Monetary Programming For Growth in Tanzania

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Abstract: Economic managers in central banks and finance ministries in emerging market economies have increasingly been faced with the challenge of making and implementing policy decisions by using indirect policy instruments. This has necessitated development of proper programming frameworks as well as proper understanding of the interactions of macro-economic variables. Monetary programming has become such an important framework. This paper attempts to develop a monetary programming framework for Tanzania. Tanzania has implemented economic reforms since the mid 1980s-moving from a centrally controlled economy to free market economy. The methodology used was econometric estimation of a macro-economic model, built with incorporation of information obtained through surveys.

The survey results indicated that the majority of policy makers (90%) showed that they were aware of the way monetary policy is conducted, (60%) of the respondents expressed dissatisfaction with the conduct of monetary policy pointing out conflicting objectives, crowding out of the private sector, and lack of transparency.
The econometric framework was characterized by ten equations for the four sectors of the economy namely: output and expenditure; the public sector; the monetary sector; and the external sector.

Data for the estimates covered the period 1986 to 1998, which corresponds with the period of economic liberalisation. Results of the estimations showed that current consumption is highly determined by disposable income and lagged consumption. There was no evidence though, that consumption was affected by interest rates. Similarly investment is weakly influenced by the interest rate but strongly and positively affected by output and government expenditure.
Output is positively influenced by changes in money supply. In the short run output moves in the opposite direction with changes in the real exchange rate. This can be attributed to the fact that when domestic currency depreciates the cost of import dependent activities increases possibly affecting output negatively.

Exports are influenced by real output and their own lagged values, while imports are influenced by output and their own lagged values. No strong evidence of exchange rate influence is obtained, in support of the argument that the demand for imports is inelastic to movements in the exchange rate.

Demand for money is positively influenced by real output and is negatively influenced by inflation. The coefficient of interest rate however is positive contrary to theory. This can be explained by the coincidence of liberalization of interest rates with the rate of growth of money supply, which began to decline due to tight monetary policy. Domestic prices are positively influenced by foreign prices, changes in money supply, the exchange rate and negatively influenced by real output. Domestic interest rates are influenced by both foreign interest rates and money supply.

The money supply equation was included in an attempt to establish the relationship between current level of broad money supply and the level of reserve money and its own lagged values. The findings show that the current values of money are mainly related to their lagged values and by the level of current and lagged reserve money.

With respect to tax revenue it was found that private consumption is the determinant of tax revenue. This is natural given the recent introduction of VAT and predominance of trade taxes in total revenue. Surprisingly imports are not a significant factor in influencing domestic revenue. The findings of this study provide an important contribution to the understanding of the macroeconomic environment within which monetary policy operates in Tanzania.

INTRODUCTION

1.1 Background

Tanzania is among the countries selected for the Harvard Institute for International Development (HIID) supervised study on specific objectives in Less Developed Countries (LDCs) within the framework of the research program " Equity and Growth through Economic Research- Public Strategies for Growth and Equity (EAGER/ PSGE)." Among the research areas for the Tanzanian study is "Improving the Framework for Monetary Programming." Basically the exercise aims at increasing understanding and capacity of local experts on the relationships between macroeconomic variables and monetary programming. The research aims at contributing

to the request expressed by central banks/ finance ministry managers to improve their tools for predicting the economic impact of alternative monetary policies. An operational framework will be developed based on relationships among monetary variables.

As relates to policy, the study aims at strengthening the central bank and other economists' hand in persuading policy makers on the importance of fiscal discipline and monetary stability in creating a macro-economic environment that encourages domestic and foreign investments, thereby furthering growth and employment.

From the composition of the research team some interaction on macro-economic issues between research staff in the central bank on the one hand and other local macroeconomists, based at the University of Dar es Salaam has been enhanced.

By incorporating concerns of the relevant central bank and finance ministry officials at the initial stages of the study and conducting surveys that capture the feelings of the business community the researchers are content that the feelings of the main players in the economy will have been captured.

The Role of Monetary Programming.

There is wide consensus among economists that money plays an important role in an economy. For monetarists in particular, it is believed that the primary determinant of the set of macroeconomic aggregate demand is money and more specifically its rate of change. This view holds that fluctuations in economic activity are not so strongly related to expenditures of economic agents but are basically caused by an inadequate monetary policy. It is assumed that the monetary authority can control money supply and changes in the money stock are the most important determinants of variations in national income and expenditure. The outcome of this belief is that monetarists have a strong focus on controlling money supply or other monetary aggregates for regulating the economy.

If the economy can be regulated by adjusting the money stock then two major related questions emerge: Who is responsible for the control? Do they have the capacity to do that? To acquire the capacity to control requires an understanding of the role of money in the economy and the macro-economic relationships among the major variables in the economy. Having had a grasp of the relationships there must be an operational framework, which the authority would use in analyzing the consequences of alternative policy measures.

This should however not be limited to the monetary authority. The main players in the economy ought to have this understanding as well. This study is geared towards that goal.

Methodology

In executing that task the study proceeds along four steps. In the first step extensive literature review on theory and policy is carried out. Three main areas are covered: theoretical and conceptual issues; money supply process and central bank control and the accounting framework that links values of domestic and foreign assets and liabilities of the central bank as they relate to fiscal parameters. The important relationships in the framework are those between the public sector balance and credit to economic agents and money supply.

The second step draws a list of the plausible key variables, which are considered pertinent in the study. The review of literature in step one shed light on the plausibility of such variables in view of the characteristics of the Tanzanian economy.

In the third stage data on key variables were compiled. Since our main focus is the post reform period the data from 1986, the beginning of adjustment programmes, were collected on a monthly, quarterly and annual basis.

The fourth step was the empirical work. This involved specifying the macro-economic model and its estimation to get the parameters of interest. Information collected through surveys and discussions with central bank and finance ministry

officials was used to complement results from the estimated model.

After this short introduction, the rest of the paper is organized in five sections. In section two we give a brief background on the Tanzanian financial sector, its evolution and monetary policy regimes. The third section is devoted to the conceptual issues, starting with the role of money in an economy, issues of monetary control and the accounting framework. Section four deals with empirical analysis and discussion of estimation results. Outcomes of the surveys precede the discussion of the econometric results. The last section gives a summary and draws some conclusions and implications for future policy.

II: TANZANIA'S FINANCIAL SECTOR: EVOLUTION AND PERFORMANCE

Evolution

Before restriction to entry was eliminated in 1991 the financial sector in Tanzania was monopolistic with a narrowly organised financial system comprising only twelve financial institutions apart from the central bank (Table 1). The National Bank of Commerce accounted for over 95% of the deposits in official financial institutions. There were only three long-term financing institutions and two statutory savings institutions. All institutions with the exception of two (a long term financing and a savings one that were private), were owned by the government and enjoyed monopoly power. Private entry and the diversification of the financial assets menu was restricted by the legislation of the state monopolies (Kimei, 1994).

During the pre reform period monetary policy was characterized by fixing of interest rates and pre-determining the quantity and price of credit through the Finance and Credit Plan. Competition was thus non-existent. Other macro-economic policy related indicators including high inflation rate, exchange rate controls and expansionary monetary and fiscal policies persisted up to the late eighties.

Table 1: *The pre-reform financial system*

Commercial Banking	Contractual Savings Institutions
NBC	NPF
PBZ	PPF)
CRDB	
Savings Institutions	Long Term Financing
POSB	TIB
DJIT	TDFL
	THB
Insurance Companies	
NIC and ZIC	

Key:
NBC = Nationl Bank of Commerce
PBZ = Peoples Bank of Zanzibar
CRDB = Cooperative and Rural Development Bank
NPF= National Provident Fund
PPF = Parastatal Pension Fund
TIB = Tanzania Investment Bank
TDFL = Tanzania Development Finance Co LTD
THB = Tanzania Housing Bank

A report of the Presidential Banking Commission gave way to a comprehensive financial sector reform in 1991. The major objectives spelt out in the reform document are, among others, the creation of an enabling environment for the evolution of a competitive and efficient financial system. Main elements of the implementation include restructuring of existing institutions; allowing entry of new ones and creation of an enabling environment and prudential regulatory roles of the central bank.

Liberalisation of the financial market resulted in the mushrooming of banks and non-bank financial institutions. By 2001 there were seventeen commercial banks, eleven non-bank financial institutions, eleven insurance companies, two pension funds and one stock exchange operating in the country. It is well documented that the inefficiency features of the pre-reform era are still in existence. Commercial banking is still oligopolistic in nature, deposit rates are still low while lending rates are high; the payments system is still poor and transaction costs are high.

Performance

There are a number of measures for financial development. The use of one measure or the other is dictated by the availability of data. In most cases the indicators used are the ratio of Broad Money (M2) to Gross Domestic Product (GDP). In some cases financial savings as a ratio of M2 is used to get the proportion of M2 that is in the form of savings deposits. Table 2 shows the indices for Tanzania. There is an erratic trend in some indicators of financial development in nominal terms, for most of the period prior to 1990. The post-1992 period is characterised by a decline. Note that this represents the post liberalisation period. The ratios are well below those attained in most industrialised countries (60 % to 70 %), and close to 100% in Japan in the late 1960s (Goldsmith, 1969; Polak, 1989).

There has been a sharp decline in liquidity in the economy as evident from the sharp decline in the ratio of M2 to output, pointing to the process of demonetisation. A major source of this relative liquidity contraction appears to be the slow credit expansion to the private sector relative to the extent of retirement of Government debt and scaling back the size of the public sector, releasing resources through the banking system.[1] This liquidity is parked in the banking system, where low loan-to-deposit ratios are prevalent. With lending by NBC (1997) Ltd and NMB frozen under a Memorandum of Understanding with the Government, except for holding Treasury Bills, excess liquidity in the banking system has risen at a time when the private sector is starved of credit. This characterises the process of dis-intermediation. Returns to treasury bills have fallen from an excess of 45% prior to 1995 to the current range of 8%-15%); commercial banks are hard pressed to look for more profitable outlets, having squeezed savings deposit rates as far down as possible to reduce the cost of funds. It is thus the likelihood of a strong emission of liquidity into the economy as lending activities pick up.

[1] It could as well be that efficiency of credit utilisation has improved. During the co-operatives and parastatal era, credit was never recycled.

In terms of efficiency there has not been much achievement though. There still exists a near monopoly situation in commercial banking by the former largest commercial bank. The interest rate spread is large and bank commissions are exorbitantly high. The payments and settlements systems are still poor (Nyagetera and Kilindo, 1995; Nyagetera and Tarimo, 1997). With the largest commercial bank (NBC) under restructuring during the period of this study, the new entrants were not hard pressed to compete aggressively through price manipulation.

There has however been significant success in combating inflation from a high of 30% during most of the 1980s to a single digit level by the beginning of 1999. This has been achieved through monetary policy whereby the central bank followed "tight" policy for the second half of the 1990s. It is believed that the real sector, the private sector in particular, has been hardest hit by monetary stringency. This implies increased efforts to monitor what is happening in the real sector in terms of production and distribution. The importance of understanding the impact of changes in the money stock and its channels of transmission can therefore not be over-emphasized.

A quantitative measure would unquestionably be an important contribution towards that direction. However, the current study is limited to developing a framework for monetary programming in order to equip monetary authorities with tools of analysis. This requires an understanding of the money supply process as it is linked to the relationships among macro-economic variables in the economy. Effectiveness of monetary policy depends on the extent to which influences of money supply will affect economic activity and the lives of individuals. This in turn depends on the depth of the financial system.

A more precise measure of the functioning of the financial system uses four indicators, (King and Levine, 1993). First, is depth of the financial system defined as liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial

Table 2: *Tanzania: Financial intermediation and economic performance indicators*

	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999	2000
Real GDP Growth (%)	4.4	2.2	2.9	3.4	3.3	3.0	4.2	3.3	4.0	4.8	5.1
AnnualChangeinM2(%)	15.4	19.7	21.2	23.1	29.1	20.7	11.6	11.0	11.1	15.0	12.5
Income velocity (GDP/M2)	4.1	3.4	2.4	2.9	4.7	5.0	5.5	6.2	6.6	6.6	6.6
Financial Development (M2/GDP)	.24	.29	.41	.35	.21	.20	.18	.16	.15	.15	.15
Inflation rate (annual change inNCPI)(%)	3.7	26.5	30.0	33.3	19.7	26.9	15.4	15.4	11.2	7.0	5.5
Real Deposit rate (%)	-.2	-22.5	-25.4	-23.3	-9.8	-1.4	-4.8	-5.2	-1.3	2.3	2.7
Budget deficit/GDP (%) (-ve = surplus)	7.8	16.9	13.6	8.2	2.1	-4.6	0.3	-3.4	-0.2	-1.0	1.6

Source: Bank of Tanzania (2001)

intermediaries) as a proportion of GDP. Second, is the degree to which the central bank versus commercial banks are allocating credit to the sum of bank credit and bank domestic assets. Third, credit allocation to the private sector as measured by the ratio of credit allocated to private enterprises to total domestic credit (excluding credit to banks). Fourth is the ratio of credit to private enterprises to GDP.

Table 3 shows a comparison of these ratios obtaining in Tanzania with those in very rich, rich, poor and very poor countries. It is indicative that Tanzania ranks as poor in terms of financial development. The performance of credit growth, particularly to the productive sector has not been impressive after liberalization. Lending to deposit ratio declined consistently from 141.4% in 1990 to 86.1% in 1995 and to a low 33.8% in 1998[2] Commercial banks also manifested increasing risk aversion in lending giving preference to holding government paper, of which interest rates were relatively high during the period. Other reasons are high risks in lending as perceived by new entrant banks (foreign banks); state owned banks which were under restructuring being restricted to lend; and difficulties in assessing the credit worthiness of private borrowers and problems associated with the handling of commercial disputes. Thus initiatives by the Bank of Tanzania (BOT) to establish the credit information bureaux and commercial courts are critical in this respect. The rural sector is deprived of financial services and agriculture has experienced the steepest decline in its share of credit. Banks are concentrated in major urban centers and closure of remote branches of the National Bank of Commerce has left the gap of financial services to rural areas unfilled. This demands a deliberate strategy to intensify micro-finance services and pursue new initiatives for availing such services.

The ratio "BANK" that measures the degree to which the central bank versus commercial banks are allocating credit declined sharply because of liquidation of much of NBC's loan portfolio. A comprehensive audit and classification of the loan portfolios of the major financial institutions was completed by 1992 and by 1996 non-performing assets in the NBC still accounted for over 67% of the loan portfolio. Further restructuring that followed privatization led to the split of NBC into two independent units, which were tailored for privatization.

Looking at the ratio of credit allocated to private enterprises to total domestic credit (excluding credit to banks) i.e., "PRIVATE" it

[2] Some of this decline is associated with the clearing up of the balance sheets of the state owned banks by removing non-performing loans/assets.

almost doubled between 1990s and 2000. About 80% of the largest commercial bank, NBC's loan portfolio involved loans to only 20 borrowers of which 19 were parastatal enterprises. Moreover, of the loans to cooperative unions, classified under the private sector, 65% were considered non-performing.

Table 3: *Financial development and real per capita GDP*

Sample of 96 countries (Kin & Levine, 1993)									
					Correlation with real per capita	Tanzania			
Indicator	Very rich	Rich	Poor	Very Poor	GDP in 1985	1985	1990	1995	2000
DEPTH	0.67	0.51	0.39	0.26	0.51	0.35	0.21	0.20	0.15
BANK	0.91	0.73	0.57	0.52	0.58	0.52	0.59	0.51	0.48
PRIVATE	0.71	0.58	0.47	0.37	0.51	0.35	0.27	0.30	0.47
PRIVY	0.53	0.31	0.20	0.13	0.70	0.16	0.19	0.08	0.05
No. of countries	29	29	29	29					

DEPTH = (liquid liabilities of financial system (currency + demand & interest-bearing liabilities of banks)/ GDP
BANK = bank credit / (bank credit + central bank domestic assets)
PRIVATE = credit allocated to private enterprises / total domestic credit (not including credit to banks)
PRIVY = credit allocated to private enterprises / GDP

We observe that "PRIVY" has dropped in ten years to only 40% of the mean value for the "very poor" countries. Two explanations can be given for this. First by mid 1990s, BOT imposed a credit squeeze as well as giving freedom to commercialbanks to allocate credit without pressure from marketing boards and other parastatal enterprises. Second, this may represent an extent of crowding-out by the government in the acquisition of financial assets. A very indirect indicator of crowding-out which is also indicative of the loan magnitude may be shown by the loan-deposit ratio. The decline in the loan-deposit ratio shown above, indicates that a drastic fall has occurred in credit flow to other domestic sectors, i.e. in respect of domestic lending to non-government sectors.

III: THE MONEY SUPPLY PROCESS, CENTRAL BANK CONTROL AND GROWTH: SOME CONCEPTUAL ISSUES

Central Bank Control Under the "Monetary Base Approach"

This section follows closely Sijben (1979).According to the reserve money (monetary base theory), money supply (M) is a product of the money multiplier (m) and the monetary base (B). The monetary base is defined as the sum of money supplied by the central bank which the commercial banks are required to hold as cash reserve (R) against their deposit liabilities and which is desired as currency (C) by the non-bank public. The monetary base is a completely liquid financial asset issued by the monetary authority sometimes referred to as "high-powered money."

In algebraic terms we can present it as:

$$B=R+C \qquad (1)$$

It is normal practice for the central bank to determine a certain cash-reserve requirement (r_d and r_t for commercial banks to hold against their demand deposits (D) and time deposits (T). As far as the banking system holds excess reserves (E), we can define bank reserves as:

$$R=r_dD+r_tT+E \qquad (2)$$

The supply of demand deposits can be derived from equation (2):

$$D= (R-r_tT-E)/r_d \quad (3)$$

To get the total money supply (M) we have to add the currency in the hands of the non-bank public. Hence,

$$M=C+(R-r_tT-E)/r_d \quad (4)$$

We have six factors that determine money supply as shown in equation (4). Of the six factors three (R, r_d and r_t) are dependent on the behaviour of monetary authorities and two are determined by the public (C and T) and one, (E), is dependent on the monetary behaviour of the commercial banking system. Excess reserves (E), defined as the difference between the total bank reserves and required reserves, are held by the commercial banking system for two reasons. One is for withstanding the future risk of deposit loss (precautionary motive) and second is to keep open the possibility of investing these reserves in a more profitable way in due time (speculative motive).

It further assumes that the public desires a ratio (c) of currency to private demand deposits and a ratio (t) of interest bearing time deposits to demand deposits and assuming that the commercial banking system desires a ratio (e) of excess reserves to demand deposits.[3] Equation (I) can be reformulated to yield:

$$B = (r_d + r_t t+ e + c)D$$

The relationship between demand deposits and the monetary base can be written as:

$$D= 1/(r_d+r_tt+e+c)B \quad (5)$$

The final expression of money supply has to include the sum of demand deposits and currency. This leads us to the relationship of the money supply to the monetary base.

$$M=(1 +c)/(r_d+r_tt+e+c)B \quad (6)$$

[3] The money multiplier would also be affected by confidence in the banking system, political stability, and macro-economic management.

surplus on the balance of payments and decreased when there was a deficit. The relationship between DCE and changes in the stock of money is presented in Table 5.

What the banking system balance says is simply DCE = ΔM - ΔNFA. We see that the notion of domestic credit that has been extended is implicit in the reasonig given above by defininga wider lending total and relating it to the net foreign assets of the banking system.

Andretta and D'Adda (1979) have an exposition of an accounting identityamong the financial balances of the macro-sectors of the economy. The financial balances of importance are change in financial assets of the private sector (FAPS); change in financial liabilities of the private sector FLPS); financial balanceof the government (FBG) and the foreign financial balance (FFB). The relationship among these variables is given as:

$$FAPS -FLPS + FBG + FFB = 0$$

The government budget is usually expressed as, FBG = GD and current account surplus of the balance of payments as, FFB = BPC. Defining in accordance with an overall view of the economic system, DCE2 = FLPS + GD.

The above identity can be replaced by FAPS = DCE2 + ΔNFA which is similar to the former ΔM = DCE + ΔNFA shown above. The second expression provides a more general notion of DCE, and considers change in assets of the private sector in the current account component of the balance of payments. This analysis shows that the whole set of assets of the private sector and the whole set of credit to both the private and the public sector have to be considered by the monetary authorities in order to maintain control of the current account of the balance of payments and the price level.

Money Supply, Financial Development and Growth

Money and Growth

In practice the process through which monetary factors affect the real variables is rather complicated. If, for example, the central bank pursues an expansionary monetary policy by purchasing short-term government securities from the private sector a disturbance in portfolio balance of the agents occurs. This comes about because this action by the central bank will initially involve an excess supply of real cash balances that individuals want to eliminate by interest bearing close substitutes. If the substitution is directed to bonds, an excess demand for bonds is created and prices rise. Further portfolio adjustment comes about and the demand for shares increases (through the mutual substitution hypothesis). The increase in the price of shares brings a rise in the existing capital goods, above the price of newly produced units. This price difference gives an incentive to increased investment activity and leads to the expansion of capital goods production. Through the traditional multiplier and accelerator process, a rise in economic activity is realized. It is possible to measure the impact of changes in the money stock on economic activity and hence growth.

Kalumia and Yourongoa (1998) evidenced stronger money output causality in co-integration and dynamic model in five African countries, where the real exchange rate, the price level and nominal money balances were used as determinants of long run real output. Similarly, using various indicators of financial development, Allen and Ndikumana (2000) investigated the role of financial intermediation in stimulating economic growth in Southern Africa. The results lend some support to the hypothesis that financial development is positively correlated with the growth rate of real per capita GDP.

Financial Development and Growth

It has been evidenced in recent macroeconomic literature, e.g. Levine (1997) that finance is essential for economic growth. Focusing on exploring the channels through which financial development stimulates economic growth, most studies conclude that financial development enhances efficiency in the allocation of resources, thus stimulating the growth process. The efficiency-increasing role of the financial system is supported by many arguments. Among the arguments is that the financial system reduces liquidity risk and facilitates the management of risk by savers and investors. Financial intermediaries evolve to channel saving into long-term assets that are more productive than short-term assets, (Allen and Ndikumana, 2000). What the financial system does is to facilitate portfolio diversification for savers and investors, and the choices to investors increase as the financial system develops. In the process more resources are allocated to more productive activities.

It is also argued that the financial system is better placed in collecting and processing information about investment projects (King and Levine, 1993). Financial systems collect and evaluate information more effectively and less expensively than individual investors due to economies of scale that they enjoy. The overall cost of investment declines, and this in turn stimulates growth. If the opposite obtains in any economy i.e., if there is low financial development or distortions exist in the cost of investment, economic growth is retarded.

Implications for Monetary Programming

We can now summarize the money supply process that combines the monetary base approach and the new approach that introduces the external sector. Under the monetary base approach we identified three main actors in the money supply process: the central bank, the commercial banks and the non-bank public. Introduction of the domestic credit expansion approach has brought up the Treasury as far as the budget balance is evidently among the factors

changes in base money on money supply. The value of the money multiplier tends to vary because some of the determinants of the money multiplier such as public demand for currency, banks' demand for excess reserves and shifts between time anddemand deposits have been changing over time.Between 1985 and 1998 the currency to depositratio increased from 0.99 to 1.29, while excess reserve ratio increased by almost four times from0.06 to 0.23. The saving deposit ratio increased from 0.3 in 1985 to 0.76 in 1998 while the time deposits to total deposits ratio declined from 0.78 during period.

Table 4: *Trends in the monetary base, money supply and money multiplier*

Year	Base Money (TSh. bill)	M3 (TSh. bill)	Money Multiplier	Change in Base money from previous year TSh. bill)	Change in M3 from previous year (TSh.bill)
1987	27.88	66.44	2.38		
1988	36.65	88.25	2.41	8.77	21.81
1989	43.76	116.54	2.66	7.11	28.29
1990	62.28	165.33	2.65	18.82	48.79
1991	70.35	215.06	3.06	8.07	49.73
1992	112.75	302.36	2.68	42.40	87.30
1993	152.32	420.95	2.76	39.57	118.59
1994	226.44	569.74	2.52	74.12	148.79
1995	314.89	737.81	2.34	88.45	168.07
1996	335.77	821.50	2.45	20.88	83.69
1997	364.94	927.07	2.54	29.17	105.57
1998	418.73	1026.98	2.45	53.79	99.91
1999	508.67	1217.53	2.39	89.94	190.55
2000	556.43	1397.69	2.51	47.76	180.16

Source: BOT, Economic and Operations Reports

determining domestic credit (of course the Treasury would also be an element in the former approach). Now we see also that activities of the banking system and the non-bank public that are related to the balance of payments are also important in the money supply process. This then implies that for the monetary authority to be able to control the money stock it should be equipped with a deep understanding of the working of not only the financial system but also the interactions of the macroeconomic variables that determine the relevant prices, the balance of payments, the government sector and the real sector. In other words the economy has to be understood in a macro setting. This can be done using a macroeconomic model of the economy. Before the model is displayed views of policy making, banking and business communities on the conduct of monetary policy were solicited through a survey. The next section presents the findings of the survey

Policy Makers, Banking and Business Communitie's Views on Monetary Policy[4]

Policy Makers' Awareness of the Conduct of Monetary Policy

In Tanzania the conduct of monetary policy is undertaken by the Bank of Tanzania, the central

[4] Randomly picked officials of the central bank, finance ministry and financial and business community were interviewed. The sample frame was based on the final design of the Research Proposal.

bank. However, the whole process involves a much broader level of participation both from within BOT itself, commercial banks, key ministries like finance and planning as well as institutions like the Bureau of Statistics.

Given the role of these institutions in the conduct of monetary policy it is important that at least, senior officials in these institutions are knowledgeable of the objectives of and the process involved in the conduct of monetary policy in Tanzania.

It is also important that their views on certain parameters, which might escape the attention of those more directly involved in the conduct of monetary policy is incorporated in the monetary policy framework, so as to improve effectiveness of the conduct of monetary policy. Of course, at a more advanced stage it would be necessary to ensure that the broader public is also brought into the picture.

The survey aimed at identifying the extent to which the current framework for the conduct of monetary policy in Tanzania has involved these key stakeholders. In this regard, the major aim of the survey was to ascertain whether policy makers are aware of the way monetary policy is implemented and also whether they have any concerns on the current framework.

A questionnaire was formulated and interviews conducted with senior policy makers in the Ministry of Finance, the President's Office, Planning and Privatisation, Ministry of Agriculture and Livestock Development, and the National Bank of Commerce. It also involved senior statisticians at the Bureau of Statistics and senior officials with the Bank of Tanzania, who are not directly involved in the conduct of monetary policy. The questionnaire was administered to 40 interviewees, who were randomly selected.

The inquiry ranged from what they understand by the term monetary policy and how BOT conducts its monetary policy. We also wanted to know if they are satisfied with the current stance and the way monetary policy is implemented by BOT.

We were also interested in knowing if they are aware of the various media, through which BOT communicates with the general public on monetary policy issues in order to establish the level of transparency of BOT's monetary policy, instruments and targets.

The survey also aimed at identifying what the policy makers saw as deficiencies in the current framework of monetary policy. We went further to investigate their position on the link between monetary policies conducted by BOT and economic growth.

Issues of the link between monetary policy and fiscal policy were also addressed. We wanted to ascertain whether policy makers think the link exists and thus the need for harmonisation of monetary policies. Finally we inquired on what they consider as major achievements of monetary policy in Tanzania in recent years, and if there are areas needing further improvement.

Most officials interviewed had some knowledge on the conduct of monetary policy. Among the institutions covered, the level of understanding was found to be highest at the Ministry of Finance.

Most interviewees related monetary policy with control of liquidity in the economy. The aspect of price stability was also mentioned by a few of them.

A good number of the respondents related the conduct of monetary policy with the use of indirect instruments and there were some who recognised that monetary policy had growth as its main objective. About 90% of the respondents indicated that they are aware on how BOT conducts monetary policy, but only 40% said that they are satisfied with the way monetary policy is conducted. The survey also indicated that respondents get information on monetary policy mainly through bulletins produced by BOT. It was interesting to note that none of the respondents mentioned radio programmes as source of information on monetary issues. This raises concern that this medium, most accessible to ordinary Tanzanians, is not used in educating the public on the conduct as well as importance of monetary policy.

The level of transparency in the conduct of monetary policy was ranked as medium by 40% of the respondents, while 30% ranked it as high and 30% as low. This shows that opinions among the interviewed individuals are highly variable. However, when asked whether they are satisfied with the way monetary policy is being conducted 30% said they are satisfied. 60% said they were not satisfied, while 10% said they were indifferent.

The deficiencies in monetary policy pointed out by respondents included the pursuance, by the BOT, of *conflicting objectives* and lack of adequate instruments. Some respondents pointed out that the major weakness of monetary policy has been the crowding out of the private sector by the Government, while others associated the weaknesses with lack of adequate autonomy. There seems to be no clear position on whether the current monetary policy stance is conducive to growth or not despite 50% of the respondents indicating that monetary policy is conducive to growth and 40% saying it was not conducive to growth and 10% being indifferent.

On what should be done to improve the situation, respondents indicated that there was need for greater collaborative efforts between the monetary authority and main actors in the economy. It was also cautioned that monetary policy should take cognizance of the fact that external shocks contribute quite significantly to inflation in Tanzania. There was thus need to clearly understand this phenomenon, so as to avoid the use of monetary measures to control such supply-led shocks.

The crowding out effect was also sighted as a matter that should be checked. Skepticism was expressed that the problem was only a temporary one. Some interviewees were of the opinion that economic growth should be the target to be pursued by the Bank and that merely targeting low inflation may be counter productive, since high growth can also be attained, even if the level of inflation is not very low. This points to the need for the Monetary Authority to determine the optimum level of inflation for the economy.

On the issue of monetary and fiscal policy harmonisation, 50% believed there is harmonisation, 30% felt there is no harmonisation and 20% were indifferent. Respondents indicated that the main achievement of monetary policy has been lowering of inflation, but other achievements are liberalisation of the financial sector, BOP improvement and exchange rate stability. Respondents thought that in order to improve monetary policy in Tanzania, there was need to increase the range of monetary instruments and also improve the harmonization of fiscal and monetary policies.

Banking and Business Communities' Understanding of Monetary Policy

A survey was conducted by way of interviewing randomly selected employees in the seven major commercial banks in the City of Dar es Salaam, namely the National Bank of Commerce (NBC, 1997 Ltd.), the National Micro-finance Bank (NMB), Citibank, Standard Chartered Bank, Stanbic and the Cooperative and Rural Development Bank (CRDB, 1996 Ltd.). Effort was made to interview staff at senior and supervisory management levels. A few low rank employees were also interviewed. Questions asked related to the following major themes:

What monetary policy is and who implements it in Tanzania and what they rank as the most important function of the BOT. We also wanted to know what they thought were the factors that cause inflation and it impacts on their work and lives.

We went further to inquire on another important factor, the interest rate. We wanted to know what they thought was the main cause of high interest rate experienced in the recent past and if they thought BOT could do something about it.

On the conduct of monetary policy we were interested in their understanding of the different methods of its conduct. We asked them whether they understood the mechanisms involved, hinting to them some ways like the Treasury bills market.

Table 5: *Domestic credit expansion and changes in the money stock*

The Central Bank		Commercial Banks	
Assets	Liabilities	Assets	Liabilities
Official Foreign reserves	Monetary base	Reserve holdings	Deposits
		Foreign assets	Foreign Liabilities
Government Securities		Loans and securities	

If we aggregate and consider increments, we have capital account for the banking system.

Banking System	
Change in Net Foreign Assets of the Banking System (ΔNFA)	Money (ΔM)
Domestic credit expansion (DCE)	

The survey went deeper as far as commercial bankers are concerned. We asked them how they judged the Statutory Minimum Reserve Requirement and its effectiveness in influencing their credit expansion.

Such measures as an increase in reserve requirements, or treasury bills operations that raise interest rates affect commercial banks' foreign exchange operations. We inquired on how they were affected by this instrument.

As was the case for policy makers we solicited their ideas on what they thought BOT should do to improve the effectiveness of monetary policy. Most of the senior executives and officers of commercial banks appeared to be conversant with issues relating to monetary policy. This was not the case with the lower rank staff. Most of the interviewed belonging to the latter group could answer the questions only when we referred to the BOT. They understood what BOT was doing and what was expected of it, without knowing that this was actually monetary policy. On the contrary, members of the business community, as represented by the TCCIA, were mostly ignorant of the workings of monetary policy, despite understanding the role of BOT. In particular, while they mostly attributed high interest rates to bad policies of the BOT, or failure of BOT to 'control' interest rates, they were not able to relate them to heavy government borrowing (large fiscal deficits). It would appear that much of this ignorance is due to the long period during which operation of markets were suppressed. Thus, members of the business community questioned the rationale of BOT to have allowed free market determination of interest rates! Very few of those interviewed were able to relate interest rates to the supply and demand for money, nor was it easy for some people to understand the sources of money in the economy.

In defining monetary policy, interviewees found it easier when the question was raised as "What is the role of BOT" rather than "Can you define monetary policy?" Most of those who were asked the latter question tended to give the textbook answer that it is the control of money supply, without being able to relate it with interest rates and other monetary policy instruments. However, virtually every interviewee was able to list down the functions or at least what he expected of BOT. It is however a curiosity that the function that came out more clearly was the 'the control and supervision of the banking system" followed by "control of inflation." Other

functions (listed by order in which they were mentioned) were: exchange rate management, custodian of foreign exchange reserves; banker and advisor to government on financial matters; issuer of currency and banker to banks. The overemphasis on BOT role in the licensing and regulation of banks is probably a reflection of the public's perception that in case there are problems with banks, BOT will be answerable. Events linked with bank failures would however support this belief.

While most individuals were able to characterise inflation as a persistent rise in prices, there were varied answers to the causes of inflation. Of the 15 individuals interviewed, 3 were of the view that inflation was mainly caused by supply shortages; 4 thought it was a result of taxes; 6 suggested it was exchange rates and interest rates; while only two thought it was excessive money supply.

The most interesting response was on the impact of inflation on interviewees' activities and life. About 65% of the members of the business community responded that they had better times during the high inflation era, specifying at the same time that the inflation rates of 20%-30% were not hazardous. 35% of the respondents said that lower inflation than experienced in the past might boost their competitiveness and also allow them to predict production costs. However, as high as 82% of bankers were of the view that inflation was harmful to business activity. Only two respondents were asked how inflation affected their lives, and all answered that they had better life during the inflationary period. They argued that the efforts taken by the government to reduce inflation might be justified, but for a long time salary adjustments were much below the inflation rates. They suggested that there was a need for a one time large increase in the salary levels to bring them in line with the minimum subsistence levels.

BOT was blamed by a large part of those interviewed, (58%), for the high interests rates that prevailed in the economy during the first half of the 1990s. They argued that BOT as an advisor to the government on financial matters should not have allowed this to happen. When asked how BOT could have prevented this to happen when the Treasury needed to borrow from the public at market determined rates, they responded that the BOT should have 'managed' the market in a better way (no specifics were given on this). About 40% of the interviewees from the business community blamed the government for the high interest rates, pointing at large fiscal deficits as the source. 2% attributed the problem to 'poor banking and lack of competition in the financial sector.' A majority of the bankers (89%) identified the following factors: tight BOT policies like high reserve requirements; high interest rates in the Treasury bills market resulting from expansionary budgetary policy; and high inflation rates. There was a sort of mix-up of causes and effects. They thought that BOT had taken appropriate stance. While the bankers generally understood the essence of open market operations, the business community was mostly in the dark. Those who were able to talk about this issue saw the Treasury bill operations as liquidity mop-up exercises, which they also thought were quite effective, but 'damaging the economy by depriving credit to the private sector.' The bankers thought that this was a better way of reducing liquidity than the use of reserve requirements. They explained that the latter instrument was a tool of BOT to 'exploit' the banks and 'tax' depositors. However, the commercial bankers admitted that statutory minimum reserve requirements reduced their ability to do business, and hence their profitability. This implied that the Statutory Minimum Reserve (SMR) policy was effective.

The understanding of the linkage between domestic interest rates, exchange rates and inflation was unfamiliar to the respondents. There was a general understanding that inflation leads to an increase in interest rates.

One may conclude that the Tanzanian business and banking communities are relatively aware of

issues relating to monetary policy and the operations of the BOT. They are also able to link fiscal and monetary policy in a reasonably sophisticated way. However, increased efforts towards more public awareness and enlightenment would be important for improving the credibility of the central bank and making the public more supportive of various monetary policy initiatives.

IV: EMPIRICAL ANALYSIS

The Macro-economic Model

The purpose of this section is to build an appropriate analytical framework to improve the understanding of the macroeconomic relationships among selected variables. At the outset the framework builds on the response of the members of the financial and business communities, as economic actors, to recent economic developments. On the basis of the above information and relevant literature, alternative specifications and lag structures highlighting policy variables easily recognised by policy makers are made. Specifications that best fit the data, with theoretical plausibility in mind, are identified and coefficient estimates made. We believe that these estimated coefficients are translatable into concrete policy recommendations. This required us to include policy variables in the models as far as theory and practice allowed.

The most difficult task is the choice of the relevant macro-economic model and the functional form. The guideline here is to develop estimates of a set of macro-economic variables that are policy-wise considered important. Importance of an estimate may be measured by the extent of its use. The more widely it is used the more important it is. It has been difficult to arrive at a consensus on the general specification of such models among economists for different countries (Haque *et. al.*, (1990). We envisage such disagreement even within a country.

To minimise the possibility of disagreement we work along conventional widely used specifications, while incorporating the specific structure of the economy and the changing policy regimes. The basic formulations follow closely those by Blejer and Khan (1984a, b) and Haque *et. al*, (1990)

The model intends to capture both the external and domestic sectors of the economy. On the external sector our main interest is the balance of payments. We therefore have the export and import functions. In the domestic side we are interested in domestic aggregate demand, with investment and consumption as components, growth of real output, determination of prices, money demand, interest rates, and government revenue.

Aggregate Demand

Standard literature defines demand for domestic real income measured by GDP in time t, (Y_t) as a sum of real private consumption (C_t), real investment (I_t), real government expenditure (G_t) and the difference between real exports (X_t) and real imports (Im_t), ($X_t - Im_t$).

$$Y_t = C_t + I_t + G_t + (X_t - Im_t) \qquad (7)$$

We then consider one component of demand, real consumption. This is specified as a function of the domestic real interest rate (r_t, real disposable income (Yd_t). and lagged real private consumption (C_{t-1}).

$$C_t = \alpha_0 + \alpha_1 r_t + \alpha_2 C_{t-1} + \alpha_3 Yd_t \qquad (8)$$

Disposable income and consumer expenditure are linked to the net change in consumer wealth by the private sector budget constraint (Haque *et al.*, 1990).[6]

We specify investment as a function of standard variables, the real interest rate (r_t), real income (Y_t), real government expenditure (G_t)

[6] Consumer disposable income is defined to be GNP (i.e. GDP plus net factor income from abroad) less depreciation, undistributed corporate profits, and taxes net of transfers. The lagged consumption introduces partial adjustment.

and aid (AID). In including aid we consider the Tanzanian case whereby inflows may have considerable influence on the level of investment. Prior to the upsurge of foreign direct investments, the major component has been aid.[7] Foreign exchange availability from aid has thus been an important factor. Again given the underdeveloped nature of the capital goods sector, it is plausible to assume that most of it is being imported.

$$I_t = k_o + k_1 r_t + k_2 Y_t + k_3 G_t + k_4 AID_t \quad (9)$$

Next we consider the aggregate supply side of the economy. The most important variable of interest is growth of real income. According to Haque et.al. (1990), the best method would be to estimate a production function modeled in the conventional way, i.e.

$$Y_t = \theta_0 K^{\theta 1} L^{\theta 2}, \quad (9a)$$

Where, K and L are measures of the aggregate capital stock and employment and the θs are the co-efficients to be measured. To follow this would however lead us into data problems, especially on aggregate capital stock. We thus relate growth in real income (ΔY) to changes in money supply (ΔM), the real exchange rate (REX), the inflation rate (ΔP), and aid inflows (AID). Lagged real income is introduced to capture partial adjustment. It is well documented that inflows as "investment support" and latter as "commodity import support" has all along made a significant contribution on all sectors of the domestic economy, (Doriye *et al.*, 1993). The inclusion of the money stock and movements in the exchange rate has been standard procedure for other developing countries where capital is mostly imported and investment is constrained by working capital. Inflation is also related to the specification due to its influence on savings and investment.

$$\Delta Y_t = \varphi_0 + \varphi_1 \Delta Mt + \varphi_2 REXt + \varphi_3 \Delta Pt + \varphi_4 AIDt + \varphi_5 Y_{t-1} \quad (10)$$

The External Sector

The import equation is derived from the theoretical foundation developed by Hemphill (1974) and modified in Moran (1989). Under these theoretical presentations it is assumed that the basic objective is to minimise the costs of discrepancies between actual and desired levels of both imports and international reserves. It is expected that in a steady state, the current and desired levels of imports will be equal and will both equal the long-run foreign exchange earnings, which has been hypothesised to be directly related to external reserves.

Considering these assumptions real imports (Im_t) are specified as a function of the availability of foreign exchange (F_t) - measured by export earnings - real output (Y_t) and lagged imports. The lag of real imports is intended to capture partial adjustment mechanisms (Egwaikhide, 1999; Moran, 1989).

$$Im_t = \delta_0 + \delta_1 F_t + \delta_2 Y_t + \delta_3 Im_{t-1} \quad (11)$$

Real exports are assumed to be influenced by the real exchange rate (REX), defined as eP_t^*/P_t, where e is the exchange rate, P* import price index and P is the domestic price; and the level of real output (Y_t). Positive co-efficients are hypothesised for all variables and the partial adjustment mechanism is introduced by including a lag of the dependent variable, X_{t-1}

$$X_t = \tau_o + \tau_1 REX_t + \tau_2 Y_t + \tau_3 X_{t-1} \quad (12)$$

The Monetary Sector

In the monetary sector we have three equations of interest. The first explains demand for real balances the second is determination of prices and the third is determination of the domestic interest rate. A money supply equation is introduced to cater for the current use of reserve money as central bank's operational target in

[7] It is assumed that investors either face a savings constraint (I = S + AID), which can be bridged by Am or face a foreign exchange constraint which can be bridged by foreign exchange earnings. Therefore a long run constraint will involve both a savings and a foreign exchange term.

achieving the desired levels of broader monetary aggregates.

The demand for money specification follows standard theory, whereby money is demanded as an inventory to smoothen differences between income and expenditure streams and as one of the several assets in agents' portfolio. A long run specification would include the real interest rate (r_t) and real income (Y_t). However in developing countries it is common to consider the interest rate as not being the correct measure of the opportunity cost of holding money because it is not market determined and hence does not reflect its market cost. The demand for money function therefore includes the inflation rate ΔP_t. There are plausible reasons to include it since the study covers a period when some degree of market determination of interest rates was achieved.

$$(M/P)_t = \beta_0 + \beta_1 r_t + \beta_2 Y_t + \beta_3 (MIP)_{t-1} + \beta_4 \Delta Pt \qquad (13)$$

Demand for money is inversely related to the interest rate and inflation rate while positively related to income and the money stock. Price changes are determined by changes in money supply (ΔM_t), changes in nominal exchange rate (ΔEXR), external prices (P^*) real output (Y_t) and lagged prices (P_{t-1}). Lagged prices are included because in most cases no price adjustment is instantaneous. The higher the stock of money, the higher would be the current price level.

$$\Delta P_t = \lambda_0 + \lambda_1 + \Delta M_t + \lambda_2 \Delta EXR_t + \lambda_3 \Delta P_t^* - \lambda_4 Y_t + \lambda_5 P_{t-1} \qquad (14)$$

The external price variable is included *to* measure the influence *of* imported inflation and is expected to fuel domestic inflation, i.e. a positive coefficient is hypothesized.

The last equation in the monetary sector specifies the domestic nominal interest rate. Prior *to* liberalization such estimation would *not* be plausible as nominal interest rates were strictly controlled as indicated earlier. The domestic interest rate (R) is influenced by the foreign nominal interest rate (Rf), changes in the exchange rate (ΔEXR) and the change in real cash balances, $\Delta(M/P)$. The inclusion of the foreign interest rate is based on the assumption that in a small open economy nominal interest rates are determined by the interest parity condition that equates the domestic nominal interest rate to the sum of the nominal rate prevailing abroad and the expected change in the value of the domestic currency (Haque *et. al*, 1990). The real money variable captures factors purely covered in domestic markets and hence the equation takes into account both external and internal factors.

$$R_t = \tau_0 + \tau_1 Rf_t + \tau_2 \Delta EXR_t + \tau_3 \Delta (M/P)_t \qquad (15)$$

Considering the existing conduct *of* monetary policy whereby the central bank relies on the link between reserve money and the broader monetary aggregates a money supply equation that seeks to explain changes in broad money supply (M3) in terms *of* changes in reserve money (MO) and its own lagged values is specified.

$$M3_t = \phi_0 + \phi_1 MO_t + \phi^2 MO_{t-1} + \phi_3 M3_{t-1} \qquad (16)$$

Government Sector

The government sector is introduced by a revenue function, whereby real government revenue (Rg) is specified as a function of the bases of the main taxes, i.e. real income, (Y), real imports ($1m_t$), real private consumption (C) and the real exchange rate REX.[8]

$$Rg_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 lm_t + \gamma_3 Ct + \gamma 4\ REX_t \qquad (17)$$

A summary of the model is presented in Table 4.1.

Table 4.1: *A Structural Model for Tanzania*

Aggregate supply and demand	
$C_t = \alpha_0 + \alpha_1 rt + \alpha_2 C_{t-1} + \alpha 3 Yd_t$	(8)
$I_t = k_0 + k_1 r_t + k_2 Y_t + k_3 G_t + k_4 AID$	(9)

$$\Delta Y_t = \varphi_0+\varphi_1\Delta M+\varphi_2 REX_t+ \varphi_3\Delta P_t + \varphi_4 Al.D_t+\varphi_5 Y_{t-1} \quad (10)$$

$$Im_t = \delta_0+\delta_1 F_t+\delta_2 V_t + \delta_3 Im_{t-1} \quad (11)$$

$$X_t = \eta_0+ \eta_1 REX_t+ \eta_2 Y_t+\eta_3 X_{t-1} \quad (12)$$

The monetary Sector

$$(M/P)_t=\beta_0+\beta_1 r_t+\beta_2 Y_t+\beta_3(M/P)_{t-1}+\beta_4\Delta P_t \quad (13)$$

$$\Delta Pt = \lambda_0+\lambda_1\Delta M_t+\lambda_2\Delta EXR_t+\lambda_3\Delta P^*t -\lambda_4 Y_t+ \lambda_5 P_{t-1} \quad (14)$$

$$R_t=\tau_o +\tau_1 Rf_t+\tau_2\Delta EXR_t +\tau_3\Delta M/P_t \quad (15)$$

$$M3_t =\phi_o +\phi_1 MO_t +\phi_2 MO_{t-1}+ \phi_3 M3_{t-1} \quad (16)$$

Government Sector

$$Rg_t=\gamma_o+\gamma_1 Y_t+\gamma_2 Im_t+\gamma_3 C_t+\gamma_4 REX_t \quad (17)$$

The Empirical Findings[9]

In this section we report the results of surveys and the econometric model on the relationships among macroeconomic variables.

Econometric Results

Details of the results of the parameters of the econometric model by OLS estimation (t-values in parentheses) are presented in Appendix 2. The model was estimated using quarterly data spanning from 1986 to 1998.

Interpolated quarterly series for income, consumption and investment was used. It is well understood that the process of interpolation may lead to strong first-order auto-correlation especially when done mechanically. In our case the exercise was based on observing the behaviour of money supply data which is available in quarterly series.[10]

Real consumption is influenced by real disposable income and lagged consumption with their coefficients significant at the I% level. The interest rate is significant at the 10 % level, but is inelastic to consumption, a result similar to other studies although in our case there is change in the sign, contrary to theory. This may be a result of using inappropriate proxies for derivingderiving domestic real interest rate, (for example the rate of inflation). The coefficient of lagged consumption is close to unity and statistically significant at the I % level, in support of the permanent income hypothesis.

In the investment equation the results are supportive of interest inelasticity of investment, contrary to most results from developing country studies. Most investment functions do not include the real interest rate because of lack of information In the investment equation the results are supportive of interest inelasticity of investment, contrary to most results from developing country studies. Most investment functions do not include the real interest rate because of lack of information, Blejer and Khan (1984a), Haque *et al* (1990). The sign is however negative as expected. Real income and government expenditure influence investment as is hypothesised by theory and are both statistically significant at the I% level. Aid was statistically significant at the 1% level but has the opposite sign (results are not reported). This is likely caused by multi-collinearity, since in some cases aid is determined by real government expenditure. For some programs in Tanzania the amount of aid is positively related to local effort in raising funds and therefore to expenditure itself. We dropped "AID" from the equation and this is what is shown in Table 5.2.

Real output growth is influenced by changes in money supply and lagged real output, and is statistically significant at 1% level while the real exchange rate is significant at the 5% level. Inflation and the real interest rate are insignificant. The co-efficients on the inflation and exchange rates have wrong signs. Similar perverse results were obtained in a study conducted in Kenya,

8 Government expenditure is taken as residual.

9 The model was developed with no representation made that it will feature stable coefficients lending themselves to precise projections of economic outcomes from alternative monetary policies.

10 We tested for serial correlation by the Durbin *h* test as given in Pindyck and Rubinfeld (1991). The critical value of the normal distribution at the 5% level (1.645) was compared with respective calculated *h*, which is 3.53 for consumption, 1.15 for output, 0.81 for exports and 0.78 for imports. It is only in the consumption function where the calculated *h* is greater than the critical value, leading us to reject the null hypothesis of no serial correlation and therefore requiring us to correct for serial correlation

where it was explained that this was a reflection of high import content of domestic production in such economies (McPherson and Rakovski, 1998). Aid came out with the wrong sign but statistically significant at the 10% level. Two explanations can be given for this. First is that for the period under study there was more aid flowing in the form of commodity support rather than investment support. Second is that most aid financed recurrent rather than development expenditure hence exerting little influence on growth.

The export equation indicates a positive influence of real domestic output, the exchange rate and lagged exports on current real exports. Both real income and lagged exports are significant at the 1% level while the coefficient of real exchange rate is statistically insignificant. Problems linked to the measurement of real exchange rate may have caused this. For example, instead of using the import price index the CPI of US was the only foreign currency price of imports that was used in the computation of the real exchange rate.

Imports in real terms are influenced by availability of foreign exchange and past quarter imports and are statistically significant at the 1% level. Current real income has the right sign and is also statistically significant at the 1% level.

In the demand for money equation the sign of the coefficient on inflation is supportive of theory, and is significant at the 5% level. However we have perverse results for the interest rate variable where there is change of sign. This is indicative that the inflation rate is still the correct measure of the opportunity cost of holding money. Similar results have been reported in estimates of demand for money functions in many developing countries.

Changes in the domestic price are positively influenced by money supply the changes in the exchange rate and foreign and the domestic price levels. Except for money supply, which is statistically significant at the 5% level, the rest are all statistically significant at the 1% level (Table 5.7).

Estimation results of the domestic interest rate equation indicate that real money balances and movements in the exchange rate significantly influence the domestic interest rate. The foreign interest rate is insignificant while real money balances and movements in the exchange rate are statistically significant at the 1 and 5% level respectively (Table 5.8).

In the money supply equation the coefficients of both MO and M3 are statistically significant at the 1% level.

Real tax revenue is influenced by real private consumption and is significant at the 1% level while the exchange rate is significant at the 5% level, but imports are insignificant at conventional levels (Table5.10). Surprisingly the coefficient on income is not statistically significant at conventional levels.

Appendix I presents results of Recursive tests of coefficients.[11] It is notable from the graphs that he coefficient of the domestic interest rate (R) which corresponds to the opportunity cost of holding money had the correct sign until the third quarter of 1993. This is the period when the free market determination of interest rate was introduced through public auction of Treasury bills. One would expect the market determined interest rate to be consistent with the theoretical assertion i.e. negative relationship between money demand and the rate of return on its alternative assets. It does not turn out to be the case here. This could be explained by the fact that at the introduction of Treasury bills auctions a combination of speculative liquidity overhang and the "sudden" entry of Government in the private credit market at the time when inflation was still high sent the yield rates soaring to the levels on the higher side of the equilibrium rate. As the economy adjusted to the new developments the rates began to fall. Meanwhile the rate of growth of money supply had started to fall due to decline in government

[11] This is an attempt to evaluate the stability of the demand for money equation by re-estimating it recursively. The graphs shown in Appendix lindicate that a-one-step-ahead residuals are bounded by two standard elTors and around tre mean. Any value breaking this boundary is considered to be insignificant and hence unstable.

borrowing from the Bank of Tanzania and other factors. It coincidentally thus occurred that the yield on Treasury bills fell at the same time when real money holdings were falling. The unexpected relationship manifested in this equation can thus be linked to the shock exerted by the regime change.

V:CONCLUSION

This study has attempted to design a macro-economic model for Tanzania in order to be a tool for monetary programming and growth. Through econometric analysis alternative specifications have highlighted policy variables that best fit the data on the basis of theoretical plausibility. The model was designed to capture some of the sectoral issues in Tanzania. The purpose of the model was to try as far as possible to address concerns of policy makers on the conduct of monetary policy and its implications on economic activity and growth. Like the experience of studies that have made a similar attempt it has been difficult to come out with specifications that maximize the degree to which "predictions today match what occurred in the past and what will occur in the future." Nevertheless we have come up with the observation that for monetary policy to be more favorable to growth authorities need to observe movements in variables that influence consumption, investment, domestic prices and the external sector. In that endeavor, movements in the money stock in addition to other monetary variables namely exchange and interest rates and prices should be areas of primal concern of the policy makers. The above actions are likely to bring about improvements in the macroeconomic environment and in turn induce investment and in turn a higher rate of economic growth. Proper design of monetary policy would require a better understanding of the workings of the relationships among the variables analyzed in the macro-economic model.

Implications for Monetary Policy

Tanzania has made progress towards financial liberalisation since the mid-80s. The central bank faces a number of challenges when conducting monetary policy during the post-liberalization period.

Predictability of monetary policy impacts may be uncertain for the case of Tanzania for a number of reasons. First are unpredictable changes in net foreign assets held by commercial banks, which currently account for about 18% of broad money supply. These are outside the central bank's direct control.

Second, interest rates are no longer under the central bank's effective control because market forces determine them. This implies that the Bank of Tanzania cannot determine the levels and term structure of interest rates directly as it used to through changes in reserve money and minimum reserve requirements.

Third, the foreign exchange market is operated freely, with interventions limited to smoothing fluctuations in the exchange rate. Unpredictable changes in net foreign assets held by commercial banks and domestic foreign currency denominated deposits with commercial banks constitute a large exogenous influence on money supply.

Lastly, after liberalising the banking sector, BOT influences the behaviour of banks and non-financial institutions mainly through moral suasion rather than direct control. This means effective conduct of monetary policy depends on the voluntary cooperation of commercial banks beyond the statutory measures.

To maintain stability in the resulting environment requires the central bank to manage indirect instruments more actively than in the past. Despite the drawbacks listed above, the statistical analysis shows that monetary policy is important in attaining economic growth, price stability and a favorable balance of payments. The model has shown the process at work on how money supply influences growth in real output, prices, the domestic interest rate and which are linked to investment and consumption. Formulation and implementation of effective monetary policy in macroeconomic management calls for such understanding.

The emerging policy issue is how best to link of monetary policy with the real sector. This has also to do with the behaviour of banks. It has been observed that the real sector is not getting the required investment resources from the financial sector. Monetary policy has a bearing on the flow of credit to the private sector. There is need to design ways that will increase lending to the private sector to carter for the credit requirements of micro-, small-, and medium scale enterprises.

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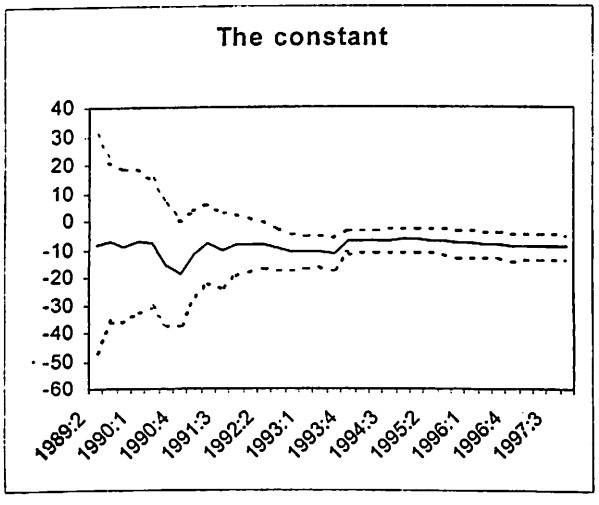
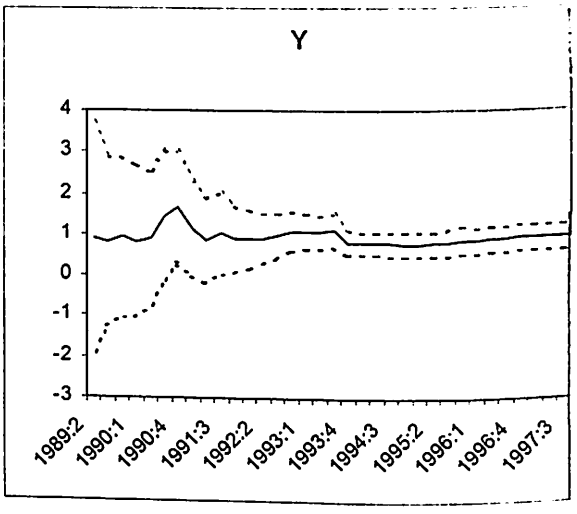
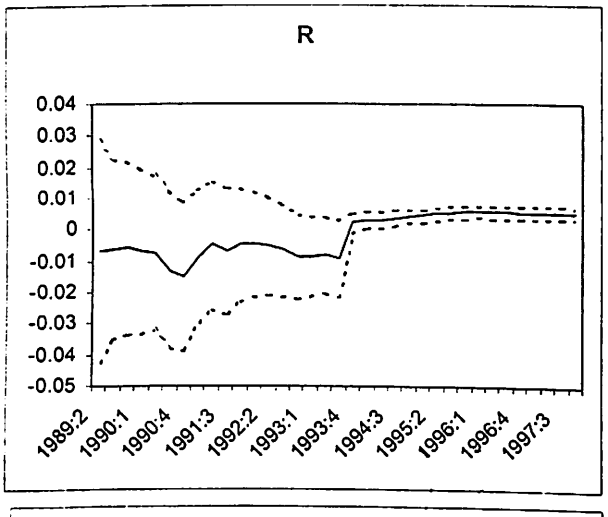
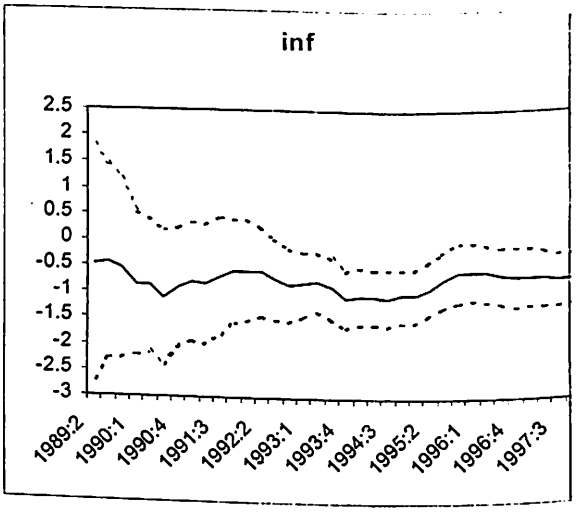
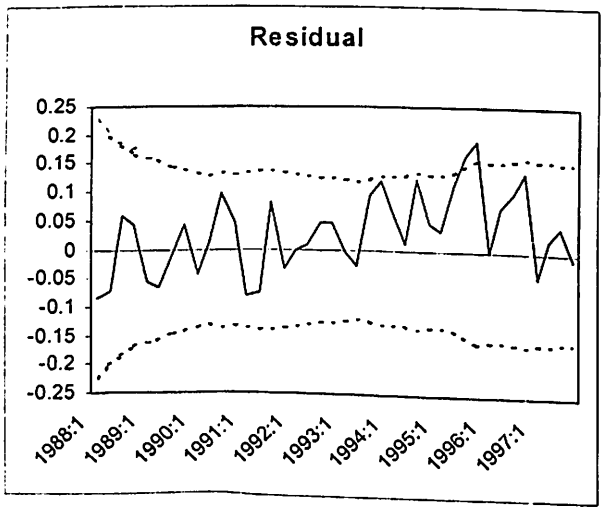
Appendix 1: *Recursive stability tests: Demand for money function*











Appendix 2: *Summary of Regression Results*

Table 1(a): *Consumption*

Lags \ parameters	α_0	α_1	α_2	α_3
0	-3.98 (-2.01)	0.00 (1.83)	0.94 (13.67)	0.67 (2.84)
1			-0.33 (-4.06)	

$AdjR^2 = 0.96$ F = 224.77 S.E. 0.03 DW = 1.15

Table 2(a): *Investment*

Lags \ parameters	k_0	k_1	k_2	k_3	k_4	k_5
0	-7.99 (-4.01)	-0.14 (-1.17)	0.78 (6.01)	0.41 (5.33)	-0.03 (-2.37)	
1						0.46 (4.87)

$AdjR^2 = 0.79$ F = 26.47 S.E. 0.08 DW = 1.49

Table 2(b): *Investment*

Lags \ parameters	k_0	k_1	k_2	k_3	k_4	k_5
0	-8.26 (-4.45)	-0.22 (-2.15)	0.77 (6.65)	0.37 (5.75)		
1						0.50 (5.86)

$AdjR^2 = 0.77$ F = 36.12 S.E. 0.08 DW = 1.50

Table 3(a): *Change in Real Output*

Lags \ parameters	φ_0	φ_1	φ_2	φ_3	φ_4	φ_5	φ_6
0	-0.01 (-0.23)	0.94 (6.94)	-0.09 (-2.62)	0.09 (0.53)	0.00 (0.72)	-0.15 (-1.61)	
1							-0.43 (-3.93)

$AdjR^2 = 0.58$ F = 10.31 S.E. 0.07 DW = 2.68

Table 3(b): *Change in Real Output*

Lags \ parameters	φ_0	φ_1	φ_2	φ_3	φ_4	φ_5	φ_6
0	-0.02 (-0.35)	0.94 (6.97)	-0.09 (-2.54)	0.11 (0.65)		-0.14 (-1.53)	
1							-0.43 (-3.97)

$AdjR^2 = 0.58$ F = 12.43 S.E. 0.07 DW = 2.67

Table 4: *Exports*

Lags \ parameters	η_0	η_1	η_2	η_3
0	-7.97 (-3.88)	0.09 (0.92)	0.82 (4.31)	
1				0.73 (11.9)

$AdjR^2 = 0.91$ F = 146.27 S.E. 0.11 DW = 1.80

Table 5 (a): *Imports*

Lags \ parameters	δ_0	δ_1	δ_2	δ_3	δ_4
0	1.38 (0.77)	0.00 (0.02)	0.00 (0.88)	1.00 (7.18)	
2				-1.05 (-8.03)	0.93 (7.89)

$AdjR^2 = 0.80$ F = 28.84 S.E. 0.07 DW = 1.13

Table 5 (b): *Imports*

Lags \ parameters	δ_0	δ_1	δ_2	δ_3	δ_4
0	1.61 (1.16)	0.08 (1.06)		0.97 (8.61)	
2				-1.05 (-9.01)	0.91 (9.06)

$AdjR^2 = 0.81$ F = 48.26 S.E. 0.06 DW = 2.22

Table 6: *Demand for Real Balances*

Lags \ Parameter	β_0	β_1	β_2	β_3	β_4
0	-9.19 (-4.24)	0.01 (5.84)			
1					
2			0.95 (6.32)		
3					-0.70 (-2.96)

$AdjR^2 = 0.80$ F = 54.98 S.E. 0.08 DW = 1.48

Table 7: *Price Determination*

Lags \ Parameter	λ_0	λ_1	λ_2	λ_3	λ_4	λ_5
0	-231.04 (-6.64)	-0.06 (-2.27)		5.03 (8.76)	-0.00 (-7.52)	
1						0.02 (0.09)
2						0.02 (0.08)
3						-0.02 (-.15)
4						0.98 (6.21)

$AdjR^2 = 0.99$ F = 3135.6 S.E. 6.12 DW = 1.58

Table 8: *Domestic interest rate*

Lags \ Parameter	τ_0	τ_1	τ_2	τ_3
0	-83.45 (-2.74)	1.71 (1.05)	0.31 (2.55)	0.15 (3.18)

$AdjR^2 = 0.26$ F = 4.53 S.E. = 18.34 DW = 1.69

Table 9: *Money Supply*

Lags \ Parameter	ϕ_0	ϕ_1	ϕ_2
0	11630.17 (1.18)	0.86 (4.60)	
1		-0.73 (-3.52)	0.94 (9.36)

$AdjR^2 = 0.99$ F = 2546.52 S.E. 14305.97 DW = 1.99

Table 10: *Tax Revenue*

Lags \ Parameter	γ_0	γ_1	γ_2	γ_3	γ_4
0	-9438.7 (-0.06)	0.02 (0.20)	0.54 (1.39)	1.48 (5.21)	-532.49 (-2.33)

$AdjR^2 = 0.73$ F = 25.41 S.E. = 62781.9 DW = 2.56

Appendix 3: *Stationarity Test of the demand for money equation Variables*

The variables of demand for money equation were tested for satationarity using the Augmented Deckey-Fuller test. All variables were found to be integrated of order one I (1) as presented in the table below.

Variable	ADF test statistic	5% Critical value
$\Delta M/P$	-9.72	-2.93
ΔY	-3.13	-2.93
ΔInf	-6.97	-2.93
ΔR	-6.55	-2.93