Monetary Policy-Making in Mauritius

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1 Introduction

The implementation of monetary policy in Mauritius has changed dramatically over the past two decades. This paper starts by describing the original mechanism of implementing monetary policy from the establishment of the Bank of Mauritius in 1968 until the reforms of the 1990s. The description is followed by a short analysis of the defects of the earlier system and the rationale for adopting alternative mechanisms for implementing monetary policy. The paper then describes the present system by which monetary policy in Mauritius is implemented. Although monetary policy can never be explained in isolation from fiscal and exchange rate policy, this description touches on fiscal and exchange rate policies only where absolutely necessary.

2 The Old System of Credit Ceilings and Administered Interest Rates

Before 1991 monetary policy was conducted primarily by establishing an annual ceiling for the expansion of bank credit, which was then allocated among the commercial banks, and setting institutional interest rates by administrative fiat. From 1973–1979, bank credit was allowed to expand by 15 percent a year; a more restrictive sub- ceiling was set for credit expansion to nonpriority borrowers. Interest rates were set, in part,

on the basis of the presumed importance of the activity for which the credit was to be used; lower rates were set for the activities accorded higher priority.

In conjunction with a large fiscal deficit and a fixed exchange rate, this system of monetary control failed to prevent a balance-of-payments crisis from occurring in the late 1970s. This crisis was resolved after the negotiation of a Stand-by facility from the International Monetary Fund (IMF). Under this Stand-by that lasted from 1979 to 1986, an overall credit ceiling continued to be established annually in consultation with the IMF; the fiscal deficit was also reduced as part of the agreement. During this period, the primary goal of the annual credit ceiling was to improve the balance of payments. After the Stand-by ceased in 1986, the same process of establishing the annual credit ceiling continued until June 1992.

Although interest rate liberalisation was announced in the 1987 Budget Speech, the Bank of Mauritius continued to issue guidelines to the commercial banks. The Minister of Finance announced Bank Rate, the interest rate that formed the basis for determining the cost of borrowing by the commercial banks from the Bank of Mauritius. The yield on treasury bills was set in relation to Bank Rate by the Bank of Mauritius. At the same time, the monetary authorities issued the guidelines for the commercial banks' deposit and lending rates.

3 The Objectives of Credit Ceilings and Administered Interest Rates

The objectives of this system of monetary policy implementation were to prevent excessive and so inflationary credit expansion through the overall credit ceiling and to set interest rates at levels that would encourage, or at least not discourage, investment.

While the rupee was linked to sterling at Rs13.33 until January 1975, the price level in Mauritius could not deviate in the long run to any substantial extent from the price level in Britain. Had prices become much higher in Mauritius than in Britain, cheap imports would have surged in and exports would have been priced out of world markets. The loss of international reserves would have forced corrective action in the form of a devaluation combined with a credit squeeze designed to lower domestic prices. In January 1975 the link between the Mauritian rupee and sterling was severed and a new link established with the SDR at a rate of Rs7.714. Since the SDR consists of a

basket of several currencies, this seemed a more stable exchange-rate peg.

Under the fixed exchange rate system maintained by Mauritius until 1983, reducing credit availability improved the balance of payments either by reducing imports and possibly raising exports or by encouraging capital inflows and deterring capital outflows. If Mauritian firms found it more expensive to borrow at home, some might attempt to borrow abroad. Since a credit squeeze was accompanied by higher domestic interest rates, there was less incentive to transfer savings abroad through the standard practice of overinvoicing imports and underinvoicing exports.[1]

Evidently, monetary policy failed to be implemented consistently with the exchange rate policy implied by the adoption of this exchange rate regime. Across-the-board wage increases for both public and private sector employees occurred in the mid-1970s. Higher public sector wage costs financed by substantial government borrowing from the Bank of Mauritius deepened the balance-of-payments crisis through excessive credit expansion. After the 1979 devaluation, the continuation of inflationary wage rounds was confronted by a considerably tighter monetary policy under the IMF Stand-by agreement.

4 Some Drawbacks of Credit Ceilings and Administered Interest Rates

Unfortunately, low interest rates achieved in this manner distort the economy in four ways. First, low interest rates produce a bias in favour of current consumption and against future consumption. Therefore, they may reduce saving below the socially optimum level. Second, potential lenders may engage in relatively low-yielding direct investment instead of lending by way of depositing money in a bank. Third, bank borrowers able to obtain all the funds they want at low loan rates will choose relatively capital-intensive projects. Fourth, the pool of potential borrowers contains entrepreneurs with low- yielding projects who would not want to borrow at the higher market-clearing interest rate. To the extent that commercial banks' selection process contains

[1] An exporter submits an invoice for a smaller sum than that actually received for the exports when surrendering foreign exchange to the central bank; the difference can then be deposited in the exporter's bank account abroad. Conversely, an importer submits an invoice for an amount exceeding the true cost of the imports in order to siphon the difference into his foreign bank account.

an element of randomness, some investment projects that are financed will have yields below the threshold that would be self-imposed at market-clearing interest rates.

One of the most critical defects of low fixed interest rates is that they contribute to inflationary pressure resulting from excessive monetary expansion by reducing the real demand for money. In the simplest balance sheet of the banking system, the banks hold loans L and reserves R as their assets and deposits D as their liabilities:

Assets		Liabilities	
Reserves	R	Deposits	D
Loans	L		

The balance sheet identity implies $R + L = D$. Naturally, this balance sheet identity is still preserved if one divides both assets and liabilities by nominal GNP Y:

Assets		Liabilities	
Reserves	R/Y	Deposits	D/Y
Loans	L/Y		

When nominal deposit rates remain fixed, the ratio D/Y falls as inflation accelerates because households and firms choose to hold smaller money balances in relation to their expenditure levels due to the rising cost of holding money. Therefore, the ratio $(R + L)/Y$ must also fall. If the ratio R/L or R/D remains roughly constant, then both R/Y and L/Y fall as D/Y falls. Since L/Y is the ratio of bank loans to the nominal value of output, business firms find themselves facing a credit squeeze as inflation rises. Unable to obtain the necessary loans to cover the costs of their working capital, some firms may be unable to stay in business. The aggregate level of output in real terms would then fall. In this case, therefore, the deterioration of money reduces the extents to which the banking system administers the country's payments mechanism and intermediates between savers and investors; performance in both functions is related. Perhaps the former effect reduces income levels while the latter effect reduces income growth.

The inefficiencies created through interest rates that are administratively set below their competitive free-market equilibrium level are illustrated in Figure 1. Here the demand for credit is equated with investment and the supply of credit is equated with saving. Although saving S_{g_0} at a rate of economic growth g_0 is depicted as a positive function of the real rate of interest, the interest-elasticity of saving in most countries tends to be small. The line FF represents financial repression, taken here to consist of an administratively fixed nominal interest rate that holds the real rate r below its

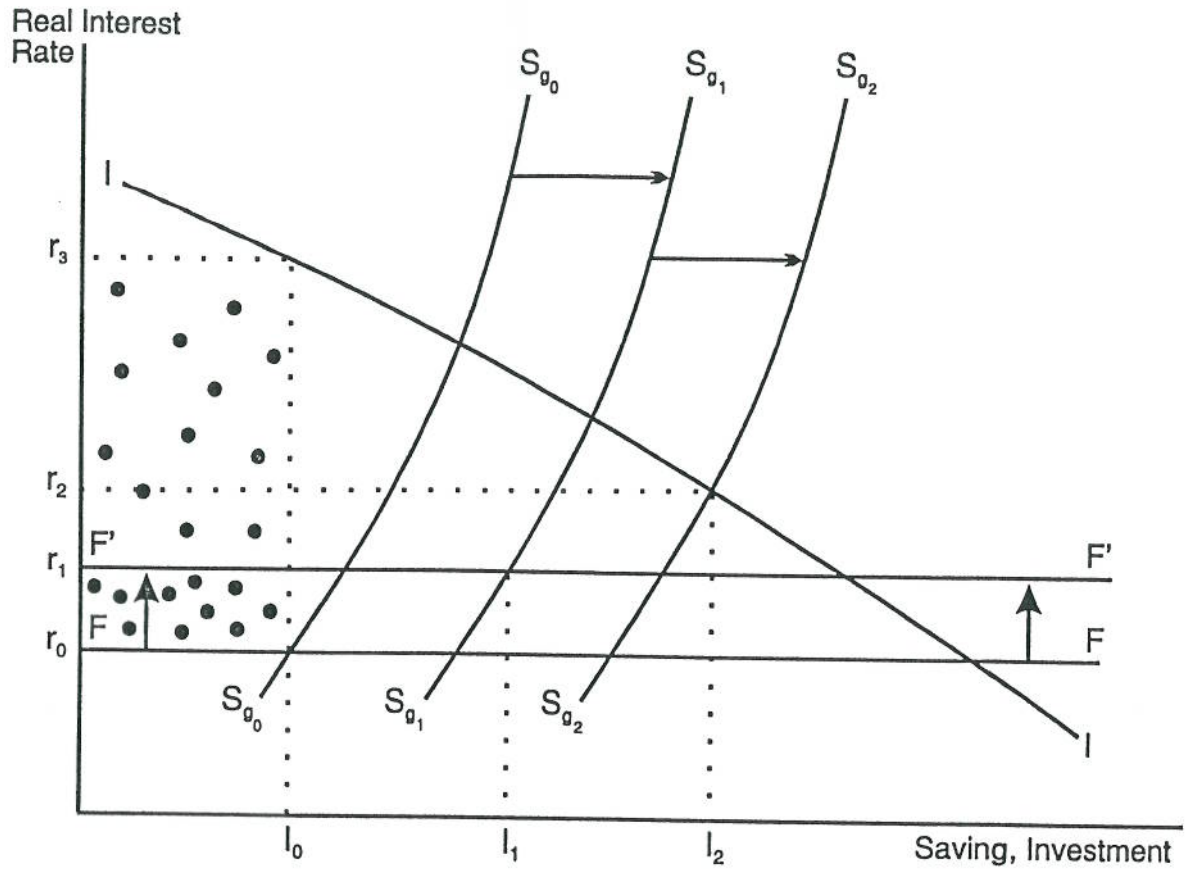

Figure 1: Saving and Investment under Interest Rate Ceilings

equilibrium level. Actual investment is limited to I_0, the amount of saving forthcoming at the real interest rate r_0.

If the interest rate ceiling applied only to savers' interest rates (only to deposit but not to loan rates of interest), the investor/borrower would face an interest rate of r_3, the rate that clears the market with the constrained supply of saving I_0, in Figure 1. The spread r_3–r_0 would be spent by a regulated but competitive banking system on nonprice competition (advertising and opening new bank branches). These nonprice services, however, may not be valued at par with interest payments; real money demand invariably declines with a decrease in the explicit real deposit rate of interest.

In fact, there were loan rate ceilings as well as deposit rate ceilings in Mauritius prior to the 1990s. Although private commercial banks can evade loan rate ceilings through compensating balances, they seem to be observed by state-owned commercial banks and for most public sector borrowing. To the extent that commercial banks do observe loan rate ceilings, nonprice rationing of loanable funds must occur. Credit is allocated not according to expected productivity of the investment projects but according to transaction costs and perceived risks of default. Quality of collateral,

political pressures, "name," loan size, and covert benefits to loans officers may also influence allocation. The investments that are financed under such conditions are illustrated by the dots in Figure 1.

Even if credit allocation is random, the average efficiency of investment is reduced as the loan rate ceiling is lowered because investments with lower returns now become profitable. Entrepreneurs who were previously deterred from requesting bank loans now enter the market. Hence, adverse selection in terms of social welfare occurs when interest rates are set too low and so produce disequilibrium credit rationing of the type described here. Adverse selection also occurs when interest rates rise too high because equilibrium credit rationing is not working properly.

Loan rate ceilings discourage financial institutions from taking any risks; risk premia cannot be charged when ceilings are binding and effective. This itself may ration out a large proportion of potentially high-yielding investments. In the financially repressed economy there is, therefore, a tendency for the investments that are financed to yield returns barely above the ceiling interest rate r_0. These are shown in Figure 1 by the dots lying just above FF but below $F'F'$. Another drawback of loan rate ceilings is that they tend to deter bank spending on loan assessments. Since even in an unrepressed situation commercial banks are likely to underspend on screening, this additional deterrence may be worse for social welfare than another form of repression that affects the financial system at a margin which is initially undistorted.

Under selective or directed credit programmes, commercial banks are required to allocate minimum percentages of their asset portfolios for loans to priority sectors of the economy at subsidised loan rates of interest. Part of the critical problem of loan delinquency encountered in virtually all directed credit programmes is due to the fact that these subsidised loan rates, which are typically negative in real terms, discourage prompt loan repayment. High delinquency and default rates reduce the flexibility (less credit available for new investment) and increase the fragility of financial systems.

Raising the interest rate ceiling from FF to $F'F'$ (from r_0 to r_1) in Figure 1 increases saving and investment. Changes in the real interest rate trace out the saving function in this disequilibrium situation. Raising the interest rate ceiling also deters entrepreneurs from undertaking all those low-yielding investments illustrated by the dots below $F'F'$. They are no longer profitable at the higher interest rate r_1. Hence the average return to or efficiency of aggregate investment increases. The rate of economic growth rises

in this process and shifts the saving function to S_{g_1}; the saving ratio is invariably influenced positively by the rate of economic growth.

Thus the real rate of interest as the return to savers is the key to a higher level of investment, and as a rationing device to greater investment efficiency. The increased quantity and quality of investment interact in their positive effects on the rate of economic growth. The policy prescription for the financially repressed economy is to raise institutional interest rates or to reduce the rate of inflation. Abolishing interest rate ceilings altogether produces the optimal result of maximising investment and raising still further investment's average efficiency. This is shown in Figure 1 by the equilibrium r_2, I_2, and the higher rate of economic growth g_2.

5 Indirect Market-Based Monetary Policy Implementation in Mauritius

In recognition of these disadvantages of the disequilibrium credit-rationing system that was entailed by the system of credit ceilings, the Mauritian monetary authorities embarked upon a gradual transition from direct ceilings and controls to indirect market-based instruments of monetary policy in the early 1990s. The first sign of this transition came in November 1991 with the introduction of treasury bill auctions. Under the auction system, the yield on treasury bills was no longer rigidly fixed by administrative decision but became influenced by relative demand and supply.

However, this transition was not and is still not a move to unfettered market conditions, since the Bank of Mauritius continues to set a reserve price below which it declines to accept any auction bids. Hence, the supply of treasury bills offered at the auction may not be sold if there are insufficient bids at or above the reserve price. Of course, setting a reserve price is a typical characteristic of any auction. It simply means that supply T^s is not vertical at any price but becomes horizontal at the reserve price P_R, as shown in Figure 2. This figure shows three alternative demand curves. If demand for treasury bills is characterised by T_1^d, the reserve price results in sales of only Q_1 bills instead of the full tender amount of Q_T. The full tender amount can be sold under these demand conditions only at the lower price P_1. Under demand conditions illustrated by T_2^d, the reserve price is reached and all bills are sold. With demand conditions of T_3^d, all bills are sold at a price P_2 which lies above the reserve

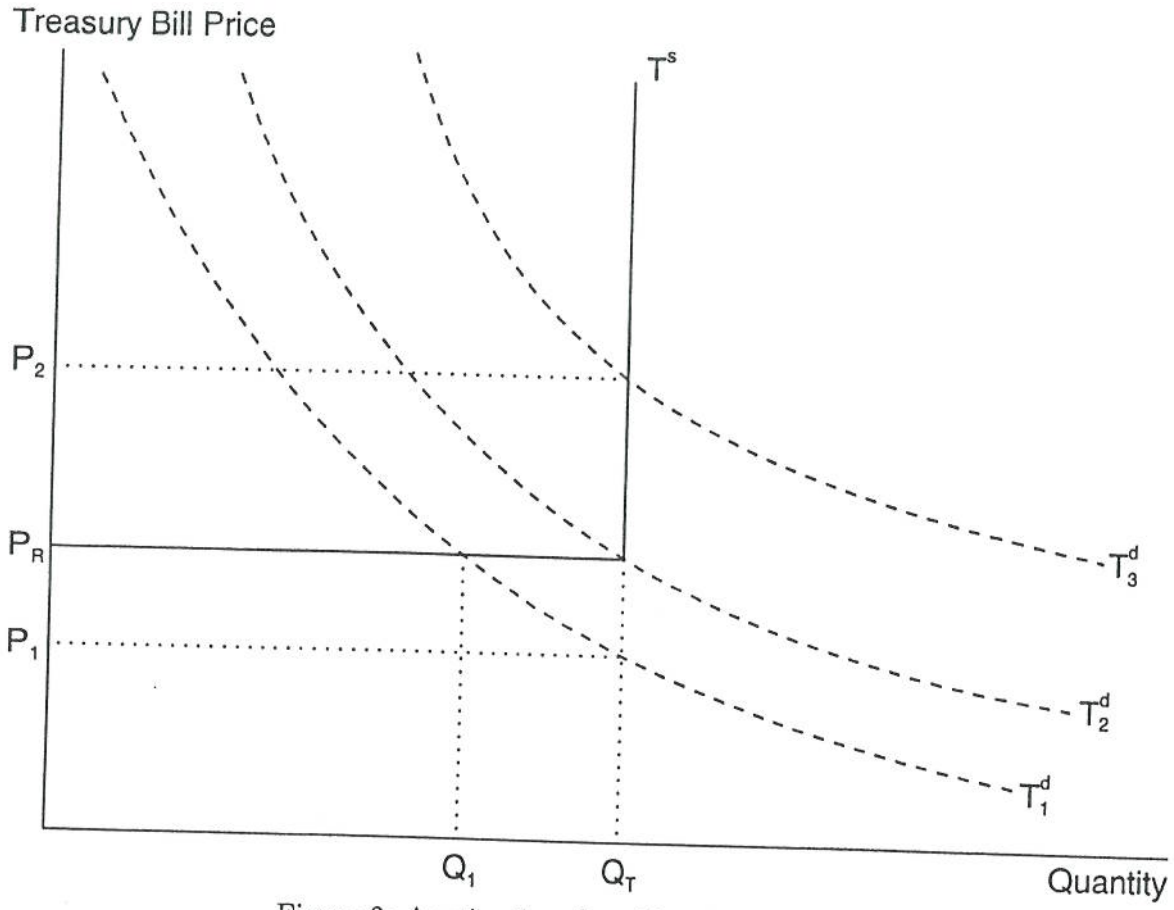

Figure 2: Auction Supply with a Reserve Price

price P_R.

The second major step in the transition to indirect market-based monetary policy implementation came with the abolition of credit ceilings. In July 1992 the credit ceiling for priority sector borrowing was removed. However, a ceiling on credit expansion for purposes deemed to be of a nonpriority nature was retained. The remaining credit ceiling was abolished in July 1993. Now the Bank of Mauritius had to implement monetary policy entirely through indirect market-based monetary policy instruments. In the absence of open-market operations, the two primary instruments used for this purpose are the treasury bill auction process and the set of rediscount tranches offered by the Bank of Mauritius to the commercial banks.

Prior to the adoption of indirect market-based techniques of monetary control, the exchange rate regime had been altered from a system under which monetary policy had to adjust or be consistent with the exchange rate to one in which the exchange rate adjusted or was made consistent with monetary policy. This resulted from the adoption of a trade-weighted exchange rate basket in February 1983. Under this system, the value of the Mauritian rupee is pegged to a trade-weighted basket of foreign currencies

rather than to the SDR. However, the major difference is not so much the change in the composition of the basket to which the rupee is pegged but the change from a fixed exchange rate to a managed exchange rate, thus ensuring that the exchange rate is always adjusted to be consistent with domestic monetary policy.

6 Prerequisites for Successful Interest Rate Liberalisation

International experience over the past 20 years indicates that there are five prerequisites for successful interest rate liberalisation (Fry 1995, 454–460):

1. Adequate prudential regulation and supervision of deposit-taking institutions, implying minimal levels of accounting and legal infrastructure.
2. A reasonable degree of price stability.
3. Fiscal discipline taking the form of a sustainable government borrowing requirement that avoids inflationary expansion of reserve or high-powered money, which consists of currency in circulation and bank reserves, by the central bank either through direct domestic government borrowing or through the indirect effect of government borrowing producing surges of capital inflows that require large purchases by the central bank if exchange rate appreciation is to be avoided.
4. Profit-maximising, competitive behaviour by the deposit-taking institutions.
5. A tax system that does not impose discriminatory explicit or implicit taxes on financial intermediation.

When these five conditions are met, a country should benefit from interest rate liberalisation in three ways:

1. Better monetary control and hence lower and more stable inflation.
2. Improved allocation of scarce investible funds.
3. Higher levels of saving which, in turn, permit more investment without accelerating inflation.

Any central bank can choose between three basic alternative methods of monetary control. Since the money supply M is the liability side of a simplified consolidated balance sheet of the banking system (the monetary survey) in which net foreign assets

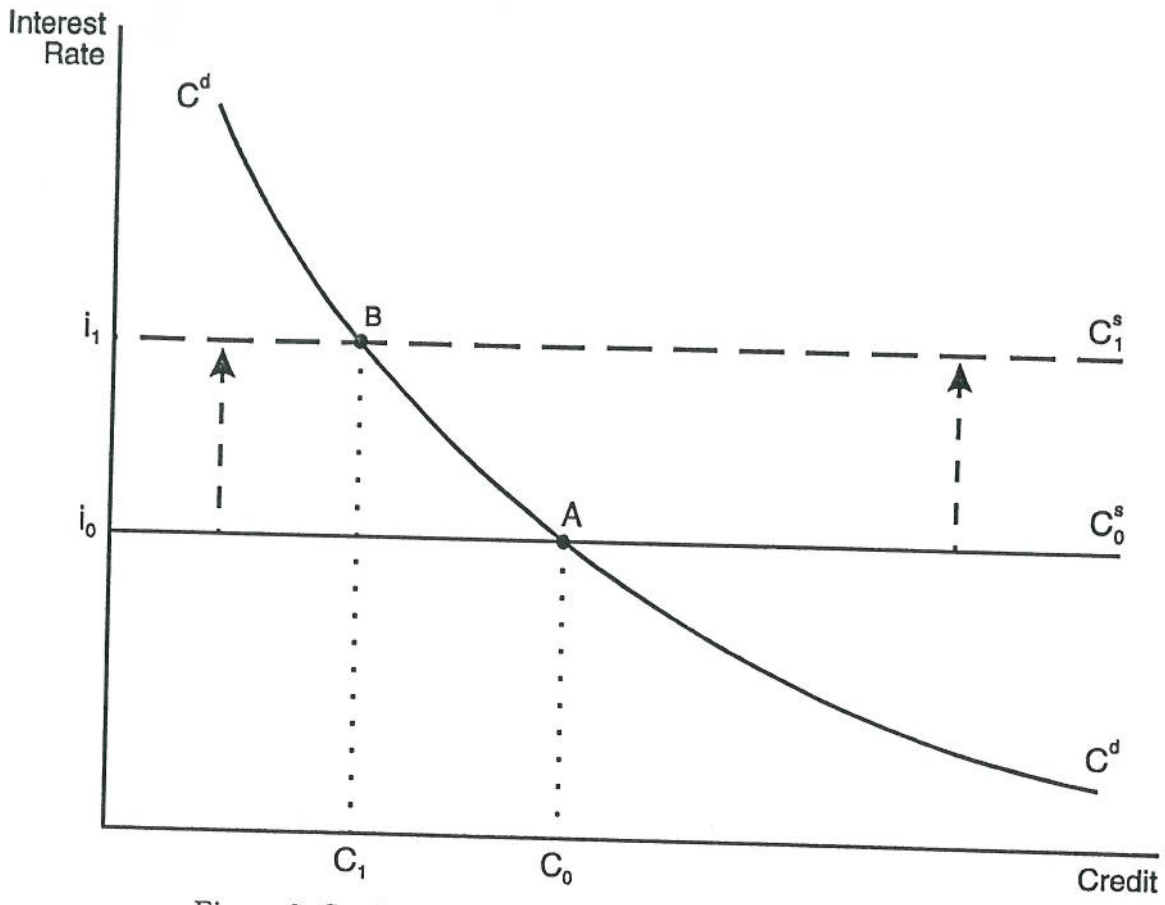

Figure 3: Setting Interest Rates to Control Credit Volume

NFA and domestic credit *DC* are the assets ($M = NFA + DC$), any change in *DC* is necessarily accompanied by the same change in *M*, provided *NFA* remains unchanged. All three methods of monetary control involve affecting the money supply by influencing the volume of credit.

The first method of influencing the volume of credit, which is used by virtually all the central banks in the OECD countries, is for the central bank to set the price (that is, the interest rate) of its advances to the commercial banks and to supply whatever demand is forthcoming at that price as illustrated in Figure 3. By so doing, the central bank affects all other interest rates in the economy. If the advance rate is raised and bank loan rates are initially below the new advance rate, commercial banks will choose not to borrow. However, as they repay their previous advances to the central bank, their reserves will decline. Their choice is then to call in loans or to borrow from the central bank at the higher advance rate. They will borrow rather than reduce loans only if they can pass on the higher costs of their advances from the central bank in the form of higher loan rates. Provided demand for credit is negatively related to the loan rate (that is, downward sloping), the volume of bank credit will fall in either case. The

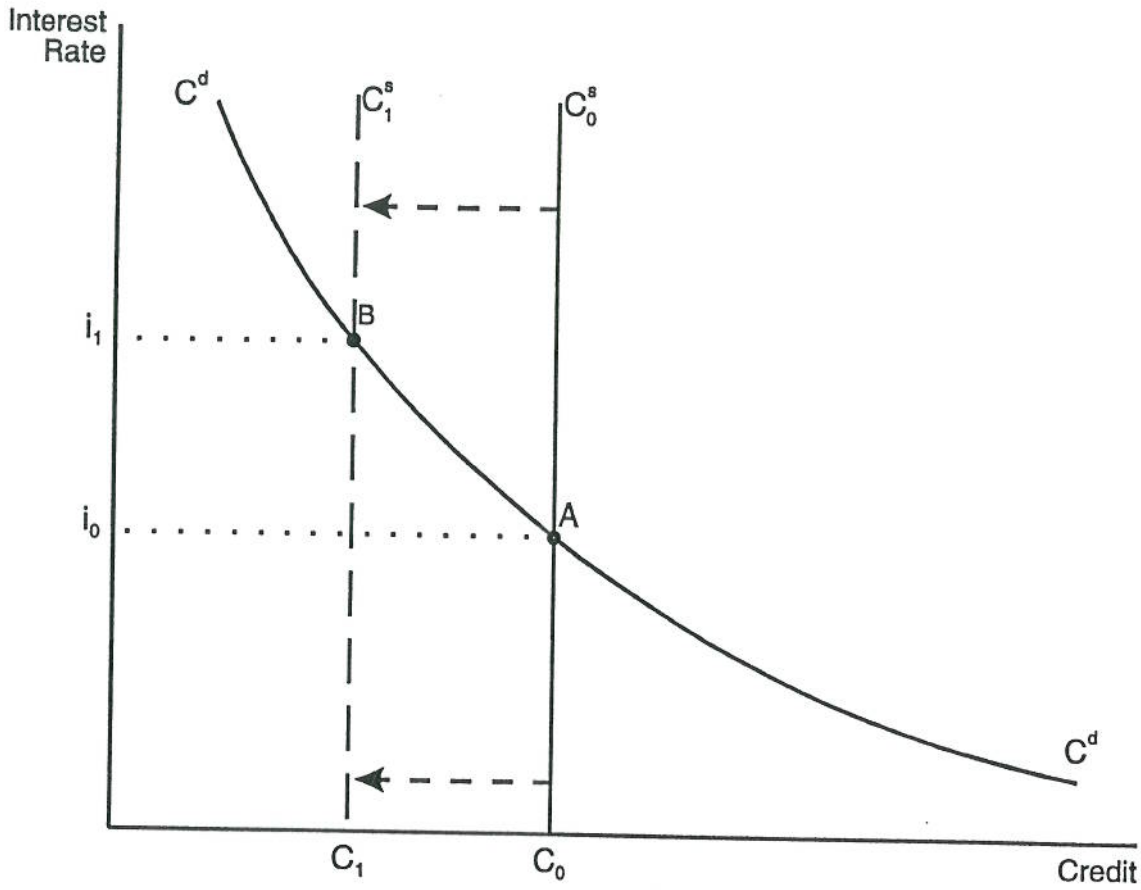

Figure 4: Interest Rates Determined by Credit Demand

main problem here is that the actual volume of credit created is not under the direct control of the central bank and may exceed the central bank's target at the selected interest rate.

Alternatively the central bank can influence the volume of bank credit by setting the volume of advances it is prepared to offer the commercial banks and allowing the price (that is, the interest rate) to be determined by the interplay of market forces as shown in Figure 4. Some form of auction system can be used to allocate the fixed quantity of advances to those commercial banks who are willing to pay the highest rates. At one extreme, the central bank can auction the entire volume of advances it is prepared to make available to the commercial banks. Alternatively, it may auction part of this facility and then provide additional access at some markup over the preceding auction rate. In such case, commercial banks have a market incentive to acquire their advances through the auction but the central bank provides a safety net for those commercial banks that fail to acquire sufficient reserves through the auction. However, the safety net must always be provided at a rate higher than the auction rate for the auction process to work. The perceived problem here is that the interest rate established in

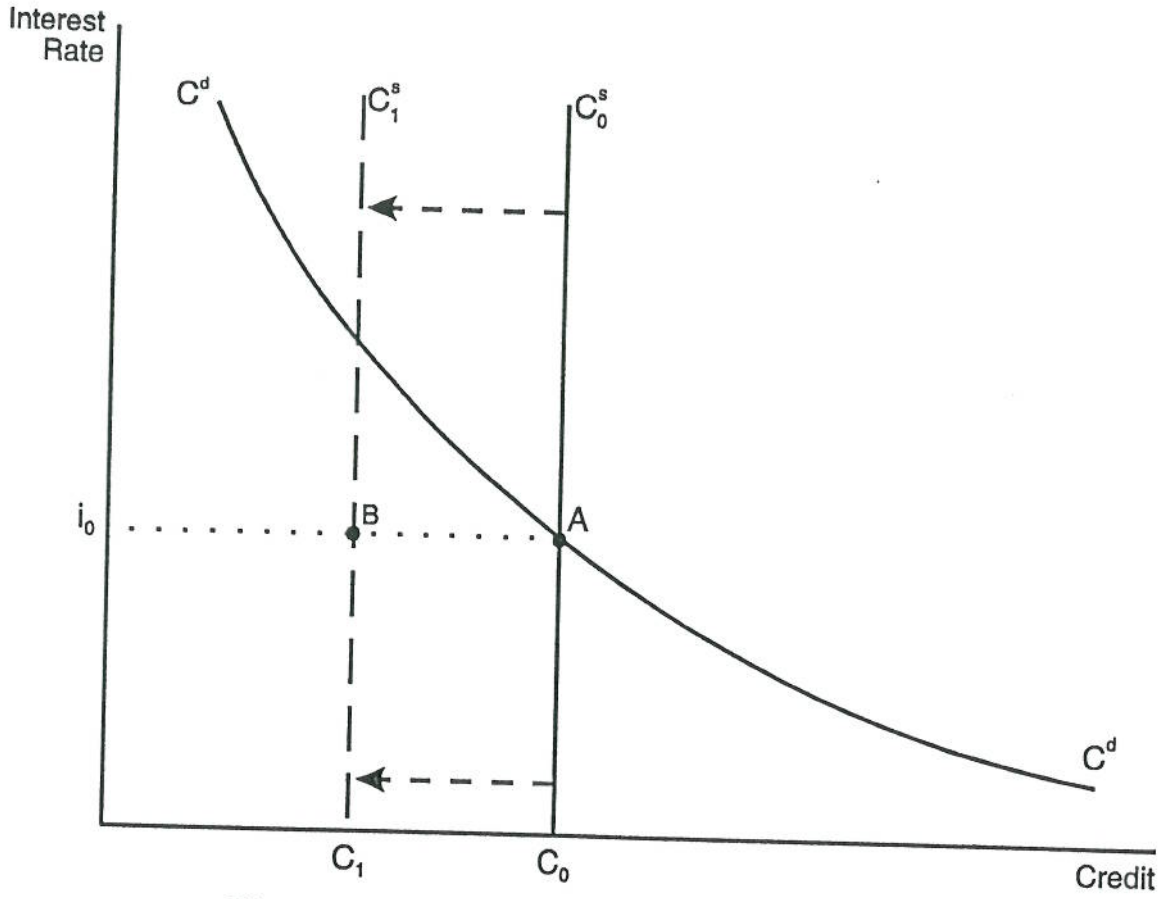

Figure 5: Setting Both Quantity and Price of Credit

the auction is not directly controlled by the central bank and may exceed the level deemed appropriate.

In an attempt to get the best of both worlds, many central banks have set both the quantity and the price of their advances as illustrated in Figure 5. In this way, neither the volume of credit nor the interest rate can exceed their target levels. Figure 5 illustrates the system of monetary policy implementation that was used in Mauritius until the 1990s.

7 The New System of Monetary Policy Implementation in Mauritius

Under the old system of monetary policy implementation in Mauritius, commercial banks were constrained from lending an excessive amount by the credit ceilings. Under the new system, credit expansion by the commercial banks is controlled not by credit ceilings but by the availability of reserves. All commercial banks in Mauritius are obliged to hold 10 percent of their deposits in the form of reserves. These reserves

consisting of vault cash and deposits at the Bank of Mauritius are liabilities of the Bank of Mauritius.

In order to increase its loans, a bank must either sell other assets or attract more deposits. Given that most commercial bank assets other than loans are treasury bills that are needed to satisfy the minimum liquid asset ratio of 23 percent, the former possibility is not a practical option in Mauritius. Effectively, a commercial bank can increase loans only to the extent that it can attract more deposits.

Suppose that bank A receives a new deposit of Rs100. This new deposit increases reserves by Rs100. Therefore, bank A now holds reserves in excess of the legal minimum of 10 percent of its total deposits and can acquire income-earning assets with 90 percent of the deposit increase, i.e., Rs90.

There are two critically different ways in which this deposit increase could have occurred. One is a transfer of deposits from another bank, the other is not. If the new deposit in bank A is simply a deposit transfer from bank B, then bank B that has lost the deposit will have been obliged to transfer reserves of equal value to bank A receiving this deposit.

In such case, bank B that has lost reserves will need to borrow Rs90 in order to maintain its 10 percent reserve requirement against its remaining deposits. It will bid for these reserves in the interbank money market, a market specifically available for banks with excess reserves to lend to banks experiencing reserve shortfalls. If bank A that obtained the new deposit was reluctant to lend its new reserves through the interbank market, bank B with the reserve shortfall would have to offer increasingly attractive terms until it persuaded bank A to which its reserves had been transferred to lend them back again.

In fact, since deposits are constantly transferred from one bank to another, the commercial banks in Mauritius have agreed to make available any excess reserves to other banks at a rate closely linked to Bank Rate. The upshot of all this is that reserves are lent back to bank B from which the deposit was transferred and bank A receiving the new deposit no longer has spare reserves available for new lending. Because the banking system has not received any net increase in reserves, the banking system as a whole is unable to increase its lending.

Only action by the Bank of Mauritius to increase the supply of reserve or high-powered money can enable the commercial banks as a whole to expand credit. For

example, suppose that the Mauritian Sugar Syndicate sells $1 million to the Bank of Mauritius and deposits the proceeds of Rs17 million in an account with bank A. In this case, the Bank of Mauritius has created Rs17 million of reserve money and the new deposit in bank A is not matched by a reduction of deposits in any other commercial bank. Hence, bank A will not face other commercial banks needing to borrow Rs17 million to satisfy their reserve requirement. In this case, the banking system as a whole will be able to increase its supply of credit.

Initially, the banking system in the form of bank A will increase its loans by Rs11.39 million, keeping Rs1.7 million to satisfy its increased reserve requirement and Rs3.91 million for the liquid asset requirement. However, very soon after bank A lends, this loan will be spent on something. The seller will probably deposit the sale proceeds in a bank account. In this way, the new reserves of Rs17 million will become spread around the banking system as a whole, with each bank increasing its loans by 67 percent of its increased deposits.

The Bank of Mauritius controls the quantity of high-powered money it creates by controlling the asset side of its balance sheet. Essentially the Bank of Mauritius can increase high-powered money to acquire assets. Its primary assets are foreign exchange assets, loans to the government and loans to the commercial banks. Therefore, the Bank of Mauritius increases high-powered money by buying foreign exchange, increasing credit to the government and increasing loans to the commercial banks. Effectively, the asset is acquired in each case by increasing high-powered money. In other words, the Bank of Mauritius acquires more assets by printing money. Conversely, the Bank of Mauritius can reduce high-powered money by selling foreign exchange, reducing credit to the government and contracting loans to the commercial banks.

Under the new system of monetary policy implementation, the Bank of Mauritius estimates the appropriate expansion in domestic credit and then achieves that outcome by increasing or decreasing high-powered money.

Unfortunately, implementation of monetary policy is not quite as simple as this exposition might suggest. The Bank of Mauritius buys and sells foreign exchange not to increase or decrease high-powered money but to achieve its exchange rate objective. In other words, the Bank of Mauritius stands ready to buy foreign exchange when the rupee starts to appreciate beyond the target range and to sell foreign exchange when the rupee begins to depreciate below its target range. In this way, the Bank of

Mauritius ensures that the value of the rupee remains within a range of values vis-à-vis the U.S. dollar that is established twice a day.

Clearly the pursuit of its exchange rate objectives means that the Bank of Mauritius' purchases and sales of foreign exchange can produce increases or decreases in high-powered money that are not in line with its domestic credit objectives. Hence, the Bank of Mauritius must offset changes in this asset item by changes in its other assets. Such action is known as "sterilising" the effect of changes in foreign exchange assets on high-powered money.

Another problem that confronts the Bank of Mauritius lies in the fact that it cannot use its lending to the government primarily to influence high-powered money. As banker to the government, the Bank of Mauritius is obliged to meet the government's financing requirements. Here again, therefore, increases in loans to the government may change high-powered money in the wrong direction. Such effects must be "neutralised" by changes in the only other major asset of the Bank of Mauritius, namely, loans to the commercial banks.

In practice, the Bank of Mauritius can attempt to reduce its lending to the government by selling more treasury bills on the government's behalf. If the auctions of treasury bills raise more funds for the government, then government borrowing from the Bank of Mauritius will be reduced by the same amount. Generally, however, raising more money from the auctions of treasury bills involves offering a more attractive yield, i.e., allowing the interest rate to rise.

Under the new system of monetary policy implementation in Mauritius, Bank Rate is set equal to the average auction rate over the previous 12 weeks. Therefore, any attempt to sell more treasury bills at auction by reducing the reserve price increases Bank Rate. In turn, an increase in Bank Rate increases the cost of commercial bank borrowing from the Bank of Mauritius. Other things equal, an increase in the rate at which they can borrow will reduce the amount of commercial bank borrowing from the Bank of Mauritius.

Through the treasury bill auctions, therefore, the Bank of Mauritius can affect simultaneously two of its assets, loans to the government and loans to the commercial banks. In both cases, there is a one-to-one effect on high-powered money. Reductions in loans to both the government and commercial banks reduce high-powered money, provided the Bank of Mauritius's holdings of foreign exchange remain unchanged.

8 Financial Programming

The new system of monetary policy implementation is a continuous process of monitoring and reacting to changes in domestic credit *DC*, the total of net domestic credit to the government (loans to the government minus the government's deposits) and domestic credit to the private sector, extended by both the Bank of Mauritius and the commercial banks, in the light of current indicators of inflation and economic activity. To facilitate the monitoring process, the Bank of Mauritius prepares monthly projections of key monetary variables, an exercise known as financial programming.

Domestic credit and net foreign assets (foreign assets minus foreign liabilities) *NFA* are the two major assets of the consolidated banking system consisting of both the Bank of Mauritius and the commercial banks. The main liability is money—demand deposits, time deposits and currency in circulation *M*. Other assets and liabilities are combined into a liability item known as "net other items" *NOI*.

This simplified balance sheet of the consolidated banking system known as the "monetary survey" can be represented:

Assets		Liabilities	
Net Foreign Assets	*NFA*	Money	*M*
Domestic Credit	*DC*	Net Other Items	*NOI*

To achieve any given inflation objective, the money supply must be increased by just enough to satisfy the demand for money forthcoming at the target price level. For example, if the demand for money increases by 1 percent for every 1 percent increase in gross national product (GNP) and if output (real GNP) is expected to increase by 5 percent and the inflation target is also 5 percent, then money supply must be increased by 10.25 percent, since nominal GNP will increase by 10.25 percent under these assumptions.

Were money supply to be increased at a faster rate, the extra money would lead to extra spending. If output cannot increase faster than 5 percent, then the extra spending can result only in higher prices and the inflation target will not be achieved. On the other hand, if money supply is increased at a slower rate, the concomitant credit squeeze may reduce output growth as well as inflation. In the short run, there is often a trade-off between reducing inflation faster at the expense of lower economic growth. In the long run, however, lower inflation tends to facilitate higher economic

growth. On average, low-inflation countries achieve higher growth than high-inflation countries. The problem is that high-inflation countries may find that economic growth is reduced during the transition from high to low inflation.

In any event, the new system of monetary policy implementation in Mauritius starts with the government's inflation target and the Central Statistical Office's economic growth forecast. The Bank of Mauritius then estimates the rate of growth in the money supply M that is consistent with the inflation target and growth forecast. The Bank also forecasts net other items *NOI* and determines an appropriate level of net foreign assets *NFA*. The monetary survey balance sheet shown above indicates that the residual balancing item is domestic credit *DC*.

One refinement to this process involves separating domestic credit *DC* into net domestic credit to the government *NDCG* and domestic credit to the private sector *DCP*. The Ministry of Finance provides the Bank of Mauritius with monthly estimates for government borrowing. The Bank of Mauritius then derives corresponding figures for *NDCG* from these estimates and the planned sources of financing (that is, taking into account the planned division of net borrowing from the banking system, other domestic sources and foreign borrowing). This procedure leaves *DCP* as the residual asset which the Bank of Mauritius must influence through its control over its main liability, high-powered money.

When monetary policy is implemented through indirect market-based techniques, success in achieving any inflation objective is dependent on the ability to forecast money demand. With an accurate forecast for money demand, the Bank of Mauritius can set a domestic credit target consistent with the inflation objective. An inaccurate money demand forecast, however, will mean that the inflation objective is unlikely to be achieved even if the credit target is realised.

Estimating money demand for forecasting purposes differs from estimating money demand for other purposes. To forecast money demand, it is also necessary to forecast the determinants of this demand. Hence, the search for a stable money demand function must be confined to those explanatory variables that can either be forecast or constitute the target of monetary policy, such as the inflation rate.

Assume that a stable demand for M expressed at constant prices in natural logarithms has been detected using modern error-correction estimating techniques. The upshot of this money demand estimating procedure is the explanation of the rate of

change in real money demand using the rate of change in real income and the change in the inflation rate (or the change in the expected inflation rate), together with the lagged error taken from the demand function estimated in level form with the same set of explanatory variables. The Bank of Mauritius's Research Department can confront the lack of quarterly data for real income in various alternative ways. There is no doubt that data deficiencies will continue to jeopardise attempts at estimating money demand in Mauritius, at least in the immediate future. However, the demand for better data with which to estimate money demand will itself help to accelerate the process of remedying these deficiencies.

For illustrative purposes, suppose that the estimated income elasticity for M is 1.5, the semi-elasticity with respect to inflation is –1, and the coefficient of the error-correction term is –0.5. Furthermore, suppose that projected real income growth is 5 percent, the inflation target is also 5 percent, inflation in 1994 was 8 percent, and that the lagged error in the levels equation is +0.01. These values indicated that real money demand in 1995 will be 10 percent above its 1994 level: $100[1.5(0.05) - 1(-0.03) - 0.5(0.01)]$. Producing such an estimated growth in real money demand is the first step in the preparation of a financial programme for 1995 because this estimate determines the growth in money supply that is consistent with the inflation target. In this case, the appropriate nominal money growth rate is 15.5 percent: $100[1.1(1.05) - 1]$. One would expect higher money growth to cause inflation higher than 5 percent, while lower money growth might reduce both inflation and real growth below their targets.

To achieve the 15.5 percent target growth in M through indirect market-based monetary policy measures necessitates estimation of the appropriate level of domestic credit (DC) for 1995. This can be achieved only by estimating the behaviour of net foreign assets (NFA) and net other items (NOI) in the monetary survey simultaneously with analysis of money demand in Mauritius, for these two items must also be forecast for 1995. In its simplest form, the monetary survey indicates that NFA plus DC must always be identical to the sum of M plus NOI. Hence, projections for NFA, M, and NOI provide the appropriate value of DC as the residual. Domestic credit itself can be decomposed into net domestic credit to the government ($NDCG$) and domestic credit to the private sector (DCP).

Annual or quarterly estimates of M, NFA, and NOI must now be converted into

monthly projections for 1995 so that the Monetary Policy Committee, which meets on the last Thursday of each month, can monitor developments as monetary data appear for each month of 1995. This conversion involves applying seasonal factors (in other words seasonalising the projections) as well as monthly growth rate factors to each of these three variables to ensure that the projected end-of-year value or the period-average projected value is produced by the monthly projections. Preferably the annual or quarterly estimates of *M*, *NFA*, and *NOI* would be based on centered monthly average data (that is, each month's observation for the econometric work would consist of the average beginning- and end-of-month observation or even averages of beginning- and end-of-week or eventually averages of beginning- and end-of-day observations). In this case, the 1995 projections would also be in the form of period-average figures which must be converted into appropriate end-of-month figures for the monetary survey projections.

This conversion can be achieved by applying an arbitrary monthly growth factor together with appropriate seasonal factors to each variable starting from the December 1994 figures. The monthly growth factor is then adjusted by dividing the arbitrary growth factor by the ratio of the first-round period-average figure to the required period-average projection. Iterating this procedure to estimate new monthly growth factors will eventually yield the appropriate period-average figure for 1995.

The spreadsheet constructed and used by the Bank of Mauritius's Research Department contains at least 12 months of past monetary survey data as well as at least 12 monthly projections. The seasonal and monthly growth rate factors for each item of the monetary survey are contained within the spreadsheet along with the annual targets and projections for inflation and growth. The monthly growth rate factors are calculated from the annual figures within the spreadsheet so that any change in the annual target or projection automatically produces corresponding changes in the monthly growth rate factors.

The spreadsheet is set up so that changes in basic targets or assumptions automatically change the monthly growth factors and recalculate all items in the projected monthly monetary surveys. This enables the Research Department to conduct sensitivity analysis in order to pinpoint areas in which further analysis is warranted. It also enables the Research Department to recalculate the monetary projections when changes in the underlying growth and inflation projections and targets are made. In

other words, the operating targets for monetary policy produced by the monetary projections change automatically with any change in the overall objectives of monetary policy.

Each month the Research Department updates the monetary survey using a copy of last month's spreadsheet file. Comparisons between projections and actuals are presented in the monthly briefing papers prepared for the Monetary Policy Committee. These briefing papers form the basis for the decision making process by the Monetary Policy Committee.

To ensure that the Research Department always uses the latest revisions and estimates of actual data, the spreadsheets used by the Research Department are linked to master spreadsheets through a computer network. In this way, any changes to the actual data are automatically incorporated by the Research Department staff whenever their spreadsheets are accessed.

9 Reserve Money Programming

The next step in this exercise is to link the monetary survey projections to projections of the Bank of Mauritius's own balance sheet. While consistent projections for the monetary survey, the Bank of Mauritius's balance sheet and the commercial banks' consolidated balance sheet involve innumerable practical considerations, the basis concept can be illustrated by using the simplest link in the form of the money supply multiplier. As in the case of estimating money demand, so the Research Department can analyse the behaviour of the money supply multiplier—the ratio of M to reserve money (m)—either directly or indirectly by analysing its components, the currency/deposit ratio (cd) and the reserve/deposit ratio (rd): $m = (1 + cd)/(rd + cd)$.

In exactly analogous fashion to the projections of the monetary survey, projecting the Bank of Mauritius's balance sheet consists of projecting reserve money H (calculated by dividing the M target by the projected money supply multiplier [$H = M/m$]), Bank of Mauritius net foreign assets (*BMNFA*), and Bank of Mauritius net other items (*BMNOI*). In its simplest form, the Bank of Mauritius's balance sheet indicates that *BMNFA* plus *BMDC* must always be identical to the sum of H plus *BMNOI*. Hence, projections for *BMNFA*, H, and *BMNOI* provide the appropriate value of *BMDC*. Again, *BMDC* can be decomposed into government and private sector credit.

The balance sheet identity leaves Bank of Mauritius's domestic credit (*BMDC*) as a residual which becomes the Bank of Mauritius's target for the appropriate overall volume of Bank of Mauritius lending. This is the Bank of Mauritius's operating target through which it must achieve the appropriate rate of monetary growth. In practice, *BMDC* can be controlled through the treasury bill auction process. Clearly, the Bank of Mauritius must control reserve money through the control of at least one of its assets in order to implement any active monetary policy at all.

10 The Monetary Policy-Making Process

Each month the Bank of Mauritius's Research Department prepares a briefing paper for the regular monthly meetings of the Monetary Policy Committee that is chaired by the Minister of Finance and includes the Governor of the Bank of Mauritius. This Committee was established in June 1994 to determine monetary policy.

Since July 1994 monetary and fiscal policy have become considerably more independent of each other. This results from the decision to separate the volume of treasury bills tendered at auction from the government's financing needs. Should monetary policy dictate a larger volume of treasury bill sales than the government's financing requirement, the excess is deposited in a special government account at the Bank of Mauritius that earns interest exactly equal to the treasury bill yield. Thus, there are no financial implications of this excess treasury bill sale for the government budget. On the other hand, if monetary policy dictates a smaller sale of treasury bills than the government's financing requirement, the Bank of Mauritius automatically takes up the financing shortfall.

While the divorce of monetary and fiscal policy from each other by the separation of the government's financing requirements from treasury bills sales for monetary policy is a necessary condition for central bank independence, it is far from a sufficient condition. In Mauritius, some central bank independence is provided by the prohibition of civil servants or members of the government assuming directorships of the Bank of Mauritius. However, monetary policy decisions are made by the Monetary Policy Committee. Hence, the Bank of Mauritius takes the day-to-day decisions for implementing the policy determined by the Monetary Policy Committee.

When the actual money stock and domestic credit outcomes differ from their tar-

gets, the Monetary Policy Committee has to decide on one of three courses of action: (1) Do nothing on the assumption that the difference lies within reasonable error-tolerance limits; (2) Adjust the projections so that last month's projected M figure now equals the last month's actual figure and attempt to achieve targets in future months on the grounds that correcting the error is more costly than accepting it (known as introducing a shift parameter or base drift); (3) Attempt to correct the error through an active and deliberate change in the stance of monetary policy. Unless there is strong evidence that assumptions on which the projections were made have now been proved wrong, the second choice would not normally be considered.

Since the main instrument of monetary policy in Mauritius is the treasury bill auction, a more restrictive monetary policy stance must involve offering a greater volume of treasury bills at the auctions and accepting a lower reserve price. Conversely, a more expansionary monetary policy stance would imply reducing the volume of treasury bills offered at the auction with the consequent increase in price and reduction in yield.

11 Conclusion

Since the formation of the Monetary Policy Committee and the preparation of monthly briefing papers in June 1994, aggregate monetary resources M and domestic credit DC have risen approximately in line with their targets. However, despite the increase in domestic credit to the private sector from 65 to 70 percent of deposits, domestic credit to the private sector fell below target in September 1994 and has remained below target since then.

A rather different picture emerges when the behaviour of net domestic credit to the government is examined. Here a positive gap between actual and target figures has widened continuously. This overshoot was matched in the middle of 1994 by a shortfall in net foreign assets and since then by the slower growth in domestic credit to the private sector.

In sum, the monetary programming exercise highlights the monetary impact of the looser fiscal stance introduced in the June 1994 Budget. Had the Monetary Policy Committee not seen that monetary and credit aggregates were close to their target levels, it might have adopted a more expansionary monetary policy. Such action could

well have reversed the benefits now accruing from the lower inflation rate.

Reference

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