government bodies, public enterprises and marketing boards. Thus, at one time or another during the period since 1965, the monetary authorities of the respective countries have financed directly the operational deficits of the Cocoa Marketing Board (Ghana); the Coffee Marketing Board (Uganda); the Industrial Holding Company (Ghana); the National Wheat Board (Tanzania); the Maize and Produce Marketing Board (Kenya); the Gambia Utilities Corporation; the Uganda Development Corporation; the Nigeria Produce Marketing Company; and the National Diamond Mining Company (Sierra Leone).

III. The Model – Its Structure and Reduced Forms

Theoretically, the relationship between domestic credit and the balance of payments can be examined by tracing out the path along which increases in credit spill over into imports, and hence have an impact on the balance of

payments. There are two sectors in an economy which generate demand for imports – the government sector and the private sector, which includes for our own purposes the public enterprises. The government sector demands imports mostly through the development budget, which often has a high foreign input component in a developing economy in the form of expenditures on imported capital goods and technical assistance. Similarly, the private sector demands imports, mostly consumer goods, which are fueled in great part through the extension of credit by the banking system. In this model, the incidence of domestic credit on imports is effected through national income, since gross domestic product is determined by the money supply via a quantity theory equation. Thus it is stipulated that:

$$Y = \nu Ms,^{5} \tag{1}$$

where (Y) is nominal GDP, and (Ms) the supply of money broadly defined, that is the sum of domestic credit (D) and net foreign assets (F) or:

$$Ms = D + F. \tag{2}$$

The balance of payments identity can be written as:

$$F = F_{-1} + X + K - M, \tag{3}$$

where (F_{-1}) is net foreign assets lagged one year, (X) is exports of goods and services, (M) is imports of goods and services, and (K) is net capital inflows.

Unlike industrialized economies where imports are largely determined by national income through the marginal propensity to import with few other constraints, an additional limitation on imports in developing countries is imposed by an import program. The monetary authorities usually set, at the beginning of each year, a foreign exchange budget to be spent during the year on imports. Since foreign exchange is a scarce resource in a developing country, it is allocated to importers by the central bank through an import licensing mechanism according to some priority criterion. It is hypothesized in this model that the magnitude of the foreign exchange budget is determined by the change in net foreign assets lagged one year (ΔF_{-1}), with the assumption that the authorities will allocate larger foreign exchange budgets

[5]This relationship subsumes a well defined demand for money function of the standard form: Md= kY, where Md is the demand for money, and k is the well known Marshallian coefficient. Given equilibrium in the money market, Ms = Md, the equation can be rewritten as Ms = kY, or Y = υMs, where $\upsilon = 1/k$.

in those years when the balance of payments registers a surplus. Thus, the improrт function in the model is specified as follows:

$$M = \mu_o + \mu_1 Y + \mu_2 (F_{-1} - F_{-2}), \tag{4}$$

where (F_{-2}) is net foreign assets lagged two years.

The four equation model specified above has nine variables, of which four are endogenous (Y, Ms, M, and F), and five predetermined (D, F_{-1}, F_{-2}, X and K).

Through substitution, the reduced form of net foreign assets can be solved for; it equals:

$$F = -\frac{\mu_o}{1+\mu_1 \nu} + \frac{(1-\mu_2)}{1+\mu_1 \nu} F_{-1} + \frac{\mu_2}{1+\mu_1 \nu} F_{-2} + \frac{(X+K)}{1+\mu_1 \nu} - \frac{\mu_1 \nu}{1+\mu_1 \nu} D \text{ [6]} \tag{5}$$

The change in domestic credit needed to obtain balance of payments equilibrium can be obtained by taking the total differential of equation (5), setting it equal to zero, and solving for dD. This gives:

$$dD = \frac{(1-\mu_2)}{\mu_1 \nu} dF_{-1} + \frac{\mu_2}{\mu_1 \nu} dF_{-2} + \frac{(dX + dK)}{\mu_1 \nu} \tag{6}$$

Thus, the change in domestic credit (dD) obtained from given values of (dF_{-1}), (dF_{-2}), (dX), and (dK), and the estimated values of the parameters μ_1, μ_2, and ν, will assure balance of payments equilibrium.

IV. The Data, Regression Results and Policy Implications

The data used in the statistical estimation were obtained in the most part from the IMF's International Financial Statistics Yearbooks. For certain years, and more particularly since 1978, the data were obtained directly from the authorities of each country and from national statistical abstracts. The data are expressed in domestic currency at nominal prices, spanning the period 1965-80.[7] The money supply (Ms), net foreign assets

[6] The multiplier (dF/dD) = $[(-\mu_1 \upsilon)/(1+\mu_1 \upsilon)]$ must lie in the open interval (-1,0), since μ_1, the marginal propensity to import, will be less than 1 but larger than zero, and the velocity of money υ must be positive.

[7] The regression data for each country are presented in Table 4–12.

(F), as well as domestic credit (D) are stock variables, the values of which refer to the end of December of each year. All other variables are flow variables. In order to satisfy structural equation (2), the money supply is defined in the model as all liabilities of the banking system, that is to say, money, quasi-money, and all other items (net). Exports (X) and imports (M) represent foreign receipts and expenditures on goods and services, as well as transfers, while (K) represents net capital inflows. K is defined as the change in net foreign assets plus imports minus exports; thus, it represents the balance on the capital account.

Various specifications of the import function were attempted with the most significant results indicating that imports of goods and services were best explained by GDP in the current period, and changes in net foreign assets lagged one year, which were used as a proxy variable for the import program. The hypothesis is that at the beginning of each year t, the monetary authorities in each country allocate a given quantity of foreign exchange to the import program with the magnitude of the import program determined, in large measure, by the change in net foreign assets over the year (t-1) and (t-2). In order to derive the individual coefficients of equation (5), it is necessary to estimate the values of the structural parameters ν, μ_0, μ_1, and μ_2. Yet since certain explanatory variables of structural equations (1) and (4) are endogenous, as is (Ms) in equation (1) and (Y) in equation (4), it was necessary to estimate the structural parameters using the two-stage least squares estimation procedure.

The regression results for both equations are presented in Table 1. With regard to the quantity theory equation (1), the money supply variable (Ms) was found to be statistically significant at the 1 per cent level in explaining gross domestic product (Y) for all the countries considered in the analysis. In addition, the explanatory variable (Ms) explained, in all cases, at least 76 per cent of the variance of (Y). The estimated values of the velocity of money ranged from 1.75 for The Gambia to 11.38 for Uganda, with a mean value of 3.76 and a standard deviation of 2.77 for the entire sample. The significance of the statistical results for equation (4), the import function, was mixed. While GDP (Y) was statistically significant at the 1 per cent level in explaining imports (M) for all countries, except for The Gambia and Uganda, changes in net foreign assets lagged one year ($F_{-1} - F_{-2}$), were significant at the 1 per cent level only for Nigeria and Sierra Leone. For Ghana, Kenya, and Zambia, the significance was at the 5 per cent level, while for the Gambia, Malawi, Tanzania and Uganda, ($F_{-1} - F_{-2}$) was not statistically significant.

Estimated values of the marginal propensity to import, μ_1, ranged from 1.05 for The Gambia to 0.01 for Uganda, with a mean value of 0.41 and a

TABLE 1

Regression results (Two-stage least squares estimates)

	$Y = \upsilon M_s$			$M = \mu_o + \mu_1 Y + \mu_2 (F_{-1} - F_{-2})$					Value of multiplier
	$\hat{\nu}$	$\bar{R}_2$	D.W.	$\hat{\mu}_o$	$\hat{\mu}_1$	$\hat{\mu}_2$	$\bar{R}_2$	D.W.	$\partial F/\partial D = -\mu_1 \nu/1+\mu_1 \upsilon$
The Gambia	1.7547**	0.9413	0.8343	−40.3815**	1.0497	1.4648	0.9498	2.1715	−0.6481
Ghana	2.8605**	0.9902	1.7205	269.4419**	0.1124**	0.1604*	0.9786	1.3708	−0.2433
Kenya	2.8566**	0.9875	0.3155	29.2896	0.3718**	0.3776*	0.9858	1.6724	−0.5150
Malawi	4.2633**	0.9875	0.8207	−25.4643*	0.4595**	0.0474	0.9809	1.5514	−0.6620
Nigeria	2.9124**	0.9465	0.4250	−1058.2685**	0.3684**	0.2927**	0.9643	1.0689	−0.5176
Sierra Leone	2.8501**	0.8612	0.5044	−97.9863**	0.6052**	1.7314**	0.9868	0.5644	−0.6330
Tanzania	2.8289**	0.9727	0.4717	−371.4157	0.3261**	0.2894	0.9603	0.9703	−0.4798
Uganda	11.3816**	0.7588	0.9153	1996.0921**	0.0110	1.2405	0.5987	1.7422	−0.1113
Zambia	2.1182**	0.9036	0.2088	70.9637	0.4156**	0.3446*	0.8633	1.7601	−0.4682

* significant at the 5 percent level
** significant at the 1 percent level

standard deviation of 0.28 for all the sample countries. The coefficients of $(F_{-1} - F_{-2})$ ranged in values from 1.46 for The Gambia to 0.05 for Malawi, with an overall mean value of 0.67 and a standard deviation of 0.64. For all equations, over 60 per cent of the variance of imports was explained by the explanatory variables (Y) and $(F_{-1} - F_{-2})$.

The domestic credit multipliers on the balance of payments can be derived for each country by partially differentiating equation (5) with respect to domestic credit, and by substituting the corresponding estimated values of μ_1 and ν in the equation. Thus, for Zambia the value of the multiplier would be equal to:

$$\frac{dF}{dD} = \frac{-\mu_1 \nu}{1+\mu_1 \nu} = \frac{-(0.42)\,(2.12)}{1+(0.42)\,(2.12)} = -0.47 \qquad (7)$$

which implies that an increase in domestic credit equaling kwacha (KZ) 1 million would decrease *(ceteris paribus)* international reserves by KZ 470,000. The multipliers for each of the other countries in the sample are presented in Table 1. The values of all multipliers are negative as expected, since an increase in domestic credit will reduce the level of international reserves. The values of multipliers ranges from -0.11 for Uganda to -0.65 for The Gambia, with a mean value of -0.48 and a standard deviation of 0.97.

By substituting $\hat{\mu}_1$, $\hat{\mu}_2$ and $\hat{\nu}$ into equation (6), the change in domestic credit required to bring about and maintain balance of payments equilibrium can be obtained; thus, for Zambia, this magnitude can be calculated as follows:

$$dD = \frac{1-0.34}{0.88}\, dF_{-1} + \frac{0.34}{0.88}\, dF_{-2} + \frac{1}{0.88}\,(dX+dk). \qquad (8)$$

At the beginning of every period t, the monetary authorities of Zambia can solve for the change in domestic credit (dD) required to achieve a particular balance of payments objective by substituting particular values of dX, dK, dF_{-1}, and dF_{-2} in equation (8). If the actual increase in domestic credit is identically equal to the calculated dD, then the resulting balance of payments will be in equilibrium; however, an increase in credit larger than dD will bring about a deficit in the balance of payments, while a change in credit less then dD will generate a balance of payments surplus.

Table 2 summarizes the monetary policy implications for each of the sample countries that can be derived from the model. The table lists recorded balance of payments deficits and surpluses for the period 1965-80, and the actual changes in domestic credit associated with those deficits.

TABLE 2

Required versus actual changes in domestic credit for balance of payments equilibrium[1]
(in millions of domestic currency units)

	The Gambia (dalasis)	Ghana (cedis)	Kenya (shillings)	Malawi (kwacha)	Nigeria (naira)	Sierra Leone (leones)	Tanzania (shillings)	Uganda (shillings)	Zambia (kwacha)
1965									
Balance of payments	0.80	−56.90	−10.90	−2.00	27.50	1.40	−108.00	−108.90	10.50
Change in D	0.53	73.50	325.00	2.34	22.10	1.79	207.00	227.00	18.19
Required change in D	0.12	380.00	210.00	1.18	38.20	10.03	118.00	583.00	22.63
Deviations	0.41	−306.50	115.00	1.16	−16.10	−8.24	89.00	−356.00	−4.44
1966									
Balance of payments	4.30	−19.80	338.20	−4.90	−21.90	−1.70	227.10	154.20	9.40
Change in D	−1.50	58.60	−41.00	8.63	82.20	4.25	46.00	82.00	27.16
Required change in D	12.51	31.20	189.00	4.12	49.70	2.12	58.00	75.00	45.12
Deviations	−14.01	27.40	−230.00	4.51	32.50	2.13	−12.00	7.00	−17.96
1967									
Balance of payments	−0.60	−26.60	−181.30	0.60	−82.50	−3.60	−0.80	71.20	−23.50
Change in D	−0.03	75.10	293.00	4.53	43.20	3.37	81.00	34.00	46.91
Required change in D	8.91	48.60	162.00	4.98	28.90	1.18	56.00	12.00	33.61
Deviations	−8.94	26.50	131.00	−0.45	14.30	2.19	25.00	22.00	13.30
1968									
Balance of payments	−1.50	−13.10	195.50	0.50	24.40	11.40	108.20	72.90	5.90
Change in D	2.66	55.50	48.00	1.32	139.10	−2.10	115.00	141.00	25.72
Required change in D	3.84	32.90	614.00	4.98	184.30	15.52	276.00	1125.00	60.91
Deviations	−1.18	22.60	−566.00	−3.66	−45.20	−17.62	−161.00	−984.00	−35.19
1969									
Balance of payments	1.00	−18.60	466.90	—	14.60	9.10	115.90	68.60	127.70
Change in D	0.86	40.20	88.00	4.90	220.90	−3.23	265.00	243.00	−59.69
Required change in D	3.70	26.90	369.00	5.00	237.50	1.17	342.00	1604.00	88.19
Deviations	−2.84	13.30	−281.00	−0.10	−16.60	−4.40	−77.00	−1361.00	−147.88
1970									
Balance of payments	6.30	62.00	360.90	6.40	59.50	2.20	−50.20	34.00	113.70
Change in D	0.22	23.30	442.00	0.75	331.90	0.29	410.00	302.00	−20.48
Required change in D	1.60	518.40	901.00	8.82	373.00	6.35	339.00	1022.00	130.04
Deviations	−1.38	−495.10	−459.00	−8.07	−41.10	−6.06	71.00	−720.00	−150.52
1971									
Balance of payments	−0.90	19.00	−415.70	0.50	126.60	−1.40	135.80	−325.70	−194.10
Change in D	2.63	136.00	656.00	10.49	−21.00	6.05	387.00	384.00	228.12
Required change in D	−0.14	151.00	446.00	11.06	531.20	4.23	858.00	3086.00	−151.37
Deviations	2.77	−15.00	210.00	−0.57	−552.20	1.82	−471.00	−2702.00	379.49

1972									
Balance of payments	8.30	128.80	130.60	4.00	−36.30	10.10	473.10	−1.10	−110.10
Change in D	1.22	91.70	491.00	7.13	157.70	3.25	110.00	572.00	111.95
Required change in D	18.89	74.30	618.00	11.34	−41.10	9.37	95.00	−1911.00	60.35
Deviations	−11.67	17.40	−127.00	−4.21	198.20	−6.12	15.00	2483.00	51.60
1973									
Balance of payments	5.20	104.70	214.90	27.10	170.90	7.40	231.20	−53.70	−9.40
Change in D	18.31	15.00	841.00	−2.24	127.50	12.58	379.00	1054.00	63.44
Required change in D	−0.04	44.70	1070.00	21.64	863.20	15.45	805.00	−5207.00	−78.33
Deviations	18.27	−29.70	−229.00	−23.88	−735.70	−2.87	−426.00	6261.00	141.77
1974									
Balance of payments	22.90	−209.10	−585.10	11.90	3085.70	−6.70	−1022.90	−110.90	7.20
Change in D	7.90	411.00	1107.00	21.59	−2009.00	22.12	1934.00	1152.00	39.00
Required change in D	31.80	383.40	552.00	26.33	−3506.70	17.68	1007.00	4679.00	247.21
Deviations	−23.90	27.60	555.00	−4.74	1497.70	4.44	927.00	−3527.00	−208.21
1975									
Balance of payments	9.30	123.40	−392.70	−42.20	167.10	−22.80	−227.90	106.50	−135.00
Change in D	6.86	343.70	1448.00	58.22	1731.80	32.66	1251.00	561.00	293.79
Required change in D	0.64	470.10	−4.00	13.44	1938.30	−6.60	400.00	1551.00	−59.12
Deviations	6.22	−126.40	1452.00	44.78	−206.50	39.26	851.00	−990.00	352.91
1976									
Balance of payments	−11.20	−112.80	882.70	−45.90	−271.70	−18.70	203.70	29.20	−29.50
Change in D	27.38	831.30	1061.00	71.22	1817.60	53.37	1345.00	1383.00	296.44
Required change in D	28.19	258.30	1866.00	61.03	1699.10	17.76	1812.00	−1206.00	−123.66
Deviations	−0.81	573.00	−805.00	10.19	118.50	35.61	−467.00	2589.00	420.09
1977									
Balance of payments	−11.50	25.60	2156.10	34.60	−434.40	7.20	951.90	63.90	−51.60
Change in D	11.70	1419.10	1780.00	6.11	2799.60	17.97	415.00	931.00	288.62
Required change in D	27.27	1783.40	4048.00	35.34	2500.00	22.47	1912.00	13626.00	−37.40
Deviations	−15.57	−364.30	−2268.00	−29.23	299.60	−4.50	−1497.00	−12695.00	326.02
1978									
Balance of payments	−17.40	230.40	−1652.50	−21.70	−1541.70	−16.40	−2076.10	84.80	−138.00
Change in D	30.15	2605.80	3315.00	51.07	2610.60	83.56	3527.00	1756.00	236.41
Required change in D	22.82	2845.70	1935.00	38.12	2017.20	17.40	505.00	−3132.00	−168.69
Deviations	7.33	−239.90	1380.00	12.95	593.40	66.16	3022.00	4888.00	405.10
1979									
Balance of payments	−48.40	23.10	1328.80	−71.60	1808.60	−12.40	15.50	−386.00	28.40
Change in D	40.40	952.20	1788.00	71.12	160.80	74.33	3740.00	3579.00	119.37
Required change in D	−7.03	2510.70	1934.00	180.06	2213.90	65.05	4136.00	−7988.00	225.34
Deviations	33.70	−1558.50	−146.00	−108.94	−2053.10	9.28	−396.00	11567.00	−105.97
1980									
Balance of payments	−10.30	−170.10	−1130.40	9.30	2504.50	−93.40	−2.80	−187.00	−83.40
Change in D	37.85	2187.40	2200.00	31.54	512.70	100.50	4389.00	7300.00	209.30
Required change in D	4.29	2082.40	−332.00	46.16	6726.80	−3.48	3316.00	13336.00	180.54
Deviations	33.56	105.00	2532.00	−14.62	−6214.10	103.98	1073.00	−6036.00	28.76

Sources: Tables 1, and 4–12; and calculations.

[1] Required change in D obtained by substituting values of net foreign assets, exports, and net capital inflows into equation (6).

The table also lists the changes in domestic credit that would have been necessary for the balance of payments to have been in equilibrium, which are derived from equation (8). Thus, for example, in 1980 the balance of payments of Zambia registered a deficit of kwacha (KZ) 83 million, while the monetary authorities raised credit by KZ 209 million. Nevertheless, based on the model's predictions, if the authorities would have increased credit by only KZ 180 million (the predicted change in credit), the balance of payments should have been in equilibrium. If the increase in domestic credit would have been less than KZ 180 million, then a surplus should have occurred; however, since the actual increase was larger than KZ 180 million, the balance of payments registered a deficit. Similarly, in 1974 the balance of payments of Zambia registered a surplus of KZ 7 million, while the authorities raised domestic credit by KZ 39 million. The model predicted, however, that an increase in credit of KZ 247 million would have brought about balance of payments equilibrium. Since the actual rise in credit during that year was only KZ 39 million, a surplus emerged; on the other hand, if the rise in credit had been higher than KZ 247 million, then a deficit should have registered. Table 2 also presents the necessary changes in domestic credit required in all sample countries for the period 1965-80. Except for the Gambia and Uganda, there were few cases which contradicted the predictions of the model. For these two countries, however, the results were not satisfactory, as the model yielded inconsistent results in seven of the sixteen years for the former country, and in eight of the years for the latter. It appears that the causes lie with the estimation of the model, as the equations did not properly specify economic events in those countries during the period considered, and the estimates were unrealistic. The estimated marginal prospensity to import for The Gambia (1.05) was too large and statistically insignificant to be accurate, while the estimated value for Uganda was too small (0.01). Furthermore, the estimated velocity of money (11.4) for Uganda was unusually high. One can only speculate on the causes of these poor results: while political instability in the latter country was present throughout the seventies which disrupted the economy, the former country may be too small (population equaling about 580,00) and too integrated with the Senegalese economy to be studied by itself.

For the other sample countries, the results indicated that the predictions of the model were plausible in most years, with the following exceptions: Ghana (1965, 1972); Malawi (1979); Nigeria (1974); and Tanzania (1972). In the case of Ghana, there were problems in 1965 and 1972. During 1965, the balance of payments recorded a deficit of cedis (¢) 57 million and credit was raised by ¢74 million. The model should have predicted an increase in credit less than ¢74 million for balance of payments equilibrium. Yet the

predicted increase was ¢280 million. An explanation of this irregular outcome is very difficult, but part of the reason may be found in the monetary developments during 1963 and 1964, when actual increases in credit totaled ¢65 million and ¢109 million respectively, while required changes were – ¢233.3 million and ¢13 million.[8] The sharp decline in required credit in 1963 and only a moderate increase in 1964 resulted in substantial required increase in 1965 (¢380 million) to offset the net decrease in credit in 1963, and return outstanding credit to some normal level. In 1972, a ¢129 million surplus in the balance of payments was recorded, and the required change was calculated to be ¢74 million. This predicted value, however, should have been larger than the actual increase in credit, which was ¢92 million. Part of the reason for this result lies in the stabilization measures implemented following a military takeover in January 1972. A 44 percent devaluation which was implemented by the civilian government in December 1971 was partially reversed by the military government in February 1972, resulting in a net devaluation of 20 per cent. Furthermore, strict import controls were reimposed, leading to a fall in imports of 16 per cent over 1971.

In Malawi, the balance of payments recorded a deficit of kwacha (KM) 72 million in 1979, with an increase in credit of KM 71 million, while the predicted change was KM 180 million. Since the actual increase in credit was less than the predicted increase, the balance of payments should have registered a surplus. Part of the explanation for this outcome may be found in a weakening in the external sector, which led to a 230 percent rise in the balance of payments deficit during 1979. This deterioration was beyond the control of the authorities, as it was caused by poor weather which adversely affected the tobacco crops, Malawi's principal exports, and by transport disruptions which hampered exports. Similarly for Nigeria, in 1974, the estimated change in credit was naira (N) -3.5 billion, while the actual change was N -2 billion. Thus, the balance of payments should have recorded a deficit, but a N 3.1 billion surplus was registered instead. Undoubtedly, the oil shock of 1973-74 was the cause of these results. With a tripling in oil prices during this period, Nigerian exports increased by 156 per cent during 1974 to approximately 6.3 billion, which would have led to a substantial overall balance of payments surplus regardless of the internal domestic credit policies pursued.

The model also failed to predict what was expected for Tanzania in 1972. During that year, a balance of payments surplus of shillings (ST) 473 million was registered, whilst a deficit should have occurred, since the

[8] For a more complete discussion of the relationship between credit policies and the balance of payments in Ghana during this period, see, Franco, [(1979, pp. 202-215)].

TABLE 3

Simulation of net foreign assets, 1965-80[1]
(in millions of domestic currency units)

	The Gambia (dalasis)	Ghana (cedis)	Kenya (shillings)	Malawi (kwacha)	Nigeria (naira)	Sierra Leone (leones)	Tanzania (shillings)	Uganda (shillings)	Zambia (kwacha)
1965									
Net foreign assets (F)	6.8	−4.1	437.1	17.8	159.7	9.7	368.0	62.1	148.6
Balance of payments (B)	0.8	−56.9	−10.9	−2.0	27.5	1.4	−108.0	−108.9	10.5
Predicted F	25.4	−11.8	238.3	26.2	242.3	14.2	405.6	18.8	137.6
Predicted B	2.6	−76.2	−4.2	−4.8	12.3	2.8	−96.2	12.8	12.3
1966									
Net foreign assets (F)	11.1	−23.9	775.3	13.0	137.8	8.1	595.1	216.3	158.0
Balance of payments (B)	4.3	−19.8	338.2	−4.9	−21.9	−1.7	227.1	154.2	9.4
Predicted F	29.3	−44.7	500.6	20.0	233.1	13.9	603.9	111.6	146.2
Predicted B	3.9	−32.9	262.3	−6.2	−9.2	−0.3	198.3	92.8	8.6
1967									
Net foreign assets (F)	10.5	−50.5	594.0	13.5	55.3	4.5	594.3	287.5	134.5
Balance of payments (B)	−0.6	−26.6	−181.3	0.6	−82.5	−3.6	−0.8	71.2	−23.5
Predicted F	31.2	−67.3	409.2	18.6	186.9	7.8	614.5	122.4	128.7
Predicted B	1.9	−22.6	−91.4	−1.4	−46.2	−6.1	10.6	10.8	−17.5
1968									
Net foreign assets (F)	9.0	−63.6	789.5	14.0	79.7	15.8	702.5	360.4	140.3
Balance of payments (B)	−1.5	−13.1	195.5	0.5	24.4	11.4	108.2	72.9	5.9
Predicted F	27.0	−85.3	585.9	17.5	198.1	11.0	712.9	134.3	135.6
Predicted B	−4.2	−18.0	176.7	−1.1	11.2	3.2	98.4	11.9	6.9
1969									
Net foreign assets (F)	10.0	−82.2	1256.4	14.0	94.3	24.9	818.4	429.0	268.0
Balance of payments (B)	1.0	−18.6	466.9	—	14.6	9.1	115.9	68.6	127.7
Predicted F	30.0	−116.8	1147.3	18.7	207.3	17.1	839.1	161.9	249.8
Predicted B	3.0	−31.5	561.4	1.2	9.2	6.1	126.2	27.6	114.2
1970									
Net foreign assets (F)	16.3	−20.2	1617.3	20.4	153.8	27.2	768.2	463.0	381.7
Balance of payments (B)	6.3	62.0	360.9	6.4	59.5	2.2	−50.2	34.0	113.7
Predicted F	39.6	−97.5	1426.6	23.2	275.6	18.9	808.7	192.9	348.4
Predicted B	9.6	19.3	279.3	4.5	68.3	1.8	−30.4	31.0	98.6
1971									
Net foreign assets (F)	15.4	−1.2	1201.6	20.9	280.0	25.8	904.0	137.3	187.6
Balance of payments (B)	−0.9	19.0	−415.7	0.5	126.6	−1.4	135.8	−325.7	−194.1
Predicted F	41.2	−85.3	1035.0	24.1	389.9	19.8	971.0	198.1	222.1
Predicted B	1.6	12.2	−391.6	0.9	114.3	0.9	162.3	5.2	−126.3

1972									
Net foreign assets (F)	23.7	127.6	1332.2	24.9	243.7	35.9	1337.1	136.2	77.5
Balance of payments (B)	8.3	128.8	130.6	4.0	−36.3	10.1	473.1	−1.1	−110.1
Predicted F	50.3	102.1	1213.2	27.2	385.3	23.0	1332.4	208.4	123.8
Predicted B	9.1	187.4	178.2	3.1	−4.6	3.2	361.4	10.3	−98.3
1973									
Net foreign assets (F)	28.9	232.3	1547.1	51.9	414.6	43.3	1608.3	82.5	68.2
Balance of payments (B)	5.2	104.7	214.9	27.1	170.9	7.4	231.2	−53.7	−9.4
Predicted F	62.2	192.7	1414.4	46.5	524.4	29.5	1513.7	79.8	119.6
Predicted B	11.8	90.6	201.2	19.3	139.1	6.5	181.3	−128.6	−4.2
1974									
Net foreign assets (F)	51.8	23.2	962.0	63.8	3500.3	36.5	585.4	−28.4	75.4
Balance of payments (B)	22.9	−209.1	−585.1	11.9	3085.7	−6.7	−1022.9	−110.9	7.2
Predicted F	87.4	14.1	1335.1	61.1	3334.5	28.3	113.4	−1.6	124.7
Predicted B	25.3	−178.6	−79.3	14.6	2810.1	−1.2	−1400.3	−81.4	5.1
1975									
Net foreign assets (F)	61.1	146.6	569.3	21.6	3667.4	13.8	357.5	78.1	−59.7
Balance of payments (B)	9.3	123.4	−392.7	−42.2	167.1	−22.8	−227.9	106.5	−135.0
Predicted F	92.3	170.5	1273.9	23.3	3591.3	20.2	−83.5	3.7	−36.6
Predicted B	4.9	156.4	−61.2	−37.8	256.8	−8.1	−196.9	5.3	−161.3
1976									
Net foreign assets (F)	49.9	33.8	1452.0	−24.2	3395.7	−4.9	561.2	107.3	−89.1
Balance of payments (B)	−11.2	−112.8	882.7	−45.9	−271.7	−18.7	203.7	29.2	−29.5
Predicted F	128.3	80.3	1935.7	−13.6	3481.2	9.9	98.8	16.0	−68.0
Predicted B	36.0	−90.2	661.8	−36.9	−110.1	−10.3	182.3	12.3	−31.4
1977									
Net foreign assets (F)	38.4	59.4	3608.1	10.3	2961.3	2.3	1513.1	171.2	−140.7
Balance of payments (B)	−11.5	25.6	2156.1	34.6	−434.4	7.2	951.9	63.9	−51.6
Predicted F	153.6	116.5	3876.9	15.7	3219.9	13.1	840.1	64.3	−116.3
Predicted B	25.3	36.2	1941.2	29.3	−261.3	3.2	741.3	48.3	−48.3
1978									
Net foreign assets (F)	21.0	289.8	1955.6	−11.3	1419.6	−14.1	−563.0	256.0	−278.7
Balance of payments (B)	−17.4	230.4	−1652.5	−21.7	−1541.7	−16.4	−2076.1	84.8	−138.0
Predicted F	187.9	305.7	2985.7	−2.6	2404.3	−4.7	−1960.5	142.6	−233.4
Predicted B	34.3	189.2	−891.2	−18.3	−815.6	−17.8	−2800.6	78.3	−117.1
1979									
Net foreign assets (F)	−27.4	312.9	3234.4	−82.9	3228.2	−26.6	−547.5	−130.0	−250.3
Balance of payments (B)	−48.4	23.1	1328.8	−71.6	1808.6	−12.4	15.5	−386.0	28.4
Predicted F	209.5	323.1	4103.0	−63.8	3362.4	−3.5	−1931.3	−319.4	−207.2
Predicted B	21.6	17.4	1117.3	−61.2	958.1	1.2	29.2	−462.0	26.2
1980									
Net foeign assets (F)	−37.7	142.8	2154.0	−73.6	5732.7	−119.9	−550.3	−317.0	−333.8
Balance of payments (B)	−10.3	−170.1	−1130.4	9.3	2504.5	−93.4	−2.8	−187.0	−83.4
Predicted F	236.8	208.3	3121.8	−53.5	5111.7	−49.7	−1922.1	−309.1	−268.8
Predicted B	27.3	−114.8	−981.2	10.3	1749.3	46.2	9.2	10.3	−61.6

Sources: Tables 1 and 4 – 12; and calculations.

[1] Obtained by solving for the general solution of equation (9).

actual increase in credit of ST 110 million was larger than the predicted rise of ST 95 million. However, the difference between the predicted and actual increases in credit is not large enough that it cannot be explained by random errors of sampling.

Table 3 provides simulated values of net foreign assets for all the sample countries for the period 1965-80. The simulation is based on the general solution of the second-order difference equation which can be obtained from equation (5) as follows:

$$F - \frac{1-\mu_2}{1+\mu_1\nu} F_{-1} - \frac{\mu_2}{1+\mu_1\nu} F_{-2} = \frac{\mu_o - \mu_1\nu D + X+K}{1+\mu_1\nu} \qquad (9)$$

The table also lists first differences of the simulated values of net foreign assets, which represent the balance of payments. Except for The Gambia and Uganda, the predicted values of the balance of payments are reasonably close to actual values.

IV. Conclusion

This paper has examined the applicability and usefulness of the monetary approach to the balance of payments for a number of African economies. The model has tried to estimate the relationship between domestic credit and changes in net foreign assets during the period 1965-80 for the following countries – The Gambia, Ghana, Kenya, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda and Zambia – in an effort to guide the monetary authorities of those countries in generating credit policies aimed at reaching a particular balance of payments objective. If the model describes reality fairly accurately, and the statistical results indicate that it may indeed provide one plausible explanation of the behaviour of international reserves for most of the countries considered, then the policymakers could determine the credit ceilings necessary to bring about a desired balance of payments outcome, in the context of a stabilization program. Nevertheless, the usefulness of the model may seem limited, since in order to estimate the required change in domestic credit it is first necessary to know the levels of exports and capital flows. This limitation, however, may be less serious than it appears to be. Policy decisions affecting credit allocations to the economy are usually made during the course of the year. Thus, the monetary authorities already have considerable information by mid-year on the size of export receipts. Many of the countries considered in the analysis are one-commodity economies where one or two agricultural products usually determine the largest proportion of export earnings. These commodities are often

sold in the forward market at predetermined prices enabling the authorities to estimate export receipts with some degree of accuracy. With regard to the magnitude of capital inflows, in developing countries they are determined largely by resource commitments made in advance by donor countries. In addition, the size of the flows is also a function of the amount of foreign borrowings effected by LDCs. Thus, while there may be discrepancies between commitments and disbursements, and between what countries want to borrow and what they actually do borrow, the authorities can determine the range within which actual values of capital flows will fall.

Another set of factors which may place limitations on the model's usefulness concerns the stability through time of the estimated coefficients. In many of the sample countries, institutional regulations such as import restrictions and the tightening or loosening of the import program will undoubtedly affect the specification of the import function. These difficulties, however, are ever-present when one attempts to model economic relationships in LDCs, and little can be done to eliminate them altogether. The above criticisms notwithstanding, the model developed in this paper does provide a reasonable framework within which credit policies can be implemented to achieve a particular balance of payments outcome within a stabilization program.

International Monetary Fund

Appendix

Key symbols used in tables 4 through 12

(All values are expressed in millions of units of currency at current prices).

Y Gross domestic product.
Ms Money supply (D+F).
F Net foreign assets.
M Imports of goods, services and transfer remittances.
X Exports of goods, services, and transfer receipts.
D Domestic credit.
F_{-1} F lagged one year.
F_{-2} F_{-1} lagged one year.
K Net capital inflows $[(F-F_{-1}) + M-X]$.
B Overall balance of payments.
BC Current account balance.
BK Capital account balance.

TABLE 4

The Gambia

Regression data: 1965-80[1] (Millions of dalasis)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	62.69	12.78	6.8	29.1	27.8	5.99	6.0	4.0	2.1	0.8	−1.3	2.1
1966	69.70	15.61	11.1	35.1	30.9	4.49	6.8	6.0	8.5	4.3	−4.2	8.5
1967	76.68	14.96	10.5	35.9	32.1	4.46	11.1	6.8	3.2	−0.6	−3.8	3.2
1968	61.94	16.08	9.0	37.3	35.3	7.12	10.5	11.1	0.5	−1.5	−2.0	0.5
1969	77.36	17.98	10.0	41.8	38.6	7.98	9.0	10.5	4.2	1.0	−3.2	4.2
1970	81.85	24.51	16.3	42.1	41.7	8.20	10.0	9.0	6.7	6.3	−0.4	6.7
1971	81.42	26.22	15.4	50.5	44.2	10.83	16.3	10.0	5.4	−0.9	−6.3	5.4
1972	108.79	35.73	23.7	55.4	51.6	12.05	15.4	16.3	12.1	8.3	−3.8	12.1
1973	109.77	59.29	28.9	63.9	53.1	30.36	23.7	15.4	15.7	5.2	−10.5	15.7
1974	158.35	90.01	51.8	93.4	91.4	38.26	28.9	23.7	24.9	22.9	−2.0	24.9
1975	173.40	106.19	61.1	106.2	118.0	45.12	51.8	28.9	2.5	9.3	11.8	−2.5
1976	210.70	122.37	49.9	154.4	115.0	72.50	61.1	51.8	28.2	−11.2	−39.4	28.2
1977	257.70	122.62	38.4	186.1	156.9	84.20	49.9	61.1	17.7	−11.5	−29.2	17.7
1978	216.60	135.38	21.0	245.1	121.1	114.35	38.4	49.9	106.6	−17.4	−124.0	106.6
1979	212.30	127.32	−27.4	271.9	156.2	154.75	21.0	38.4	67.3	−48.4	−115.7	67.3
1980	225.00	154.93	−37.7	244.7	93.7	192.60	−27.4	21.0	140.7	−10.3	−151.0	140.7

[1]For identification of the variables and their sources, see the key in the appendix.

TABLE 5

Ghana

Regression data: 1965-80[1] (Millions of cedis)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	1466	343.4	−4.1	487.0	256.8	347.5	52.8	70.7	173.3	−56.9	−230.2	173.3
1966	1518	382.2	−23.9	370.1	241.4	406.1	−4.1	52.8	108.9	−19.8	−128.7	108.9
1967	1504	430.7	−50.5	333.1	273.0	481.2	−23.9	−4.1	33.5	−26.6	−60.1	33.5
1968	1700	473.1	−63.6	392.3	348.6	536.7	−50.5	−23.9	30.6	−13.1	−43.7	30.6
1969	1999	494.7	−82.2	449.8	400.2	576.9	−63.6	−50.5	31.0	−18.6	−49.6	31.0
1970	2259	580.0	−20.2	553.6	486.2	600.2	−82.2	−63.6	129.4	62.0	−67.4	129.4
1971	2501	735.0	−1.2	551.1	400.7	736.2	−20.2	−82.2	169.3	19.0	−150.3	169.3
1972	2815	955.5	127.6	460.9	586.7	827.9	−1.2	−20.2	3.0	128.8	125.8	3.0
1973	3501	1075.2	232.3	626.3	758.9	842.9	127.6	−1.2	−27.9	104.7	132.6	−27.9
1974	4660	1277.1	23.2	1083.4	858.4	1253.9	232.3	127.6	15.9	−209.1	−225.0	15.9
1975	5283	1744.2	146.6	1060.8	1029.9	1597.6	23.2	232.3	154.3	123.4	−30.9	154.3
1976	6526	2462.7	33.8	1143.9	1028.2	2428.9	146.6	23.2	2.9	−112.8	−115.7	2.9
1977	11163	3907.4	59.4	1332.3	1173.6	3848.0	33.8	146.6	184.3	25.6	−158.7	184.3
1978	15628	6743.7	289.8	1942.6	1758.7	6453.8	59.4	33.8	414.3	230.4	−183.9	414.3
1979	22192	7718.9	312.9	2759.6	3263.8	7406.0	289.8	59.4	−481.1	23.1	504.2	−481.1
1980	29959	9736.2	142.8	3694.6	3549.7	9593.4	312.9	289.8	−25.2	−170.1	−144.9	−25.2

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 6

Kenya

Regression data: 1965-80[1] (Millions of shillings)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	7139	1478.1	437.1	2885.4	2637.2	1041	448.0	574.2	237.3	−10.9	−248.2	237.3
1966	8224	1775.3	775.3	2987.2	2849.7	1000	437.1	448.0	475.7	338.2	−187.5	475.7
1967	8751	1887.0	594.0	3117.2	2666.4	1293	775.3	437.1	269.5	−181.3	−450.8	269.5
1968	9595	2130.5	789.5	3377.2	2911.4	1341	594.0	775.3	661.3	195.5	−465.8	661.3
1969	10416	2685.4	1256.4	3445.0	3225.0	1429	789.5	594.0	686.9	466.9	−220.0	686.9
1970	11499	3488.3	1617.3	4143.6	3610.7	1871	1256.4	789.5	893.8	360.9	−532.9	893.8
1971	12845	3728.6	1201.6	4992.7	3778.3	2527	1617.3	1256.4	798.7	−415.7	−1214.4	798.7
1972	14447	4350.2	1332.2	4906.7	4148.2	3018	1201.6	1617.3	889.1	130.6	−758.5	889.1
1973	16761	5406.1	1547.1	6034.4	4942.7	3859	1332.2	1201.6	1306.6	214.9	−1091.7	1306.3
1974	20342	5928.0	962.0	9361.7	6938.4	4966	1547.1	1332.2	1838.2	−585.1	−2423.3	1838.2
1975	23846	6983.3	569.3	9448.0	7400.0	6414	962.0	1547.1	1655.3	−392.7	−2048.0	1655.3
1976	29072	8927.0	1452.0	10620.2	9458.1	7475	569.3	962.0	2044.8	882.7	−1162.1	2044.8
1977	37197	12863.1	3608.1	13245.1	13136.8	9255	1452.0	569.3	2264.4	2156.1	−108.3	2264.4
1978	41163	14525.6	1955.6	17433.5	11586.5	12570	3608.1	1452.0	4194.5	−1652.5	−5847.0	4194.5
1979	45167	17642.4	3284.4	16296.1	11978.0	14358	1955.6	3608.1	5646.9	1328.8	−4318.1	5646.9
1980	50500	18712.0	2154.0	18200.0	9180.2	16558	3284.4	1955.6	2889.4	−1130.4	−9019.8	7889.4

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 7

Malawi

Regression data: 1965-80[1] (Millions of kwacha)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	180.2	25.78	17.83	69.1	49.5	7.95	19.83	23.20	17.60	−2.00	−19.60	17.60
1966	204.4	29.55	12.97	74.6	52.8	16.58	17.83	19.83	16.94	−4.86	−21.80	16.94
1967	215.5	34.63	13.52	78.0	52.1	21.11	12.97	17.83	26.45	0.55	−25.90	26.45
1968	225.4	36.46	14.03	87.5	54.2	22.43	13.52	12.97	33.81	0.51	−33.30	33.81
1969	244.4	41.33	14.00	94.3	59.9	27.33	14.03	13.52	34.37	−0.03	−34.40	34.37
1970	267.1	48.43	20.35	105.2	68.6	28.08	14.00	14.03	42.95	6.35	−36.60	42.95
1971	334.9	59.43	20.86	118.0	83.8	38.57	20.35	14.00	34.71	0.51	−34.20	34.71
1972	359.1	70.59	24.89	135.9	89.6	45.70	20.86	20.35	50.33	4.03	−46.30	50.33
1973	401.6	95.40	51.94	151.4	119.4	43.46	24.89	20.86	59.05	27.05	−32.00	59.05
1974	487.1	128.86	63.81	192.2	155.7	65.05	51.94	24.89	48.37	11.87	−36.50	48.37
1975	571.0	144.88	21.61	260.0	183.6	123.27	63.81	51.94	34.20	−42.20	76.40	34.20
1976	659.8	140.25	−24.24	242.4	179.1	164.49	21.61	63.81	17.55	−45.85	−63.40	17.55
1977	769.3	180.92	10.32	277.0	220.3	170.60	−24.24	21.61	91.26	34.56	−56.70	91.26
1978	853.4	210.33	−11.34	345.1	199.9	221.67	10.32	−24.24	123.54	−21.66	−145.20	123.54
1979	910.4	209.86	−82.93	430.4	232.0	292.79	−11.34	10.32	126.81	−71.59	−198.40	126.81
1980	1025.4	250.71	−73.62	469.0	283.6	324.33	−82.93	−11.34	176.09	9.31	−185.40	176.09

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 8

Nigeria

Regression data: 1965-80[1] (Millions of naira)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	3361	512.0	159.7	631.1	490.3	352.3	132.2	153.6	168.3	27.5	−140.8	168.3
1966	3614	572.3	137.8	658.8	510.2	434.5	159.7	132.2	126.7	−21.9	−148.6	126.7
1967	2950	533.0	55.3	683.6	524.3	477.7	137.8	159.7	76.8	−82.5	−159.3	76.8
1968	2878	696.5	79.7	656.4	464.3	616.8	55.3	137.8	216.5	24.4	−192.1	216.5
1969	3851	932.0	94.3	927.9	681.4	837.7	79.7	55.3	261.1	14.6	−246.5	261.1
1970	5621	1323.4	153.8	1265.7	957.9	1169.6	94.3	79.7	367.3	59.5	−307.8	367.3
1971	7098	1428.6	280.0	1722.2	1431.5	1148.6	153.8	94.3	417.3	126.6	−290.7	417.3
1972	7703	1550.0	243.7	1734.3	1523.6	1306.3	280.0	153.8	174.4	−36.3	−210.7	174.4
1973	9001	1848.4	414.6	2442.0	2471.7	1433.8	243.7	280.0	141.2	170.9	29.7	141.2
1974	16962	2925.1	3500.3	3179.4	6323.1	−575.2	414.6	243.7	−58.0	3085.7	3143.7	−58.0
1975	20232	4824.0	3667.4	5515.9	5619.8	1156.6	3500.3	414.6	63.2	167.1	103.9	63.2
1976	24704	6369.9	3395.7	6970.9	6845.0	2974.2	3667.4	3500.3	−145.8	−271.7	−125.9	−145.8
1977	27924	8735.1	2961.3	9090.4	8559.7	5773.8	3395.7	3667.4	965.1	−434.4	−530.7	965.1
1978	28888	9804.0	1419.6	9289.0	7066.0	8384.4	2961.3	3395.7	681.3	−1541.7	−2223.0	681.3
1979	31776	11773.4	3228.2	9531.6	10502.4	8545.2	1419.6	2961.3	837.8	1808.6	970.8	837.8
1980	35590	14790.6	5732.7	15224.9	16803.8	9057.9	3228.2	1419.6	925.8	2504.5	1578.9	925.8

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 9

Sierra Leone

Regression data: 1965-80[1] (Millions of leones)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	246.6	28.92	9.70	70.1	61.1	19.22	8.26	5.79	7.56	1.44	−9.0	10.44
1966	266.7	31.52	8.05	78.4	67.8	23.47	9.70	8.26	8.95	−1.65	−10.6	8.95
1967	269.6	31.32	4.48	82.6	60.8	26.84	8.05	9.70	18.23	−3.57	−21.8	18.23
1968	269.7	40.57	15.83	94.6	89.9	24.74	4.48	8.05	16.05	11.35	−4.7	16.05
1969	310.9	46.44	24.93	114.1	102.2	21.51	15.83	4.48	21.00	9.10	−11.9	21.00
1970	353.3	48.97	27.17	118.8	101.3	21.80	24.93	15.83	19.74	2.24	−17.5	19.74
1971	348.6	53.64	25.79	115.6	94.3	27.85	27.17	24.93	19.92	−1.38	−21.3	19.92
1972	355.8	67.01	35.91	115.2	105.3	31.10	25.79	27.17	20.02	10.12	−9.9	20.02
1973	393.3	86.95	43.27	149.8	120.8	43.68	35.91	25.79	36.36	7.36	−29.0	36.36
1974	477.8	102.34	36.54	216.6	145.7	65.80	43.27	35.91	64.17	−6.73	−70.9	64.17
1975	572.7	112.21	13.75	202.9	136.4	98.46	36.54	43.27	43.71	−22.79	−66.5	43.71
1976	613.5	146.91	−4.92	223.6	148.8	151.83	13.75	36.54	56.13	−18.67	−74.8	56.13
1977	744.2	172.08	2.28	262.5	186.7	169.80	−4.92	13.75	83.00	7.20	−75.8	83.00
1978	814.7	239.24	−14.12	355.0	217.1	253.36	2.28	−4.92	121.50	−16.40	−137.9	121.50
1979	936.9	301.13	−26.56	472.1	259.8	327.69	−14.12	2.28	199.86	−12.44	−212.3	199.86
1980	1049.3	548.10	−119.91	566.5	303.6	428.19	26.56	−14.12	169.55	−93.35	−262.9	169.55

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 10

Tanzania

Regression data: 1965-80[1] (Millions of shillings)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	6140	992.0	368.0	1991.4	1876.4	624	476.1	483.1	7.0	−108.0	−115.0	7.0
1966	7042	1265.1	595.1	2018.9	1984.2	670	368.0	476.1	261.8	227.1	−34.7	261.8
1967	7343	1345.3	594.3	2107.2	2037.9	751	595.1	368.0	68.5	−0.8	−69.3	68.5
1968	7874	1568.5	702.5	2187.2	2077.9	866	594.3	595.1	217.5	108.2	−109.3	217.5
1969	8271	1949.4	818.4	2076.5	2181.5	1131	702.5	594.3	10.9	115.9	105.0	10.9
1970	9173	2039.2	768.3	2644.3	2298.6	1541	818.4	702.5	295.5	−50.2	−345.7	295.5
1971	9814	2832.0	904.0	3251.7	2497.4	1928	768.2	818.4	890.1	135.8	−754.3	890.1
1972	11172	3415.1	1377.1	3380.4	2940.7	2038	904.0	768.2	912.8	473.1	−439.7	912.8
1973	13103	4025.3	1608.3	3989.1	3199.9	2417	1377.1	904.0	1020.4	231.2	−789.2	1020.4
1974	15994	4936.4	585.4	5871.1	3484.7	4351	1608.3	1377.1	1363.5	−1022.9	−2386.4	1363.5
1975	19011	5959.5	357.5	6105.4	3641.8	5602	585.4	1608.3	2235.7	−227.9	−2463.6	2235.7
1976	23373	7508.2	561.2	6049.2	5303.3	6947	357.5	585.4	949.6	203.7	−745.9	949.6
1977	29310	8875.1	1513.1	6986.1	5443.4	7362	561.2	357.5	2494.6	951.9	−1542.7	2494.6
1978	33466	10326.0	−563.0	9744.4	4820.2	10889	1513.1	561.2	2848.1	−2076.1	−4924.2	2848.1
1979	38486	14081.5	−547.5	12667.7	5302.2	14629	−563.0	1513.1	7381.0	15.5	−7365.5	7381.0
1980	44259	18467.4	−550.3	15834.7	5779.4	19018	−547.5	−563.0	10552.5	−2.8	−10055.3	10052.5

[1] For identification of the variables and their sources, see the key in the appendix.

TABLE 11

Uganda

Regression data: 1965-80[1] (Millions of shillings)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	4469	744.1	62.10	1592.1	1572.0	682	171.0	176.3	−88.9	−108.9	−20.1	−88.8
1966	4674	980.3	216.30	1680.3	1581.4	764	62.1	171.0	253.1	154.2	−98.9	253.1
1967	4961	1085.5	287.50	1750.7	1678.6	798	216.3	62.1	143.3	71.2	−72.1	143.3
1968	7406	1299.4	360.40	1715.7	1696.4	939	287.5	216.3	92.2	72.9	−19.3	92.2
1969	8342	1611.0	429.00	1850.0	1828.6	1182	360.4	287.5	90.0	68.6	−21.4	90.0
1970	9449	1947.0	463.00	1938.6	2122.2	1484	429.0	360.4	−149.6	34.0	183.6	−149.6
1971	10367	2005.3	137.30	2607.7	2029.6	1868	463.0	429.0	252.4	−325.7	−578.1	252.4
1972	11287	2576.2	136.20	1923.3	2082.2	2440	137.3	463.0	−160.0	−1.1	158.9	−160.0
1973	12953	3576.5	82.50	1727.7	2039.1	3494	136.2	137.3	−365.1	−53.7	311.4	−365.1
1974	16025	4617.4	−28.40	2359.2	2196.1	4646	82.5	136.2	52.2	−110.9	−163.1	52.2
1975	22502	5285.1	78.10	2375.9	1866.5	5207	−28.4	82.5	615.9	106.5	−509.4	615.9
1976	26453	6697.3	107.30	2465.4	2809.3	6590	78.1	−28.4	−314.7	29.2	343.9	−314.7
1977	48574	7692.2	171.20	4011.6	4596.4	7521	107.3	78.1	−520.9	63.9	584.8	−520.9
1978	64304	9533.0	256.00	3577.5	2594.3	9277	171.2	107.3	1068.0	84.8	−983.2	1068.0
1979	128608	12726.0	−130.00	2989.4	3097.5	12856	256.0	171.2	−494.1	−386.0	108.1	−494.1
1980	282938	19839.0	−317.0	4262.0	3226.0	20156	−130.0	256.0	849.0	−187.0	−1036.0	849.0

[1]For identification of the variables and their sources, see the key in the appendix.

TABLE 12

Zambia

Regression data: 1965-80[1] (Millions of kwacha)

	Y	M_s	F	M	X	D	F_{-1}	F_{-2}	K	B	BC	BK
1965	711	102.23	148.59	395.1	424.6	−46.36	138.09	142.11	−19.00	10.50	29.5	−19.00
1966	848	138.78	157.98	450.5	488.6	−19.20	148.59	138.09	−28.72	9.39	38.1	−28.72
1967	957	162.17	134.46	492.9	502.9	27.71	157.98	148.59	−33.52	−23.52	10.0	−33.52
1968	1062	193.77	140.34	529.3	551.4	53.43	134.46	157.98	−16.22	5.88	22.1	−16.22
1969	1314	261.75	268.01	490.0	879.3	−6.26	140.34	134.46	−262.23	127.67	389.3	−261.63
1970	1269	354.92	381.66	532.2	713.6	−26.74	268.01	140.34	−67.75	113.65	181.4	−67.75
1971	1181	388.95	187.57	588.2	519.4	201.38	381.66	268.01	−123.29	−194.09	−68.8	−125.29
1972	1338	390.83	77.50	645.3	592.6	313.33	187.57	381.66	−57.37	−110.07	−52.7	−57.37
1973	1588	444.92	68.15	614.7	781.2	376.77	77.50	187.57	−175.85	−9.35	166.5	−175.85
1974	1893	491.15	75.38	859.8	951.9	415.77	68.15	77.50	−84.87	7.23	92.1	−84.87
1975	1583	649.91	−59.65	948.5	566.4	709.56	75.38	68.15	247.07	−135.03	−382.1	247.07
1976	1872	916.87	−89.13	820.1	810.1	1006.00	−59.65	75.38	−19.48	−29.48	−10.0	−19.48
1977	1952	1153.94	−140.68	875.1	768.3	1294.62	−89.13	−59.65	55.25	−51.55	−106.8	55.25
1978	2201	1252.34	−278.69	857.0	726.5	1531.03	−140.68	−89.13	−7.51	−138.01	−130.5	−7.51
1979	2623	1400.09	−250.31	997.0	1029.1	1650.40	−278.69	−140.68	−183.52	28.38	211.9	−183.52
1980	3038	1525.95	−333.75	1472.1	1227.3	1859.70	−250.31	−278.69	161.36	−83.44	−244.8	161.36

[1] For identification of the variables and their sources, see the key in the appendix.

Sources: For the years 1965 through 1978, for all countries the data are from the International Monetary Fund Data Tables as presented in the IMF's International Financial Statistics; for the years 1979-80, apart from direct communication from the countries concerned, the sources are recent issues of the following national statistical bulletins:

The Gambia, Central Bank of The Gambia Bulletin.
Ghana, External Trade Statistics.
Kenya, Kenya Statistical Digest.
Malawi, Monthly Statistical Bulletin.
Nigeria, Digest of Statistics; Economic Indicators.
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