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AN ECONOMETRIC STUDY OF SELECTED MONETARY POLICY ISSUES IN KENYA

F M Mwega

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AN ECONOMETRIC STUDY OF SELECTED MONETARY POLICY ISSUES IN KENYA

F.M. Mwega

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Department of Economics
University of Nairobi
P.O. Box 30197
Nairobi, Kenya

Preface and Acknowledgements

ODI working papers present in preliminary form work resulting from research undertaken under the auspices of the Institute. Views expressed are those of the authors and do not necessarily reflect the views of ODI or supporting institutions. Comments are welcomed and should be addressed directly to the authors or project leaders.

This working paper is one of seven country studies prepared as part of a study of the role of monetary policy in primary product-dependent, low income countries. The objective of the general study is to examine what monetary policy can be expected to accomplish and the principal constraints upon its effectiveness. The country studies examine the development of monetary institutions, the determination of money supply and demand, and the objectives and experience of governments in implementing monetary policy in individual countries. Other case studies include China, Côte d'Ivoire, Bangladesh and Indonesia. It is hoped that the final report will be published in 1991. The project is directed at ODI by Sheila Page. We are grateful for financial support from the Overseas Development Administration, the Rockefeller Foundation and the International Development Research Centre of Canada.

This paper should be read in conjunction with the companion paper No. 39 by Tony Killick and F.M. Mwega, 'Monetary policy in Kenya, 1967-88', which provides fuller background information on the Kenyan economy and a broader, less technical discussion of monetary policy, drawing upon the results reported here. The author is Lecturer in Economics, University of Nairobi, and was a Research Associate of ODI as a participant in the project described above.

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1. INTRODUCTION

Studies (*e.g.* Killick, 1976, Finucane *et al.*, 1985) of the literature on the economy of Kenya have found that there has been relatively little research into the use of fiscal and monetary policies. They attribute this to the traditional bias in economic research which favours microeconomics and problems of long-run development to the detriment of macroeconomics and problems of short-run economic management. The Kenyan economy has also performed fairly well, so that there was little public interest in stabilisation policies.

The objective of this paper is to contribute to this literature by analysing three sets of issues on monetary policy in Kenya. First, whether the demand for money is stable, for only then can policy-makers be in a position to predict the macroeconomic consequences of their financial policies (especially when they rely heavily on deficit finance to fund development programs), since it is the demand for money that links the nominal money supply to the behaviour of domestic prices, the balance of payments, and real income. Secondly, whether money matters; in other words, whether changes in the monetary variables significantly influence the domestic price level and the balance of payments. The third set of issues is the controllability of money and credit and the extent to which policy-makers can influence these variables.

This paper should be read in conjunction with a companion piece by Tony Killick and F.M. Mwega, 'Monetary Policy in Kenya, 1967-88' (ODI Working Paper No. 39, 1990), which draws extensively upon the results presented here but provides a somewhat broader and less technical discussion. The present paper provides much fuller information on the methodologies and data employed.

2. THE DEMAND FOR MONEY IN KENYA

There are only two published studies on this subject - by Pathak [1981] and Dharat [1985], both of which covered the ten-year period up to 1978. While Dharat did find the demand for money stable, recent developments suggest the need to re-examine the issue. First, the economy has continued to be buffeted by external and exogenous shocks mainly associated with changes in import and export prices and by the vagaries of the weather.[1] Secondly, it has been subjected to policy shocks as the authorities have attempted to stabilise the situation by applying adjustment policies mainly prescribed by the World Bank and the IMF.[2] Finally, in the 1980s the country experienced a very rapid growth in non-bank financial intermediaries (NBFIs); by the end of 1988 there were 54 NBFIs, 31 of them established in the first half of the decade. It is a well-known hypothesis [Gurley and Shaw, 1960] that such a rapid growth in NBFIs may change the elasticity of the money demand function in respect to one or several of its determinants. This section therefore tests whether all these developments did in fact render the demand for money in Kenya unstable.

2.1 The estimation model

Monetary theory suggests that the desired demand for real money balances (m^*) is a positive function of a scale variable such as the measured real income (y) or the expected real income (y^e) and a negative function of the opportunity cost of holding money. Since money can be substituted by physical and financial assets, the opportunity cost of holding money is measured by the expected rate of inflation and a relevant expected rate of interest (R^e) respectively.

In an open economy like that of Kenya where imports and exports comprise around a quarter of GDP, the less volatile expected real income is likely to be a better scale variable than measured real income, as empirically found by Dharat [1985]. It is therefore the one used here. On the other hand, about the only relevant financial asset alternative to money in Kenya is treasury bills. Since 1969 the central bank has invited tenders and sold bills to the highest bidders so that the treasury bill rate is one of the few interest rates in the country which fluctuates relatively freely in accordance with conditions in the money market. However, the central bank influences the rate by manipulating the tendering process in an effort to ensure that it moves in line with the other more rigid interest rates which, nonetheless, have been drastically increased in the 1980s in an attempt to keep them positive in real terms. The treasury bill can therefore be taken as a representative measure of the opportunity cost of holding money *vis-à-vis* other financial assets, especially for large money-holders.

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1 These shocks include the increase in the price of oil in 1979 and its decline in the early 1980s, a military coup attempt in August 1982, a severe drought in 1984, and a mini boom in beverage exports in 1986.

2 For instance the country implemented IMF stabilisation programmes throughout the 1980s except for 1986/7.

To estimate the demand for money, it is necessary to specify the functional form of the model used. Following general practice, we use the following semi log-linear model attributed to Cagan [1956]:

$$\text{Log } m^*(t) = \alpha_0 + \alpha_1 \log y^e(t) + \alpha_2 \pi^e(t) + \alpha_3 \log R^e(t) + u_1(t) \tag{2.1}$$

with $\alpha_1 > 0$, $\alpha_2 < 0$,and $\alpha_3 < 0$, where t denotes the time period and u_1 is a log-linear error term.

Because of inertia and asset portfolio adjustment costs, *inter alia*, the desired real money balances are not equal to measured real money balances. To enable equation (2.1) to be estimated, it is therefore essential to postulate how money- holders adjust measured real money balances to the desired level and how they formulate their expectations. The adjustment mechanism is described by the following frequently employed (*e.g.* by Chow, 1966) logarithmic partial adjustment process:

$$\Delta \log m(t) = \delta[\log m^*(t) - \log m(t-1)] \tag{2.2}$$

where $0 < \delta < 1$ so that only a fraction (δ) of the desired change in the stock of real money balances is adjusted for in any period. At the same time, money-holders are postulated to formulate their expectations so as to minimise the discrepancy between the measured and the expected values of a variable as captured by the following quadratic loss function:

$$L = [X^e(t) - X(t)]^2 \tag{2.3}$$

where the expected values are estimated from the measured current values as given by:

$$X^e(t) = \Sigma w_i X(t-j) \tag{2.4}$$

where w_i are weights. Given equations (2.3) and (2.4), an expected variable is predicted from a regression of measured values on their current and previous values to give $X\hat{}(t)$. The weights, w_i, were estimated by a fifth-degree Almon polynomial without imposing end-point restrictions. The length of the lag, n, was constrained to 12 quarters. The relatively high Almon polynomial and the long lag ensure that an expected variable reflects as much as possible the current and the past behaviour of its counterpart measured values.

Making the substitutions, the following money demand model is then estimated for Kenya:

$$\begin{aligned} \text{Log } m(t) = {} & \delta\alpha_0 + \delta\alpha_1 \log y\hat{}(t) + \delta\alpha_2 \pi\hat{}(t) + \delta\alpha_3 \log R\hat{}(t) \\ & + (1-\delta)\log m(t-1) + u_2(t) \end{aligned} \tag{2.5}$$

where $u_2(t)$ is a log-linear error term and the other variables are as defined above. Equation (2.5) was estimated for both narrow money (M1) and broad money (M2 and

M3) using 1973:3-1988:4 quarterly data (excluding lags).[3] All the estimated equations were controlled for first order serial correlation by the Cochrane and Orcutt [1949] technique.[4]

2.2 Empirical results

Table 1 shows the estimates of Kenya's short-run money demand functions. The adjusted coefficients of determination demonstrate that the regression model explains a very high proportion of the real demand for money in Kenya. The DW-statistics which are calculated after the equations are controlled for serial correlation indicate that the equations do not suffer significantly from any remaining autocorrelation.[5]

The lagged dependent variable is significant at the 1% level, even though the speed of adjustment of the actual real money balances is relatively slow at 16% for real M1, 10% for real M2, and 4% for real M3. This is a typical result in partial adjustment money demand models [Blinder, 1986].

The real income coefficients are positive as expected, even though the derived long-run real income elasticities of demand of 0.248 for real M1; 0.778 for real M2; and 0.556 for real M3 are much smaller than are generally found for developing countries [Adenkule, 1968; Wong, 1977]. Expected inflation and the expected treasury bill rate are also significant determinants of the demand for money with their coefficients significant at the 1% level, with a 10% increase in the expected treasury bill rate anticipated to reduce the demand for real M1 and M2 by 3.7% and 1.7% respectively in the short run. This suggests that treasury bills are attractive alternatives to M1 and M2, so that, as pointed out by Pathak [1981], interest rates are potentially an important tool of monetary policy in the country. However, the expected rate is not significant at the 5% level in explaining the demand for real M3, so that treasury bills are not an attractive alternative to NBFI deposits for money-holders.

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3 It should be noted that there is a degree of double-counting involved in the calculation of M3, to the extent that NBFIs hold deposits in the commercial banks. Unfortunately, there is no published information which would enable the data to be corrected for this, so that the M3 used in the paper should be thought of as a proxy for the actual M3 that would consolidate commercial banks and NBFI deposits.

4 Use of the Beach and McKinnon [1978] maximum likelihood procedure did not significantly change the results despite recent misgivings about the appropriateness of the Cochrane and Orcutt method in situations where a lagged dependent variable is included in an equation, in which case a maximum likelihood technique is considered more appropriate [Blinder, 1986].

5 The Durbin h-statistics or the alternative Durbin t-statistics were not estimated for these and the other equations in the paper with a lagged dependent variable, firstly because many of them had a DW-statistic of about 2 so that by definition $h \approx 0$. Secondly, this was not considered unduly necessary as many of these equations were controlled for serial correlation by the Cochrane-Orcutt method.

Table 1: Short-run money demand functions for Kenya; 1973:3-1988:4

Dependent variable	*log m1*	*log m2*	*log m3*
constant	0.945	0.196	0.176
	(1.524)	(0.535)	(0.583)
Log^y(t)	0.040	0.074[b]	0.020
	(0.697)	(1.682)	(0.561)
π^(t)	-1.280[a]	-1.319[a]	-1.206[a]
	(3.033)	(5.026)	(5.522)
Log^R(t)	-0.037[a]	-0.017[a]	-0.009
	(3.091)	(2.687)	(1.574)
Log m(t-1)	0.839[a]	0.905[a]	0.964[a]
	(12.752)	(19.686)	(30.909)
Adjusted R^2	0.82	0.92	0.97
DW	2.03	2.00	2.00
SSR	0.231	0.090	0.062
F(4,57)	72.06[a]	174.017[a]	534.02[a]

Notes: (a) significant at the 1% level;
(b) significant at the 5% level.

2.3 The stability of the demand for money

The stability of the money demand functions is evaluated by the Gujarati test [Johnson, 1972] using the results in Table 2, namely, when the constant- and slope-shift dummies for the second half of the estimation period (1981:2-1988:4) are added to the equations. The Gujarati test then examines whether these shift dummies are jointly significant from zero using the F-test, the calculated F-statistics being 0.83 for M1, 1.13 for M2 and 1.60 for the M3 equations. Since these values are not significant at even the 10% level, the hypothesis that the money demand equations are stable cannot be rejected even though the F-statistics indicate that the degree of instability increases the broader the money definition.[6]

[6] Application of the more traditional Chow test of structural change gave F=0.79 for the real M1 equation; 1.25 for the real M2 equation; and 1.45 for the real M3 equation, none of which is significant at the 10% level.

Table 2: Short-run money demand functions for Kenya; 1973:3-1988:4

Dependent variable	*log m1*	*log m2*	*log m3*
constant	-0.212 (0.234)	-0.524 (1.011)	-0.547 (1.291)
Log^y(t)	0.205[b] (1.869)	0.190[a] (2.725)	0.149[a] (2.531)
π^(t)	-1.133[b] (2.166)	-1.031[a] (3.268)	-1.015[a] (3.968)
Log^R(t)	-0.037[a] (2.425)	-0.025[a] (2.858)	-0.018[a] (2.496)
Log m(t-1)	0.803[a] (8.077)	0.866[a] (15.958)	0.914[a] (22.958)
D	2.190[b] (1.683)	1.184[b] (1.692)	1.276[b] (2.139)
D*Log^y(t)	-0.227[b] (1.717)	-0.175[b] (1.960)	-0.165[b] (2.212)
D*π^(t)	-0.195 (0.210)	-0.842 (1.561)	-0.642 (1.409)
D*Log^R(t)	-0.033 (0.393)	0.005 (0.101)	0.013 (0.331)
D*Log m(t-1)	-0.029 (0.191)	0.047 (0.511)	0.028 (0.403)
Adjusted R^2	0.82	0.92	0.97
DW	2.02	2.03	2.02
SSR	0.214	0.081	0.054
F(9,52)	32.08[a]	79.41[a]	251.72[a]

Notes: (a) significant at the 1% level;
(b) significant at the 5% level.

At the same time, Table 2 shows this is the case despite a significant decline in the expected income elasticity of demand for money.[7] For example, the long-run expected elasticity of demand is 1.04 for real M1 and 1.418 for real M2 in 1973:3-1981:1. These are closer to Dharat's estimates for 1969:1-1978:4 of 1.813 for real M1 and 1.912 for real M2.

[7] This is not inconsistent with a stable function because stability does not mean that individual parameters remain numerically constant over time, but relates to the entire money demand function rather than to the individual coefficients in that function.

Several factors could have caused this structural change. For example, the structural adjustment policies carried out in the 1980s might have induced money-holders to economise on their financial holdings, resulting in an increase in the velocity of money circulation. However, this elasticity change was counteracted by movements in the other coefficients, particularly the upward shift in functions, to leave the money demand stable. Therefore, while the monetary authorities can still use the conventional money demand model to predict the consequences of their financial policies, with negative changes in some coefficients offset by positive changes in others, they cannot tell *a priori* the extent to which such a balancing act can be relied upon always to take place.

3. MONEY AND INFLATION

Before the early 1970s, Kenya experienced a low rate of inflation averaging 3-4% p.a. in the period 1966-73. After 1973, however, the rate shot to double figures where it remained until well into the 1980s.[8]

A number of studies have attempted to explain inflation in Kenya, which the government has usually blamed on import prices especially following the OPEC oil price hikes of 1973-74 and 1979-80. Adongo [1978], for example, estimated an inflation equation using quarterly data for 1971-7 from which he concluded that monetary growth (lagged two years) was significant and external inflation (lagged one year) insignificant at the 5% level in influencing inflation in Kenya.

These results were endorsed by Killick [1984] who argued that, since imports comprise only about 15% of final expenditures as discerned from Kenya's input-output tables, import prices account for only a small proportion of the inflation rate since the propagation mechanism through the labour market is almost non-existent. At the same time, he found inflation closely correlated with M2 growth (lagged two years) after removing the influence of real income growth.

The view that money supply is a significant influence on Kenyan inflation is further supported by Nganda [1985] and Kiptui [1989] in OLS estimations of inflation equations derived from money demand models. Nganda, using 1968-83 annual data, concluded that inflation significantly declined with real income and that it significantly increased with interest rates on quasi-money and the growth of real M2 while the lagged inflation rate was not significant. Kiptui, on the other hand, found that the inflation rate increased significantly with real M2 growth and the rate of change of import prices, while the lagged inflation rate and, surprisingly, real income were not significant at the 5% level, the latter perhaps because of the likely high correlation between real income and real money supply.

Drawing on the analyses in these studies, we estimate by OLS the following equation to explain inflation in Kenya in the period 1971-88 (excluding lags):

$$\Delta\log P(t) = \beta_0 + \beta_1\Delta\log y(t) + \beta_2\Delta\log M(t) + \beta_3\Delta\log Pm(t) + \beta_4\Delta\log P(t-1) + u_3(t) \qquad (3.1)$$

where $\Delta\log P$ is the rate of inflation, $\Delta\log y$ is the growth in real GNP, $\Delta\log M$ is the growth in nominal money supply, and $\Delta\log Pm$ is the rate of change in import prices, with lagged inflation measuring the influence of static expectations. The results from estimating equation (3.1) are given in Table 3.

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[8] Inflation in Kenya was as follows in 1966-88,%:

1966	*1967*	*1968*	*1969*	*1970*	*1971*	*1972*	*1973*	*1974*	*1975*	*1976*	*1977*
4.0	1.6	0.5	-0.2	2.1	3.7	6.1	9.3	17.7	19.0	11.4	14.9
1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	
16.9	8.0	3.8	11.8	20.4	11.5	10.2	13.1	4.0	5.2	8.8	

Source: IMF, International Financial Statistics.

They show that in 1971-88 real income growth was the most significant determinant of inflation in Kenya with a 1% increase in income growth reducing inflation by 0.57%. This was offset, however, by changes in money supply and import prices which are also significant at the 1% level. A 1% expansion in M2 growth increased inflation by 0.25% while a 1% increase in import prices increased inflation by 0.21% in 1971-88.

Table 3: OLS estimates of the inflation equation (Δlog P) in Kenya

	1971-82	*1971-88*
constant	0.028 (0.957)	0.055[(b)] (2.981)
Δlog y	- 0.601[(a)] (3.497)	-0.574[(a)] (4.635)
Δlog M2	0.304[(b)] (2.583)	0.253[(a)] (3.166)
Δlog Pm	0.269[(b)] (2.767)	0.208[a] (3.402)
Δlog P_{-1}	0.139 (0.723)	0.076 (0.581)
R^2	0.78	0.79
DW	2.68	2.21
DF	7	13

Notes: (a) significant at the 1% level;
(b) significant at the 5% level.

Lastly, the lagged inflation rate - a proxy for the influence of public expectations of future inflation - has an insignificant impact.

To assess the ability of this model to explain inflation in 1971-88, Table 4 compares the actual and the model-simulated inflation rates. In a retrospective simulation and despite large estimation errors in some years, the calculated equation tracks the actually observed rate of inflation fairly well. For example, it traces out its rapid rise in 1972-4 and its decline in 1982-4 and in 1986.

The results for 1971-82 in Table 3 also show a tendency for the absolute size of the impact coefficients to decline over time even as they have become statistically more robust while the equations have shifted upwards. This may be because of the influence of the structural adjustment policies and the rapid growth in NBFIs in the 1980s, this suggesting that the growth in M3 (M2 + deposits in NBFIs) may better explain inflation in Kenya. To assess the extent that this was the case, the inflation equation was estimated with the growth in M2 replaced by the growth in M3.

Table 4: Actual and simulated rates of inflation, 1971-88 (%)

Year	*Actual inflation*	*Simulated inflation*	*Error*
1971	3.7	5.0	-27.0
1972	6.1	8.6	-29.4
1973	8.9	12.9	-31.1
1974	16.4	14.3	14.4
1975	17.4	17.5	-0.2
1976	10.8	9.8	10.4
1977	13.8	11.2	24.1
1978	15.7	14.2	10.4
1979	7.7	11.0	-30.3
1980	12.9	10.6	21.6
1981	11.2	13.2	-15.6
1982	18.6	17.6	5.8
1983	10.9	12.3	-11.8
1984	9.6	7.5	28.0
1985	12.3	11.9	2.8
1986	3.9	4.8	-18.5
1987	5.1	4.5	12.1
1988	7.9	5.8	36.8

error = (actual-simulated)/simulated inflation

Estimates of this equation for 1976-88 (when consistent data were available) using this broad definition of monetary growth are given in Table 5.

The results show that the explanatory power of the model (R^2s) and the t-values of Δlog y, Δlog M and Δlog Pm do increase. The coefficient of Δlog M increases from 0.32 to 0.36 while that of Δlog y and of Δlog Pm decline so that M3 growth is better correlated with inflation than M2 growth.

These results do not change drastically when the inflation equation is controlled for the likely feedback from inflation to money supply, which may come about through the influence of inflation on the government budget. According to the hypothesis popularised by Aghelvi and Khan [1978], it is postulated that, for socio-political reasons, developing country governments tend to maintain their expenditures constant in real terms while because of rigid tax structures and lags in collection, tax revenues tend to remain constant in nominal terms. Inflation, therefore, widens budget deficits which, if financed by borrowing from the banking system, increase money supply and accelerate inflation. To take into account such a feedback mechanism, the equation was estimated by the instrumental variables (IV) method over the period 1971-88 with Δlog M2 measuring monetary growth and for 1976-88, with Δlog M3 measuring monetary growth. The instruments used were the RHS variables lagged one year, Δlog y(t), Δlog Pm(t) and Δlog P(t-1). The regression results are given in Table 6.

Table 5: OLS estimates of the inflation equation, 1976-88

	1976-88	*1976-88*
constant	0.080[(a)] (4.494)	0.069[(a)] (4.151)
Δlog y	-0.636[(a)] (5.993)	-0.580[(a)] (6.152)
Δlog M2	0.324[(a)] (4.305)	
Δlog M3		0.361[(a)] (5.063)
Δlog Pm	0.223[(a)] (3.087)	0.207[(a)] (3.350)
Δlog P_{-1}	-0.185 (1.305)	-0.187 (1.492)
R^2	0.86	0.89
DW	2.30	2.53
DF	8	8

Notes: (a) significant at the 1% level.

Table 6: IV estimates of the inflation equation in Kenya

	1971-88	*1976-88*
constant	0.038[(b)] (1.784)	0.070[(a)] (5.097)
Δlog y	-0.691[(a)] (4.762)	-0.576[(a)] (7.979)
Δlog M2	0.436[(a)] (3.085)	
Δlog M3		0.350[(a)] (5.046)
Δlog Pm	0.263[(a)] (3.717)	0.203[(a)] (3.947)
Δlog P-1	-0.043 (0.285)	-0.178 (1.737)
R^2	0.71	0.89
DW	2.04	2.47
DF	13	8

Notes: (a) significant at the 1% level;
(b) significant at the 5% level.

When these results are compared with those in Tables 3 and 5, in the equation that measures monetary growth by Δlog M2, the impact of using the IV method is considerably to increase the absolute size and significance of the impact coefficients. For instance, the coefficient of Δlog y rises from -0.574 to -0.691; that of Δlog M2 from 0.253 to 0.436; that of Δlog Pm from 0.208 to 0.263. In contrast, the use of the IV technique produces no drastic changes in the equation that uses Δlog M3 to measure monetary growth. The coefficient of Δlog y, for instance, changes only from 0.361 to 0.350; that of Δlog M3 from 0.207 to 0.203 and that of Δlog Pm from 0.207 to 0.203; indicating yet again that changes in M3 are better correlated with inflation than changes in M2.

4. CREDIT AND THE BALANCE OF PAYMENTS

The ability of monetary authorities to pursue an effective monetary policy depends on the extent to which domestic credit (ΔDC) from the country's financial system is offset by changes in net foreign assets (ΔNFA) and the degree to which they can manipulate ΔDC to sterilise the impact of ΔNFA in augmenting money supply.

In Kenya, the offset and the sterilisation effects have only been studied obliquely in attempts to unravel the relative importance of domestic and external factors in the determination of the balance of payments. One group of studies [Grubel and Ryan, 1978; King, 1979] argues that the offset effect is important and the feedback effects unimportant, so that policy-makers can manipulate ΔDC to influence ΔNFA. On the other hand, another group of studies [Maitha *et al.*, 1978; Killick, 1984] argues that the monetary authorities in Kenya have avoided large changes in DC so that the impact on ΔNFA has been minor, while they do not generally sterilise the impact of ΔNFA on money supply so that it is ΔDC that tends significantly to respond to ΔNFA.

This section analyses the causal relationships between ΔDC and ΔNFA. The analytical framework used is the money supply identity which consolidates the balance sheets of the financial system. In this identity, ΔNFA is expressed as the difference between changes in broad money supply and DC, the basis of the monetary approach to the balance of payments. According to this approach, if a small open economy maintains a fixed exchange rate and its demand for money is stable, ΔDC is in the long run fully offset by ΔNFA, with the overall balance of payments reflecting disequilibrium in the demand for money relative to supply. In the short run, however, changes in the availability of credit may influence prices, income and hence money demand so that the offset relationship is disrupted, while the exchange rate may change to counteract the impact of ΔDC on ΔNFA. ΔNFA may also influence ΔDC so that the model becomes mis-specified.

To study the causal relationships between ΔDC and ΔNFA, the Granger [1969] methodology is used. In this methodology, a variable, X, causes another variable, Y, if past Xs are jointly significant in explaining Y when past Ys are included as explanatory variables of Y in a regression model.

Application of this method requires that the time series variables be purged of systematic temporal movements. As a result, ΔDC and ΔNFA were first detrended and deseasonalised by regressing them on an annual trend variable and on quarterly dummies, and the residuals used in the analysis. Information on changes in the terms of trade was also used to explain ΔNFA.

The following equations were fitted to quarterly data over 1972:4-1988:3 (excluding lags). It was assumed that the temporal effects take at least one quarter and at most two years to manifest themselves significantly.[9]

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[9] Longer lags could not be used because of the need to preserve degrees of freedom. There was also no compelling theoretical reason to include the terms of trade variable in the second equation. Including the term, however, did not significantly influence the results.

$$\Delta NFA(t) = \alpha_{00} + \Sigma\alpha_{1j}\Delta NFA(t-j) + \Sigma\alpha_{2j}\Delta DC(t-j) + \alpha_{40}\Delta TOT + u_4(t) \quad (4.1)$$

$$\Delta DC(t) = \beta_{00} + \Sigma\beta_{1j}\Delta DC(t-j) + \Sigma\beta_{2j}\Delta NFA(t-j) + u_5(t) \quad (4.2)$$

where DC denotes domestic credit or one of its components -domestic credit to the private sector (DCP); domestic credit to the public sector (DCG) or credit by NBFIs (NBFIC) - TOT is terms of trade and u_4 and u_5 are mutually uncorrelated 'white noise' residuals.

The null hypothesis that there was a significant offset relationship between ΔDC and ΔNFA was accepted if $\alpha_{2j} \neq 0$ for all j, while the alternative hypothesis that there were significant feedback effects was accepted if $\beta_{2j} \neq 0$ for all j. ΔDC and ΔNFA were independent of one another if $\alpha_{2j}=\beta_{2j}=0$ for all j.

The joint significance of the coefficients was evaluated by the F-test, with the equations first fitted in constrained form with $\alpha_{2j}=\beta_{2j}=0$ for all j and then in non-constrained form. The F-statistic was then calculated in the usual way as:

$$F(8,DF) = \frac{SSRc-SSRnc/8}{SSRnc/DF}$$

where SSRc and SSRnc are the sums of squared residuals in the constrained and non-constrained equations respectively, and DF is the degree of freedom in the non-constrained equation.

The regression results from estimating equations (4.1) and (4.2) are given in Table 7. They show that ΔDCP did not have a significant offset impact on ΔNFA in 1972:4-1988:3, while ΔNFA had a positive causal impact on ΔDCP owing to the credit creation process partly supporting the non-monetarist studies of the balance of payments in Kenya. However, ΔDCG had a significant offset impact on ΔNFA while ΔNFA had a significant sterilization impact on ΔDCG because of discretionary policies and perhaps because an increase in NFA was positively correlated with the level of economic activity and tax receipts so that there was less need for the public sector to borrow from the banking system.

When added together in rows 3(a) and (b), ΔDC was significantly offset in ΔNFA while the effects of ΔDCP and ΔDCG counteracted one another so that ΔNFA had an insignificant causal impact on ΔDC. In general then, this result seems to support the monetarist studies of Kenya's balance of payments that ΔDC is significantly offset in ΔNFA without significant feedback effects from ΔNFA to ΔDC. This conclusion is not affected by the addition of NBFI credit (NBFIC) to that of the banking system, as seen in the results in rows 4(a) and (b) in the table.

To evaluate the stability of these results, Granger causality tests were repeated for 1972:4-1980:3 and 1980:3-1988:3. The results are given in Tables 8 and 9.

The results for the earlier period are similar to those discussed above except that ΔDCG is no longer significantly offset by ΔNFA, and ΔDCP and ΔDCG do not fully counteract one another so that ΔNFA has a significant feedback impact on ΔDC and ΔTDC.

Table 7: Results of causality between domestic credit and changes in net foreign reserves in Kenya; 1972:4-1988:3

Direction of causality	*SSRc*	*SSRn*	*DF*	*F-Stat*	*Expected pattern*
1 (a) ΔDCP to ΔNFA	15,989,000	14,824,000	46	0.45	-
(b) ΔNFA to ΔDCP	5,803,400	3,787,800	47	3.13[a]	+
2 (a) ΔDCG to ΔNFA	15,989,000	10,738,000	46	2.81[b]	-
(b) ΔNFA to ΔDCG	36,414,000	32,589,000	47	0.70	-
3 (a) ΔDC to ΔNFA	15,989,000	11,629,000	46	2.16[b]	-
(b) ΔNFA to ΔDC	40,709,000	35,325,000	47	0.90	+/-
4 (a) ΔNBFIC to ΔNFA	15,989,000	13,757,000	46	0.93	-
(b) ΔNFA to ΔNBFIC	4,652,200	3,563,000	47	1.80[c]	+
5 (a) ΔTDC to ΔNFA	15,989,000	12,049,000	46	1.88[c]	-
(b) ΔNFA to ΔTDC	48,632,000	40,920,000	47	1.11	+/-

Notes (a) significant at the 1% level;
(b) significant at the 5% level;
(c) significant at the 10% level.

Table 8: Results of causality between domestic credit and changes in net foreign reserves in Kenya; 1972:4-1980:3

Direction of causality	*SSRc*	*SSRnc*	*DF*	*F-Stat*	*Expected pattern*
1 (a) ΔDCP to ΔNFA	3,365,700	2,139,700	14	1.00	-
(b) ΔNFA to ΔDCP	1,432,300	307,930	15	6.85[b]	+
2 (a) ΔDCG to ΔNFA	3,365,700	2,472,800	14	0.63	-
(b) ΔNFA to ΔDCG	1,759,800	1,068,600	15	1.21	-
3 (a) ΔDC to ΔNFA	3,365,700	1,740,100	14	1.63[b]	-
(b) ΔNFA to ΔDC	2,275,900	821,530	15	3.32[b]	+/-
4 (a) ΔNBFIC to ΔNFA	3,365,700	2,852,700	14	0.31	-
(b) ΔNFA to ΔNBFIC	1,324,000	757,240	15	1.40	+
5 (a) ΔTDC to ΔNFA	3,365,700	1,730,900	14	1.65[b]	-
(b) ΔNFA to ΔTDC	2,858,900	875,160	15	4.25[a]	+/-

Notes: (a) significant at the 1% level;
(b) significant at the 5% level.

Table 9: Results of causality between domestic credit and changes in net foreign reserves in Kenya; 1980:4-1988:3

Direction of causality	*SSRc*	*SSRnc*	*DF*	*F-Stat*	*Expected pattern*
1 (a) ΔDCP to ΔNFA	10,676,000	9,177,200	14	0.28	-
(b) ΔNFA to ΔDCP	3,332,000	2,329,100	15	0.81	+
2 (a) ΔDCG to ΔNFA	10,676,000	6,042,200	14	1.34	-
(b) ΔNFA to ΔDCG	32,473,000	27,570,000	15	0.33	-
3 (a) ΔDC to ΔNFA	10,676,000	7,566,900	14	0.72	-
(b) ΔNFA to ΔDC	5,835,000	30,894,000	15	0.30	+/-
4 (a) ΔNBFIC to ΔNFA	10,676,000	7,541,200	14	0.72	-
(b) ΔNFA to ΔNBFIC	42,290,000	35,224,000	15	0.38	+/-

On the other hand, none of the causal relationships between domestic credit and the balance of payments were significant at the 10% level in 1980:4-1988:3. Apparently, external borrowing and the adjustment policies carried out in the 1980s, such as the introduction of a crawling exchange rate, had broken the direct linkage between the variables.

5. CONTROLLABILITY OF MONEY AND CREDIT IN KENYA

This section discusses four issues. First, the extent to which policy-makers can manipulate money supply through the money multiplier and the monetary base in Kenya. Second, whether there is adequate co-ordination between fiscal and monetary policies and whether fiscal deficits are too closely correlated to monetary variables to permit effective pursuit of an independent monetary policy. Third, whether the public sector financially crowds out the private sector. Finally, this section discusses the nature of credit and what should be counted as domestic credit for the purposes of monetary control, since, as mentioned earlier, NBFIs have become a large component of Kenya's financial structure. Should their credit be included within credit ceilings and be subjected to the other monetary policy measures imposed on commercial banks?

5.1 The money multiplier and the monetary base

Here the study by Bolnick [1975] is updated to examine the extent to which the stock of money is controllable using a standard money multiplier model and annual data over 1971-88. Initially, the analysis is conducted for M2 which closely approximates to Kenya's official money aggregate.[10] In a standard model, money is treated as a function of the liquidity decisions of commercial banks (where, as in Kenya, the banks' minimum required liquidity is defined against private and public sector deposits) and the behaviour of the public in allocating their money portfolio between currency and deposits. Formally, let:

MB = the monetary base
LA = liquid assets held by commercial banks
CU = currency held by members of the non-bank public
PD = private sector deposits in commercial banks
GD = government deposits in commercial banks
TD = total deposits, equal to the sum of private and government deposits
β = LA/TD, the commercial banks liquidity ratio
and α = CU/PD, the currency ratio

where the commercial banks' monetary base is broadly defined as currency held by members of the public plus the banks' liquid assets[11], or

$$MB = CU + LA \tag{5.1}$$

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10 In Kenya, money is defined as total currency outside banks, all deposits with commercial banks other than public sector deposits, and the Kenya post office savings deposits. The last component is small and can be omitted without this influencing the conclusions.

11 The monetary base is here more broadly defined to include the liquid assets of commercial banks rather than just their cash reserves. Liquid assets in Kenya include the cash held by banks in their till and their deposits in the central bank,their net balances with other banks and treasury bills. Treasury bills are equivalent to cash as far as the banks' ability to create credit is concerned.

and where money supply is defined as:

$$M2 = CU + PD \tag{5.2}$$

Solving for M2 in terms of MB, GD and the parameters α and ß, the following money multiplier model is derived:

$$M2 = \frac{1+\alpha}{a+ß}(MB-ßGD) \tag{5.3}$$

As pointed out by Bolnick [1975], the term involving GD in this model shows that the government can, by manipulating its deposits with banks, influence the money stock but with less impact than via other ways of manipulating the monetary base. When the government transfers deposits from the central bank to commercial banks, it adds to their monetary base. However, a certain proportion of the increase in government deposits is tied up as liquid assets, since this increases the liabilities of commercial banks.

To get an idea of the impact of changes in government deposits on the money stock, let α and ß assume their average values in Table 10. Then:

$$M2 = 2.79(MB-0.21GD) \tag{5.4}$$

so that dM2/dGD=2.20. Therefore a 1-shilling transfer of deposits from the central bank to commercial banks can be expected to increase M2 by 2.20 shillings compared to the 2.79 shillings from a 1-shilling increase in the monetary base from other sources.[12] Manipulation of government deposits in commercial banks is thus a potentially useful tool of monetary policy in Kenya. However, while government deposits in commercial banks have increased over time, they still constitute a very small proportion of total deposits.[13]

Table 10 also shows the variability of α and ß. From the table, the following can be noted. First, α has remained fairly constant over time with a linear trend whose slope

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12 These multipliers are larger than those reported by Bolnick [1975] in 1967:3-1973:4, reflecting the lower average currency and deposits ratios. The average currency ratio in Bolnick's study was 28.5%. It averaged 22.7% in 1971-88. The liquidity ratio averaged 25.8% in Bolnick's study. It was 21.5% in 1971-88.

13 Government deposits as a proportion of total deposits in commercial banks were as follows:

	1972	*1973*	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*
%	1.7	1.7	1.5	1.4	1.0	1.3	1.8	2.5	1.8	1.4	3.1	2.3
	1984	*1985*	*1986*	*1987*	*1988*							
%	2.9	4.1	3.2	5.1	5.9							

Source: Central Bank of Kenya, Quarterly Economic Review

was not significantly different from zero.[14] While the currency ratio did decline in the 1970s, it rose in the 1980s to leave the average value of α fairly constant.

Table 10: The currency (α) and the liquidity (β) ratios in Kenya, 1971-88

Year	α %	β %
1971	24.44	18.51
1972	26.29	20.73
1973	22.45	23.55
1974	22.94	18.15
1975	22.13	17.77
1976	23.80	24.44
1977	21.33	27.94
1978	19.51	20.90
1979	19.48	20.87
1980	23.01	16.43
1981	24.12	18.38
1982	21.16	23.52
1983	22.33	18.20
1084	20.94	21.67
1985	23.01	19.56
1986	21.73	27.51
1987	24.04	27.67
1988	24.90	20.92
Mean	22.65	21.48
Standard deviation	1.80	3.58
Coefficient of variation	0.08	0.17

Source: Central Bank of Kenya, annual reports.

Unlike the currency ratio, which is a behavioural and exogenous institutional parameter mainly determined by the banking habits of the society, the liquidity ratio (β) is a policy parameter which is a target of monetary policy. Table 10 shows that this ratio was relatively more volatile, having a coefficient of variation of 0.17 compared to a coefficient of variation of 0.08 for α.

In an attempt to explain changes in β, several determinants were tried in an OLS regression model for 1972-88. These variables were:

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14 This is confirmed by the following equation estimated over 1971-88 in which the trend variable is highly insignificant (t-statistics in brackets).

$$\alpha = 22.09 + 0.04\text{TIME}$$
$$(13.82) \quad (0.32)$$

(a) The cost of credit as measured by the commercial banks' lending rate (LR);

(b) the demand for credit as measured by the advances/total deposits ratio (ADV/TD);

(c) the composition of deposits as measured by the quasi-money private deposits ratio (QM/PD);

(d) the stance of monetary policy as measured by the minimum liquidity ratio (MINLR); and

(e) the growth in the commercial banks' liquidity as measured by the growth in the monetary base (ΔMB/MB).

All these variables influenced changes in ß at one time or another in 1972-88 as seen in Table 11. Briefly, the growth in liquidity was the strongest influence, particularly in the 1980s, as found by Bolnick, with its coefficient significant at the 5% level. At the 10% level, credit demand in the 1970s and early 1980s as proxied by the advances deposits ratio; changes in the composition of deposits in the 1970s; and the minimum required liquidity ratios, were all significant influences. At the 20% level, the maximum lending rate in the 1970s and early 1980s; the demand for credit; and changes in the composition of deposits in the 1980s were significant influences on changes in ß.

If we set aside government deposits in commercial banks, the money multiplier model can be written as a product of the money multiplier (A) and the monetary base (MB), or

$$M2 = A.MB \tag{5.5}$$

Consequently, changes in M2 can be approximately explained by the proportional changes in A and MB, or:

$$\Delta M2/M2 = \Delta A/A + \Delta MB/MB \tag{5.6}$$

In Table 12, it can be seen from the coefficients of variation that the monetary base fluctuated far more drastically than the money multiplier, with changes in the multiplier tending to counteract some of the impact of these fluctuations on the money supply. Except in two years, the multiplier and the monetary base moved in opposite directions. Thus, while MB had a coefficient of variation of 0.73 and the multiplier a coefficient of variation of 0.08, M2 had a coefficient of variation of only 0.67 in 1971-88. The correlation coefficients between these variables shown in Table 13 demonstrate that an increase in the monetary base induced a decline in the money multiplier by increasing the commercial banks' liquidity ratio (ß). In this table, the correlation coefficient is 0.45 between MB and ß, -0.49 between MB and A and -0.94 between A and ß. While the negative correlation between A and MB stabilises money supply, it may frustrate monetary policy if the authorities seek to influence money supply by manipulating the monetary base, especially if the counteracting changes in the multiplier are not stable (predictable).

Table 11: OLS regression estimates of changes in commercial banks' liquidity ratio function in Kenya

	1972-80	*1972-84*	*1972-88*
constant	21.709[(b)] (2.268)	30.529[(a)] (2.973)	28.286[(a)] (2.144)
LR	5.840[(c)] (1.540)	0.425[(c)] (1.404)	0.172 (0.422)
ADV/TD	-0.487[(b)] (1.877)	-0.172[(c)] (0.947)	-0.319[(b)] (1.542)
QM/PD	-0.649[(b)] (1.817)	-0.208[(c)] (0.947)	0.171 (0.743)
MINLR	0.282 (0.493)	0.408[(b)] (1.544)	0.469[(c)] (1.315)
ΔMB/MB	0.035 (0.912)	0.089[(a)] (2.504)	0.084[(a)] (2.152)
R^2	0.95	0.86	0.74
DW	2.18	1.95	1.96
DF	3	7	11

Notes:
(a) significant at the 5% level;
(b) significant at the 10% level;
(c) significant at the 20% level.

Table 12: **Money supply (M2), the money multiplier (A), and the monetary base (MB) in Kenya, 1971-88**

Year	*M2* *Shs mn*	*A*	*MB* *Shs mn*
1971	3770	2.87	1313
1972	4295	2.67	1611
1973	5356	2.64	2030
1974	5819	2.97	1958
1975	6814	3.04	2241
1976	8455	2.55	3312
1977	12413	2.45	5076
1978	14118	2.93	4820
1979	16396	2.92	5611
1980	16208	3.10	5237
1981	18364	2.90	6329
1982	21324	2.67	7996
1983	22365	2.99	7491
1984	25242	2.80	9025
1985	26929	2.83	9501
1986	35686	2.43	14699
1987	39666	2.34	16987
1988	42817	2.65	16145
Mean	18113	2.76	6743
Standard deviation	12192	0.22	4939
Coefficient of variation	0.67	0.08	0.73

Source: Central Bank of Kenya, annual reports.

Table 13: **Correlation coefficients between the currency ratio (α), the commercial banks' liquidity ratio (ß), the monetary base (MB), the money multiplier (A), and the money supply (M2)**

	M2	*A*	*MB*	*α*	*β*
M2	1.00				
A	-0.39	1.00			
MB	0.99	-0.49	1.00		
α	-0.01	-0.18	0.02	1.00	
ß	0.35	-0.94	0.45	-0.15	1.00

As mentioned earlier, NBFIs have in recent years become a very important component of the financial sector; M3 may therefore be a more appropriate definition of money in Kenya. Consequently, the analysis was also done for M3, with the monetary base defined to include the liquid assets in these institutions. These assets were defined as cash in their tills plus net deposits in other financial institutions.[15]

Table 14 shows the data on M3, the new money multiplier (A') and the monetary base (MB'). These variables display the same pattern as in the case above. M3 has a similar coefficient of variation as M2 of 0.67; A' has a coefficient of variation 0.10 (compared to 0.08 for A) while MB' has a coefficient of variation of 0.70 (compared to 0.73 for MB). However, unlike the case above, there is little correlation between MB' and A' with, as seen in Table 15, the correlation between them equal to only -0.08. This suggests once again that a broader definition of money incorporating NBFI deposits may facilitate the formulation of monetary policy by providing a more direct linkage between the monetary base and money supply.

Next, we consider the factors likely to influence the monetary base, where it is defined narrowly as currency in circulation plus commercial bank deposits in the central bank (high-powered money), *i.e.* the liabilities of the central monetary authority. In Kenya, commercial bank deposits in the central bank constitute only a small proportion of high-powered money. The proportion was relatively high in the 1960s at 30-45% of high-powered money, but it declined in subsequent years to less than 25% following a decision by the central bank not to pay interest on these deposits.

Table 16 gives changes in net foreign assets (ΔNFA), in net domestic assets (ΔNDA) and in high-powered money (ΔH) in Kenya in the period 1969-88. The table shows a clear negative relation between ΔNFA and ΔNDA, which Grubel and Ryan [1978] interpreted in terms of the monetary approach to the balance of payments. The two variables move in opposite directions in all years except 1986. The main source of changes in NDA was credit to the public sector, which comprised more than 60% of ΔNDA in all years except 1972. On the other hand, commercial banks rarely borrowed from the central bank except in a few difficult years, namely 1974, 1978 and 1980, when commercial banks' net credit from the central bank rose by between KShs 101 million and KShs 236 million. In the rest of the period, the central bank's claims on commercial banks never rose by more than KShs 20 million.

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15 Liquid assets in the private NBFIs were estimated to equal the following amounts in millions of Kenya Shillings:

1973	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*
-92.2	7.82	149.21	176.33	475.21	495.84	527.37	827.36
1981	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*(*)
451.53	870.51	385.58	1749.01	1431.01	2321.63	2691.60	3298.64

(*) Provisional

Source: CBK, Quarterly Economic Review.

Table 14: Money supply (M3), the money multiplier (A'), and the monetary base (MB') in Kenya, 1973-88

Year	*M3*	*A'*	*MB'*
1973	6033	3.11	1938
1974	6637	3.38	1966
1975	8068	3.38	2390
1976	9884	2.83	3488
1977	14520	2.62	5552
1978	16946	3.19	5316
1979	20129	3.28	6138
1980	21061	3.47	6064
1981	24056	3.55	6780
1982	28501	3.21	8867
1983	31037	3.94	7877
1984	37396	3.47	10774
1985	40953	3.75	10932
1986	51841	3.05	17021
1987	57341	2.91	19678
1988(*)	62271	3.20	19444
Mean	27292	3.27	8389
Standard deviation	18176	0.34	5832
Coefficient of variation	0.67	0.10	0.70

(*) Provisional.

Source: Central Bank of Kenya, annual reports.

Table 15: Correlation coefficients between MB', A', and M3 in Kenya

	M3	*A'*	*MB'*
M3	1.00		
A'	0.07	1.00	
MB'	0.99	-0.08	1.00

Table 16: Changes in the net assets of the monetary authority in Kenya (Kshs m.)

	Changes in net foreign assets (ΔNFA)	*Changes in net domestic assets (ΔNDA)*	*Changes in high-powered money (ΔH)*
1969	450.3	-110.1	349.2
1970	351.2	-254.0	97.2
1971	-329.5	250.6	-78.9
1972	172.8	-65.2	107.6
1973	197.7	-92.3	105.4
1974	-523.7	902.6	378.9
1975	-306.2	126.5	-179.7
1976	684.5	-261.1	423.4
1977	2248.7	-1058.5	1190.2
1978	-1559.1	1582.9	23.8
1979	1460.1	-782.3	677.8
1980	-1474.9	1864.4	389.5
1981	-2095.3	2401.8	306.5
1982	-2119.4	3124.2	1004.8
1983	1874.8	-1993.3	118.5
1984	794.3	-284.5	509.8
1985	-1773.9	2942.4	1168.5
1986	1481.5	1153.3	2634.8
1987	-1334.9	2661.5	1326.6
1988	-997.2	1911.4	914.2

Source: Central Bank of Kenya, Quarterly Economic Review, various issues.

There are several different ways in which the determinants of ΔH can be analysed. One is to use the traditional approach in which the factors that influence H - exports, imports, net capital flows, central bank credit to the private and public sectors *etc.* - are studied individually and severally. This approach has been used extensively to study ΔNFA in Kenya. Its major shortcoming is that it does not adequately take into account how the various components of ΔH interact with one another.

On the other hand, the clearly negative relationship between ΔNDA and ΔNFA suggests that the monetary approach to the balance of payments is a potentially useful framework of analysis. Using this framework, then by definition:

$$\Delta\log(H/P)_t = \Delta\log(M/P)_t - \Delta\log m_t \qquad (5.7)$$

where M/P is the stock of real money balances, H/P is the stock of real high-powered money, and m is the money multiplier. According to this identity, the growth in high-powered money is equal to the difference between the growth of real money balances and the multiplier. At the same time, the growth in the demand for real money balances is postulated to be mainly a log-linear function of the growth of real income

(Δlog y) and inflation (Δlog P), this time disregarding interest rates. Therefore, taking into account the Chow [1966] partial adjustment process, then by substitution:

$$\Delta\log(H/P) = \delta_0 + \delta_1\Delta\log y_t + \delta_2\Delta\log P_t + \delta_3\Delta\log m_t + \delta_4\Delta\log(H/P)_{t-1} + u_{6t} \quad (5.8)$$

This simple model postulates that real high-powered money increases with real income and reduces with inflation and the money multiplier. It was estimated for 1970-88 by OLS for real M1 and M2 and the results are given in Table 17.

Table 17: Regression estimates of the real high-powered money growth model[(1)]

	$\Delta log(H/P)_t$	$\Delta log(H/P)_t$
Constant	-0.027 (0.324)	-0.042 (0.524)
Δlogy	1.252[(b)] (2.464)	1.259[(b)] (2.621)
Δlog P	-0.014 (0.002)	0.236 (0.394)
Δlogm1	-0.784[(a)] (3.558)	
Δlogm2		-0.884[(a)] (4.073)
$\Delta\log(H/P)_{t-1}$	0.035 (0.813)	-0.034 (0.204)
R^2	0.63	0.67
DW	2.18	2.26

Notes: (1) Equations are controlled for serial correlation by the Cochrane-Orcutt method.
(a) significant at the 1% level;
(b) significant at the 5% level.

The results conform with *a priori* expectations. The growth of real income had a highly significant positive impact on the growth of high-powered money in 1970-88, with a 1% increase in real income growth increasing the growth of high-powered money by about 1.3%. Thus an improvement in the terms of trade and in the weather, and an increase in real government expenditure and exports *etc.* which boosts real incomes, increase real high-powered money. This is contrary to the predictions of the traditional analysis which postulates that economic growth will reduce high-powered money by increasing tax revenues and imports, resulting in a reduction in public sector borrowing from the banking system and in foreign-exchange reserves, respectively.

Similarly, the growth in the money multiplier had a highly significant negative impact on the growth of real high-powered money in 1970-88 with a 1% increase in the multiplier reducing the growth of high-powered money by 0.8-0.9%. Therefore, discretionary policies that reduce the ability of commercial banks to increase credit for a given level of real income such as an increase in the minimum liquidity (cash) requirements; an increase in lending interest rates; use of selective credit controls; and advance import deposit schemes *etc.* have a positive impact on real high-powered money mainly by inducing a build-up of foreign-exchange reserves. This introduces an inherently cyclical pattern to monetary policy, as the latter induces policy makers to relax previous policy actions.

The inflation rate and the lagged dependent variable did not significantly influence the growth of real high-powered money in 1970-88, suggesting that there were no important lags in the adjustment of real high-powered money behaviour.

5.2 Correlations between budget deficits and monetary variables

In this sub-section, we assess whether there were significant correlations between budget deficits, domestic credit, and money supply (all expressed as a proportion of GDP), where the receipts of central government are given as tax revenues plus external grants, while government outlays comprise government expenditure plus net lending mainly to public enterprises.

To test the significance of the simple correlation coefficients, the following formula was used to derive the critical t-values [Koutsoyiannis, 1977]:

$$t=(r\sqrt{n-2})/(1-r^2)$$

where (n-2) is the degree of freedom. From this formula, the threshold correlation coefficient at a given level of significance is calculated by:

$$r=\sqrt{(t^2)}/\sqrt{(t^2+(n-2))}$$

It is this formula that was used to evaluate the significance of the correlation coefficients at the 5% level.

Table 18 gives the estimated correlation coefficients between budget deficits (DEF/Y) and bank credit to government (ΔDCG/Y); total domestic credit (ΔDC/Y); and money supply (M2/Y) - all expressed as a proportion of GDP - as well as their critical threshold levels at the 5% level.

The results show that, in the 1960s, the correlation coefficients between budget deficits and domestic credit to government, total domestic credit, and money supply (all expressed as a proportion of GDP) were not significant, since this was a period when the government pursued generally conservative policies aimed at balancing the government budget so that fiscal deficits were fairly modest [King, 1979]. However, when subsequent years are incorporated, the correlation coefficients become significant at the 5% level.

Table 18: Correlation coefficients between calendar-year annualised budget deficits (DEF/Y) and bank credit to government (ΔDCG/Y); total domestic credit (ΔDC/Y) and money supply (M/Y)

	DEF/Y				*Threshold absolute r at the 5% level*
	ΔDCG/Y	*ΔDC/Y*	*M1/Y*	*M2/Y*	
1967-70	0.0109	-0.6075	0.4004	0.3544	0.900
1967-71	0.7201	0.4947	0.4782	0.5513	0.805
1967-72	0.9968	0.9904	0.9997	0.9997	0.729
1967-73	0.9968	0.9986	0.9997	0.9996	0.669
1967-74	0.9955	0.9983	0.9994	0.9995	0.621
1967-75	0.9916	0.9883	0.9980	0.9980	0.582
1967-76	0.9912	0.9884	0.9979	0.9984	0.549
1967-77	0.9894	0.9868	0.9972	0.9972	0.521
1967-78	0.9771	0.9792	0.9972	0.9970	0.479
1967-79	0.9763	0.9792	0.9972	0.9968	0.476
1967-80	0.9751	0.9786	0.9966	0.9967	0.457
1967-81	0.9578	0.9783	0.9935	0.9948	0.441
1967-82	0.9145	0.9700	0.9933	0.9948	0.426
1967-83	0.8915	0.9632	0.9933	0.9945	0.412
1967-84	0.8920	0.9630	0.9933	0.9945	0.400
1967-85	0.8916	0.9625	0.9924	0.9942	0.389
1967-86	0.8813	0.9611	0.9902	0.9930	0.379
1967-87	0.8777	0.9608	0.9889	0.9924	0.369

Several things can be noted about the correlation coefficients in the table. First, they are in general largest between DEF/Y and money supply. This is because one of the government's non-bank sources of credit is external borrowing which increases money supply. They are also generally higher between DEF/Y and ΔDC/Y than between DEF/Y and ΔDCG/Y because the latter increases the liquidity of commercial banks which enhances their ability to give credit. Second, the correlation coefficients have fluctuated over time - that between DEF/Y and domestic credit directly with the size of budget deficits and the degree to which they are financed from the domestic banking system as opposed to non-bank domestic sources and externally, and at the expense of credit to the private sector; those between DEF/Y and money supply inversely with the impact of the balance of payments on the money supply.

When correlation coefficients were analysed for domestic and foreign deficit finance as well as the use of cash balances, a similar pattern emerged. Therefore as far as policy-makers were concerned, these were not alternative sources of finance, with these sources of deficit finance positively and significantly correlated with domestic credit and money supply at the 5% level in 1967-87 as shown in Table 19.

Table 19: Correlation coefficients between domestic (D/Y) and external (F/Y) budget deficit finance, use of cash balances (CASH/Y) and bank credit to government (ΔDCG/Y), total bank credit (ΔDC/Y) and money supply (M/Y) in Kenya, 1967-87

	D/Y	*F/Y*	*CASH/Y*
ΔDCG	0.8657	0.7649	0.6069
ΔDC	0.9370	0.8825	0.6129
M1	0.9695	0.9483	0.5493
M2	0.9748	0.9359	0.5738

5.3 Does the public sector crowd out the private sector financially?

A rapid expansion of the public sector (government in general and public enterprises) is a characteristic feature of many developing countries and causes concern among policy-makers that the public sector will crowd out the private sector financially. In a developed financial sector, this would occur through changes in interest rates. When the public sector increases its borrowing from the domestic financial market, interest rates rise and the cost of borrowing increases to discourage private sector borrowing. In many developing countries, however, interest rates are fixed by the state and are adjusted only occasionally so that crowding out is likely to occur more directly through non-price credit-rationing mechanisms.

In order to finance a budget deficit partially or fully from domestic sources, the public sector borrows both short-term and long-term. In Kenya, the public sector's long-term borrowing is usually from captive institutions such as the National Social Security Fund, the Cereals and Sugar Finance Corporation and the Post Office Savings Bank which do not lend to the private sector, so that, strictly speaking, the issue of crowding out does not arise. It is when the public sector undertakes short-term borrowing from the 'competitive' financial system that crowding out is likely to occur.

There is ample evidence in Kenya that credit to the public sector from the 'competitive' financial system does crowd out credit to the private sector. In a study by Mwega *et al.* [1986], crowding out was tested over 1973:1-1985:4 using the Granger methodology on the assumption that temporal effects take at least one quarter and at most eight quarters to manifest themselves significantly. From the results, it was found that domestic credit to the public sector (ΔDCG) significantly crowded out domestic credit to the private sector (ΔDCP) with the lagged ΔDCG coefficients significant at the 5% level, while they clearly displayed a negative behavioural pattern. When added together, these coefficients summed to -0.3597 so that a KShs 1 million increase in ΔDCG reduced ΔDCP by KShs 0.36 million. As expected, ΔDCP did not significantly cause ΔDCG so that the public sector received priority in the allocation of credit from the banking system. These results are all the more significant because there was little contemporaneous correlation between the quarterly values of these time series variables, with their correlation coefficient only 0.051 in 1973:1-1985:4.

In another study, Koori [1984] tested the financial crowding-out hypothesis using a more structural model and 1969-80 annual data. From this he explained domestic credit to the non-household private sector from the 'competitive' financial system by (a) the long-term rate of interest as proxied by the ratio of interest payments on the public sector long-term debt to the total nominal funded debt; (b) lagged public sector investment to capture the degree of complementarity between the public capital stock and the private sector output and hence borrowing; (c) total domestic credit to the private and public sectors; and (d) the share of credit going to the public sector. It was the coefficient of this last variable that measured the degree of crowding out. The results supported the crowding-out hypothesis with this coefficient negative and highly significant.

To test the financial crowding-out hypothesis further, the following *ad hoc* model was used to explain the real flow of credit to the private sector:

$$(\Delta DCP/P)_t = \phi_0 + \phi_1 y_t + \phi_2(L\text{-}\pi)_t + \phi_3(\Delta CBG/\Delta DCG)_t + \phi 4(\Delta DCG/P)_t + \phi_5(\Delta DCP/P)_{t-1} + u_{7t} \qquad (5.9)$$

where $(\Delta DCP/P)$ is the real credit flow to the private sector; y is the real GDP; $L\text{-}\pi$ is the real lending rate as measured by the difference between the nominal deposit rate and the rate of inflation; $\Delta CBG/\Delta DCG$ is the ratio of central bank credit to the public sector to total domestic credit from the 'competitive' financial system; $\Delta DCG/P$ is real credit to the public sector; and u_7 is a random error term.

The model postulates that real credit to the private sector increases with real income and the proportion of government credit from the central bank, as this entails less competition for funds for the private sector, while it decreases with the real lending rate and the real credit flow to the public sector, with the size and significance of ϕ_4 measuring the degree and importance of the crowding-out effect. The model also postulates that there are lags in the adjustment of the demand for private sector credit to its desired level so that $\phi_5 > 0$.

This model was used for estimating credit to the private sector by the banking system alone ($\Delta DCP'$) and then in combination with private NBFIs($\Delta DCP''$). The estimated equations were controlled for serial correlation by the Cochrane-Orcutt method. The regression results are given in Table 20.

The results in Table 20 show the financial crowding-out coefficient significant at least at the 5% level so that a Kshs 1 million increase in real credit reduced credit to the private sector by about KShs 0.32-0.34 million - approximately the degree of crowding out derived from the Granger-causality test cited above. When private NBFIs are included, the degree of crowding out rises with a KShs 1 million increase in credit to the public sector reducing credit to the private sector by KShs 0.36-0.37 million. In addition, private sector credit decreased significantly with the real cost of lending as found in Mwega *et al.* [1989], while it increased significantly with real income and, when the private NBFIs are included, the share of credit to the public sector borrowed from the central bank. Lastly, the lagged dependent variable was consistently insignificant so that adjustment lags in the real flow of credit to the private sector were not important.

Table 20: OLS estimates of the private credit functions in Kenya

	$(\Delta DCP'/P)_t$	$(\Delta DCP'/P)_t$	$(\Delta DCP''/P)_t$	$(\Delta DCP''/P)_t$
Constant	-1937.93[c]	-1830.56	-7419.90[a]	-7859.30[a]
	(1.460)	(1.506)	(4.870)	(5.867)
y_t	0.080[a]	0.075[a]	0.202[a]	0.215[a]
	(2.728)	(2.867)	(5.943)	(7.698)
$(L-\pi)_t$	-7243.06[b]	-6444.04[b]	-7959.13[a]	-8459.28[a]
	(1.974)	(1.994)	(4.419)	(5.288)
$(\Delta CBG/\Delta DCP)_t$	48.901	41.63	12.220[b]	12.137[b]
	(0.868)	(0.749)	(2.308)	(2.367)
$(\Delta DCG/P)_t$	-0.315[b]	-0.337[b]	-0.371[a]	-0.363[a]
	(1.817)	(2.032)	(5.030)	(5.140)
$(\Delta DCP/P)_{t-1}$	-0.146		0.085	
	(0.586)		(0.680)	
R^2	0.46	0.44	0.75	0.73
DW	2.12	2.19	3.16	3.19
Period	1969-88	1969-88	1974-86	1974-86

Notes: (a) Significant at the 1% level;
(b) significant at the 5% level;
(c) significant at the 10% level.

5.4 Is NBFI credit complementary or a substitute for commercial bank credit?

As noted earlier, Kenya has recently experienced a very rapid growth in private NBFIs. In 1973-86, the period for which comparable data are available, the total outstanding credit of private NBFIs increased more than 19-fold from KShs 655.80 million to KShs 12,784.83 million, while the outstanding credit of commercial banks increased less than 8-fold from KShs 3,228.12 million to KShs 24,561.04 million. The NBFIs' outstanding credit thus increased much faster than the commercial banks' credit, from 20.3% in 1973 to 52.1% in 1986, an increase which was gradual and erratic in 1973-8 but continuous and rapid in 1979-85. The NBFIs' outstanding credit peaked in 1985 owing to some of their deposits being moved to the more established commercial banks because of solvency problems in some of these institutions in 1986 which dented public confidence in them.

The NBFIs' outstanding credit to the public sector was fairly modest, amounting in general to less than 10% of the commercial banks' outstanding credit to the sector. NBFI credit was mainly allocated to the private sector, with the NBFI share increasing from 20.7% in 1973 to 55.7% in 1986.

The rapid growth in NBFIs in the early 1980s may be attributed to several factors. One was the coffee-tea price boom of the late 1970s which injected a lot of funds into

the economy, some of which were invested in these institutions. Another was the fact that NBFIs were cheaper to establish than commercial banks. For instance, the minimum amount of capital required for a locally incorporated financial institution was KShs 0.5 million for an NBFI and KShs 2.0 million for a commercial bank, according to the 1968 Banking Act. This was later raised to KShs 1.0 million and KShs 5.0 million respectively in 1982; and to KShs 7.5 million and KShs 15.0 respectively in 1985, thus making it increasingly difficult to set up these institutions. Lastly, favourable statutory interest rate differentials enabled NBFIs to offer higher rates of interest on deposits than commercial banks, and this made them more competitive. Overall,NBFIs have, until recently, operated within a more liberal legislative framework than commercial banks. Before the 1985 amendments to the 1968 Banking Act, for example, NBFIs could,unlike commercial banks, freely engage on their own account in such activities as wholesale and retail, and import and export trade, and could invest in such immovable property as real estate. However, in the 1985 amendments which were consolidated in the 1989 Banking Act, NBFIs were barred from acquiring or holding share capital or having a direct interest in commercial, industrial and other undertakings where their financial contribution exceeded 25% of their paid-up capital or unimpaired reserves. They were also barred from holding immovable property such as land for commercial purposes, and from owning equity in commercial banks, since it was noted that they tended to branch out into commercial banking in order to gain access to the relatively cheaper current account deposits.[16]

Traditionally, the NBFIs take deposits from the public which they use to provide credit. Generally the funds mobilised are allocated in medium- and long-term credit, unlike the commercial banks which mainly provide short-term credit. Consequently, NBFIs may be complementary to rather than competitive with commercial banks' credit. The demand for NBFI credit may increase alongside commercial bank credit because NBFIs usually require an initial deposit when they give credit, which may be supplied by the commercial banks. On the other hand, the rapid expansion of the financial system and the tightening of its legislative framework may have blurred the distinction between NBFIs and commercial banks, with each making inroads into the activities of the other. They may therefore turn out to be competitive rather than complementary. This is particularly the case because NBFIs operate mainly in urban areas where the commercial banks are already well established. NBFIs are also subject to monetary policy actions like the commercial banks, such as the minimum liquidity requirements (first imposed on the commercial banks in 1969 and the NBFIs in 1974) even though they are not subject to credit ceilings.

To test whether NBFI credit complements or competes with credit from the banking system, the following *ad hoc* equations were fitted to Kenyan data over the period 1974-86.

$$\Delta DCP/P = \mu_0 + \mu_1 y + \mu_2(L-\pi) + \mu_3 \Delta NBFIP/P + \mu_5 \Delta DCG/P + u_8 \qquad (5.10)$$

$$\Delta DC/P = \Omega_0 + \Omega_1 y + \Omega_2(L-\pi) + \Omega_3 \Delta NBFIT + u_9 \qquad (5.11)$$

Equation (5.10) explains the real credit flow from the banking system to the private sector ($\Delta DCP/P$) as a positive function of real income (y) and a negative function of:

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16 This analysis draws heavily on Central Bank of Kenya, Central Bank of Kenya: its Evolution, Responsibilities and Organization, 1986.

the real lending rate ($L-\pi$); the real credit flow from NBFIs to the private sector(ΔNBFIP/P); and the real credit flow from the banking system to the public sector (ΔDCG/P), to capture the crowding-out effect. The real credit flows from the banking system and the NBFIs to the private sector are complementary if μ_3 is close to zero and insignificant, while they are substitutes if μ_3 is negative and significant, with the degree of substitutability increasing with the size of the coefficient towards unity.

Similarly, equation (5.11) explains the total real credit flow from the banking system (ΔDC/P) as a positive function of real income and a negative function of the real lending rate and the total real credit flow from NBFIs (ΔNBFIT/P). Credit from NBFIs is a substitute for credit from the banking system if α_3 is negative and significant, with the degree of substitutability increasing with the absolute size of the coefficient towards unity.

The results from estimating these equations are given in Table 21.

Table 21: Estimates of the credit flow equations in Kenya, 1972:4-1988:3

	ΔDCP/P		ΔDC/P	
	Commercial banks	*Banking system*	*Commercial banks*	*Banking system*
Constant	-2198.180	-8397.750[(a)]	-2338.750	8442.120[(c)]
	(0.345)	(3.717)	(0.431)	(1.464)
y	0.094	0.225[(a)]	0.099[(d)]	0.240[(b)]
	(0.749)	(4.822)	(0.924)	(2.069)
$L-\pi$	-2528.810	-10509.800[(a)]	-1314.500	8977.710[(d)]
	(0.359)	(3.141)	(0.215)	(1.139)
ΔNBFIP/P	-0.932[(d)]	-1.145[(b)]		
	(0.995)	(2.713)		
ΔNBFIT/P			-0.936[(c)]	-0.851[(d)]
			(1.465)	(1.206)
ΔDCG/P	-1.562	-0.345[(b)]		
	(0.762)	(2.548)		
R^2	0.40	0.60	0.34	0.39
DW	1.80	2.22	1.71	2.29

Notes: (a) Significant at the 1% level; (b) significant at the 5% level; (c) significant at the 10% level; (d) significant at the 20% level.

The first and second columns of the table show that the credit flow from NBFIs to the private sector was significant at least at the 20% level in reducing the real credit flow to the private sector. The coefficient is also close to unity so that NBFI credit to the

private sector was a close substitute to that of the commercial banks and the banking system's credit to the private sector. The results are more robust, however, for the banking system's credit when central bank credit is incorporated. This is mainly allocated to the public sector, which aggravates the crowding-out effect by quantitatively restricting the amount of credit allocated to the private sector. At the same time, central bank credit increases high-powered money and the ability of the other institutions to give credit, thus enhancing the impact of real income on credit demand; the dampening effect of real lending rates; and the competitive impact of NBFIs on the banking system's supply of credit.

The results do not change much when the total real credit flow from commercial banks and the banking system (columns three and four of Table 21) is considered. The total real credit flow from NBFIs is significant at least at the 20% level in influencing the total real credit flow from commercial banks and the banking system. The coefficient is also close to unity so that NBFI credit is a close substitute for that of the commercial banks and the banking system's credit. The coefficients of the other variables are also more robust when NBFIs are included.

6. CONCLUSIONS

This paper has investigated several econometric relationships which bear upon monetary policy in Kenya. The first issue explored was whether the demand for money has remained stable in the 1980s in the face of exogenous and policy shocks and a very rapid growth in private NBFIs. Overall, the study finds the demand for money in Kenya stable. However, a decrease in the expected income elasticity of demand for real money was noted. This was explained by the impact of structural adjustment policies carried out in the 1980s which have reduced the demand for money at a given income level. This elasticity change was counteracted, however, by movements in the other coefficients to leave the demand for money statistically stable.

The second issue investigated was whether money and credit matter in the sense that they influence the level of domestic prices and the balance of payments. The analysis indicates that money supply significantly influences inflation, with a 1% increase in monetary growth increasing inflation by 0.3-0.4%, and in a fairly stable manner. Inflation also increases with import prices, while it significantly decreases with real income growth. Past inflation, which is often taken as a proxy for expectations about future inflation, does not significantly explain current inflation. Similarly, the study finds that changes in domestic credit were significantly offset by changes in net foreign assets (ΔNFA) in 1973:1-1988:4 without significant feedback effects. While changes in domestic credit to the government significantly sterilised ΔNFA during the period, this was counteracted by the positive impact of ΔNFA on domestic credit to the private sector so that their combined impact was insignificant. However, these results were not stable and therefore cannot be generalised to other periods or sub-periods.

Lastly, the paper addressed various issues concerning the controllability of money and credit in Kenya. It analysed the money multiplier; the determinants of high-powered money; the correlations between budget deficits and domestic credit to government from the banking system, the total domestic credit of the banking system, and money supply; whether the public sector crowds out the private sector financially; and whether private NBFI credit is a complement or a substitute for that of the commercial banks and the banking system. Like Bolnick [1975], the study finds the money multiplier unstable (unpredictable), the main cause of this being the commercial banks' liquidity decisions which were found to be influenced by a wide range of factors. The paper also found the correlation coefficients between budget deficits and bank credit and money supply insignificant in the 1960s when the government followed a balanced budget policy but significant thereafter, while the public sector was found to crowd out the private sector financially with a KShs 10 million increase in real credit to the public sector from the banking system reducing real credit to the private sector by about KShs 3.3 million, this rising to about KShs 3.7 million when NBFIs were incorporated in the analysis. Finally, the paper finds credit from NBFIs almost a perfect substitute for credit from commercial banks and the banking system, with similar effects on output, inflation and the balance of payments. The two ought therefore to be treated alike in the formulation of monetary policy; instead, NBFIs are currently exempt from credit ceilings which are imposed only on commercial banks.

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DATA APPENDIX

All the data used in the statistical work in this paper were derived from secondary published sources. For instance, the data to estimate the demand for money equations were derived from the IMF International Financial Statistics (IFS), except those on the treasury bill rate which were derived from the Central Bank of Kenya (CBK) Quarterly Economic Review. Unfortunately, data on income were only available on an annual basis so that the quarterly series was estimated by (non-linear) interpolation. The quarterly distribution of income within a given year was estimated by that of exports plus government expenditure (XG). Annual income was multiplied by the ratio of quarterly to annual XG to derive the quarterly income estimates, a procedure that can be justified by the simple income multiplier analysis. Similarly, all the quarterly data for the domestic credit/balance of payments Granger causality tests were derived from the Quarterly Economic Review except for data on the terms of trade which were derived from IFS.

The following tables show some of the annual data that were used in the statistical work in the paper.

Table A1: The basic data used to estimate the inflation equations

	Consumer price index (CPI) 1980=100	*Nominal GDP KShs million*	*Money supply (M2) KShs million*	*Unit value imports 1980=100*	*NBFI deposits KShs million*
1967	31.5	8480	2086	17	-
1968	31.7	9313	2317	17	-
1969	31.6	10220	2760	18	-
1970	32.2	11269	3521	18	-
1971	33.4	12658	3778	20	-
1972	35.5	14013	4295	22	-
1973	38.8	15882	5356	26	677
1974	45.7	19496	5819	39	817
1975	54.4	22575	6814	50	1254
1976	60.6	27710	8455	58	1430
1977	69.6	35623	12527	62	2107
1978	81.4	39351	14155	66	2828
1979	87.9	43759	16011	76	3733
1980	100.0	50969	16136	100	4853
1981	111.8	58526	18281	128	5692
1982	134.7	65232	21370	147	7176
1983	150.2	73860	22426	188	8672
1984	165.4	81378	25293	193	12154
1985	187.0	92543	26898	228	14034
1986	194.4	112443	35694	216	16116
1987	204.5	127264	39667	219	17675
1988	221.3	147731	42856	241	19454(*)

Note: * Provisional.

Sources: IMF, International Financial Statistics, and CBK, Quarterly EconomicReview.

Table A2: Data used to explain changes in the commercial banks' liquidity ratio

	Maximum lending interest rate %	*Advances/ deposits ratio* %	*Quasi money/ private deposits ratio* %	*Minimum required liquidity ratio*[(a)] %	*Growth in the monetary base* %
1971	9.00	75.4	38.98	12.7	-
1972	9.00	68.5	37.21	14.0	22.67
1973	9.00	70.8	34.17	14.1	26.00
1974	10.00	84.0	38.10	14.0	-3.56
1975	10.00	80.2	40.76	14.1	14.43
1976	10.00	74.3	40.71	17.9	47.83
1977	10.00	68.8	38.96	17.7	53.27
1978	10.00	76.5	40.78	16.5	-5.05
1979	10.00	77.6	41.97	14.3	16.42
1980	11.00	87.3	47.88	14.4	-6.68
1981	14.00	84.1	49.06	13.7	20.86
1982	15.00	79.6	45.30	13.6	26.86
1983	16.00	83.5	46.14	18.0	-6.32
1984	14.00	82.1	47.62	17.9	20.48
1985	14.00	85.0	51.11	18.2	5.27
1986	14.00	79.3	50.54	17.9	54.72
1987	14.00	82.9	52.47	18.0	15.56
1988	15.00	84.6	54.22	17.6	-4.95

Note: (a) some figures differ from the actual ratios due to rounding errors.

Source: CBK, Quarterly Economic Report.

Table A3: Liabilities of the central monetary authorities in Kenya (KShs m.)

	Currency in circulation (1)	*Commercial bank deposits in the Central Bank* (2)	*High-powered money* (3)	*(2)/(3) %* (4)
1968	529.0	231.1	760.1	30.4
1969	635.9	473.4	1109.3	42.7
1970	778.9	427.6	1206.5	35.4
1971	834.6	293.0	1127.6	26.0
1972	1004.7	230.5	1235.2	18.7
1973	1119.5	221.1	1340.6	16.5
1974	1338.9	380.6	1719.5	22.1
1975	1408.5	131.3	1539.8	8.5
1976	1830.0	133.2	1963.2	6.8
1977	2423.5	729.9	3153.4	23.1
1978	2642.8	534.4	3177.2	16.8
1979	3043.5	811.5	3855.0	21.1
1980	3444.0	800.5	4244.5	18.9
1981	3990.3	560.7	4551.0	12.3
1982	4159.7	1396.1	5555.8	25.1
1983	4669.1	768.2	5437.3	14.1
1984	5129.7	817.4	5947.1	13.7
1985	6012.2	1103.4	7115.6	15.5
1986	7422.8	2327.6	9750.4	23.9
1987	8775.6	2301.4	11077.0	20.8
1988	9786.6	2204.6	11991.2	18.4

Source: CBK, Quarterly Economic Review, various issues.

Table A4: Assets of the central monetary authorities in Kenya (KShs m.)

	Net foreign assets	*Net domestic assets*	*High-powered money*
1968	757.6	2.5	760.1
1969	1207.9	-98.6	1109.3
1970	1559.1	-352.6	1206.5
1971	1229.6	-102.0	1127.6
1972	1402.4	-167.2	1235.2
1973	1600.1	-259.5	1340.6
1974	1076.4	643.1	1719.8
1975	770.2	769.6	1539.8
1976	1454.7	508.5	1963.2
1977	3703.4	550.0	3153.4
1978	2144.3	1032.9	3177.2
1979	3604.4	250.6	3855.0
1980	2129.5	2115.0	4244.5
1981	34.2	4516.8	4551.0
1982	-2085.2	7641.0	5555.8
1983	-210.4	5647.7	5437.3
1984	583.9	5363.2	5947.1
1985	-1190.0	8305.6	7115.6
1986	291.5	9458.9	9750.4
1987	-1043.4	12120.4	11077.0
1988	-2040.6	14031.8	11991.2

Source: CBK, Quarterly Economic Review, various issues.

Table A5: Budget deficits in Kenya (KShs m.)

	Tax revenue	*Grants*	*Government expenditure*	*Lending minus repayments*	*Budget deficit*
1965/6	992	48	1379	65	-404
1966/7	1139	54	1286	111	-204
1967/8	1303	32	1492	103	-260
1968/9	1444	13	1794	3	-340
1969/70	1623	81	958	49	-376
1970/1	2143	10	2426	62	-335
1971/2	2539	15	3175	161	-782
1972/3	2612	4	3151	161	-696
1973/4	3380	6	2816	128	-558
1974/5	4438	0	5495	202	-1259
1975/6	5037	0	6614	-19	-1558
1976/7	5863	0	6883	0	-1020
1977/8	9166	0	10037	0	-871
1978/9	10376	167	12954	0	-2411
1979/80	12508	209	13839	0	-1122
1980/1	13853	498	18329	-81	-3897
1981/2	15137	452	20070	-91	-4462
1982/3	14706	319	17734	-112	-1597
1983/4	17844	590	21259	-115	-2710
1984/5	19428	514	23790	-73	-3775
1985/6	22956	990	29690	-158	-5586
1986/7	26585	928	37468	-114	-9841
1987/8	30898	1529	38046	-93	-5526

Source: IMF, International Financial Statistics, 1988 Yearbook.

Table A6: Sources of budget deficit finance in Kenya (KShs m.)

	Net domestic borrowing	*Net foreign borrowing*	*Use of cash balances*	*Budget deficit*
1965/6	49	274	81	404
1966/7	138	118	-52	204
1967/8	160	132	-32	260
1968/9	251	121	-32	340
1969/70	352	176	-152	376
1970/1	281	183	-130	335
1971/2	325	189	268	782
1972/3	471	306	-81	696
1973/4	174	250	135	558
1974/5	422	380	457	1259
1975/6	1566	767	-772	1558
1976/7	944	519	-443	1020
1977/8	-223	605	457	1259
1978/9	1920	217	272	2411
1979/80	132	128	862	1122
1980/1	969	1216	1712	3897
1981/2	3748	815	-101	4462
1982/3	3460	123	-1987	1597
1983/4	3118	-979	572	2710
1984/5	2371	-1611	3015	3775
1985/6	2611	-2266	5240	5586
1986/7	6011	-2153	5983	9841
1987/8	5170	-988	1344	5526

Source: IMF, International Financial Statistics, 1988 Yearbook.

Table A7: Domestic credit to the private and public sectors from Kenya's banking system (KShs m.)

	Change in net bank claims on the private sector	*Change in net bank claims on the public sector*
1969	79.71	50.89
1970	265.65	187.89
1971	581.73	46.05
1972	106.05	414.90
1973	725.22	114.01
1974	851.68	244.11
1975	292.15	916.45
1976	743.48	447.20
1977	1620.93	104.47
1978	2387.86	805.81
1979	873.60	689.64
1980	1984.36	-221.18
1981	1266.53	2512.53
1982	1331.35	4338.16
1983	1022.99	1003.15
1984	1564.09	1145.79
1985	2469.62	1133.69
1986	3270.75	5709.56
1987	3004.32	5216.72
1988	5026.92	1827.42

Source: CBK, Quarterly Economic Review, various issues.

Table A8: Domestic credit to the public and private sectors from Kenya's commercial banks and private NBFIS (KShs m.)

	Changes in commercial banks' outstanding claims			*Changes in private NBFIs outstanding claims*		
	public sector	*private sector*	*total*	*public sector*	*private sector*	*total*
1974	-51.09	994.18	935.09	30.86	151.62	182.48
1975	132.52	385.97	518.49	-16.34	227.30	210.96
1976	-72.42	705.12	632.70	0.51	353.85	354.36
1977	28.55	1882.28	1910.83	-12.12	359.64	347.52
1978	-56.25	2104.79	2043.54	35.33	506.11	541.44
1979	30.36	3333.40	3363.76	-7.51	549.16	541.65
1980	121.15	1466.80	1587.95	198.23	1219.04	1417.27
1981	-7.07	975.41	968.34	191.56	1097.84	1289.40
1982	218.18	1221.00	1439.18	157.41	1491.22	1648.63
1983	593.95	1008.42	1602.37	1207.91	1240.34	2448.25
1984	389.74	1571.98	1961.72	93.09	2271.77	2364.86
1985	209.51	2484.49	2694.00	870.79	1931.66	2802.45
1986	125.43	3544.93	3670.36	484.02	609.76	1093.78
1987	1726.82	1571.08	3279.90	-	-	5160.86
1988	-181.64	3845.39	3663.75	-	-	2433.68

Source: CBK, Quarterly Economic Review, various issues.

Overseas Development Institute
Regent's College
Inner Circle
Regent's Park
LONDON NW1 4NS
England
Telephone: 071-487 7413
Fax: 071-487 7590
Telex: 94082191 ODIUK