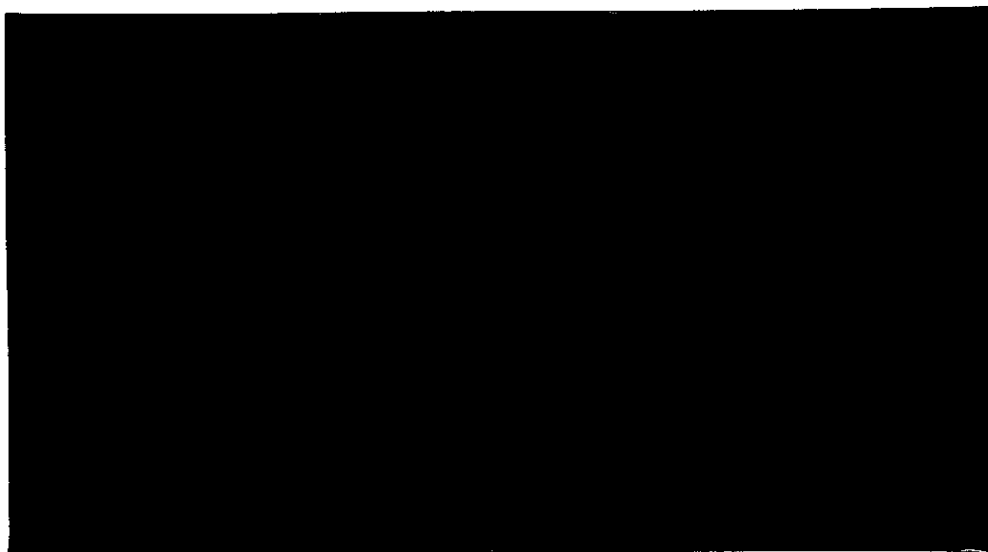# XXXII ANNUAL MONETARY STUDIES CONFERENCE

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BANK LIQUIDITY MANAGEMENT, PRUDENTIAL REGULATION, AND MONETARY AND EXCHANGE RATE POLICY: A RE-APPRAISAL OF THE LIQUID ASSET REQUIREMENT

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ABSTRACT

The liquid asset requirement (LAR) was designed to reduce liquidity risk by specifying that prescribed percentages of demand and time liabilities be supported by assets that are readily convertible into cash. It is argued that the LAR is a mechanical, 'quantitative-type,' regulatory mechanism that is formally unrelated to the underlying constrained optimisation choices of commercial banks. As such, the LAR is ineffective for securing adequate liquidity management by commercial banks. This is moreso because banks use the interbank market to manipulate the LAR and the other prudential instruments, but the resulting asset-liability management outcome is not a Nash equilibrium. That there has been no banking failure in Guyana is therefore attributable, not to the effectiveness of prudential regulation, but to: The Diamond-Dybvig type deposit insurance effectively provided by government; information asymmetries in favour of banks, given the Central Bank's minimal disclosure requirements and the public's inability to process the limited information on the state of banks; and a 'small numbers' phenomenon that allows both for easy enforcement of the informal contract among banks and for negotiations with the public.

It is further noted that the LAR is routinely exceeded by commercial banks *in consequence of* the adjustment programme currently being pursued with the IMF. The paper takes the opportunity to locate bank liquidity management within the context of the demand for money and liquidity originating in the real economy, the balance of payments, and exchange rate policy. Some implications for public debt are noted.

Claiming that their countries defy the logic of 'Western' economic theory which might, given the benefit of recent careful research, advocate a substantial review of current policy, decision makers in virtually every developing country slavishly follow those elements of policy that were designed in the pre-independence era, apparently unaware of the postulate that rational economic agents will generally 'outwit' authorities following a fully anticipated regulatory regime. Thus, with only seven commercial banks operating in an especially small economy, and with government and a mere handful of non-financial companies dominating in commercial banks' asset portfolios, the Central Bank's interest in bank liquidity management in Guyana is limited to monitoring individual banks' compliance with Reserve Requirements and the Liquid Asset Requirement (LAR). In contrast, theory recognises that liquidity management should be analysed within the context of rational, optimising, behaviour on the part of commercial banks, implying that central bank (monetary and prudential) policy should be designed with full consideration of the relative incentives and constraints that influence the asset-liability management decisions of banks.

Promulgated in Section 17 of the Banking Ordinance, 1965, the LAR requires each commercial bank to maintain minimum holdings of liquid assets against its demand and time liabilities. Unlike other types of companies, commercial banks have the incentive (the rate of return on loans) and the ability (the fractional reserve banking system) to use liabilities ('core' deposits) to create additional liabilities (deposits), which is what happens when loans are granted.[1] The problem for the lending bank is that the maturity of claims on it is typically shorter than the maturity of loans (which are repaid over a period of time), suggesting that there is some possibility of illiquidity in the *normal* course of banking business[2] (i.e., with the deposit creation associated with loans, and the maturing of additional and core claims). The liquid asset requirement was designed to reduce this *liquidity risk* by specifying that prescribed percentages of demand and time liabilities be supported by assets that are readily convertible into cash.

Another problem, overlooked by designers of the LAR, would occur if commercial banks indeed held significant amounts of liquid assets, but preferred not to convert these assets into cash even in the presence of liquidity shortfalls: in Guyana commercial banks have generally exceeded the LAR, but there is heavy (unsecured) interbank borrowing, especially on the part of the largest banks. To the extent that aggregate liquidity needs are less than the aggregate liquidity available on the interbank market, the underlying asset-liability management would not

represent a liquidity problem. If, however, this underlying asset-liability management strategy were actually optimal, other banks would rationally adopt it, and the entire financial system would face a serious liquidity problem.

In what follows, it is argued that trends in liquidity management are indeed optimal, given the presence of risk (or the incompleteness of markets) and commercial banks' limited capacity to manage risk, imperfect competition, and policy induced constraints. The structure of liquidity risk is examined in Section 1, which argues that liquidity risk is best managed if its 'core' and 'ancillary' elements are separated, as in a maturity ladder (gap report). This section also argues that, on account of imperfect competition (especially the collusive determination of the interbank, or overnight, rate) and weak central bank bailout policy, commercial banks' individually rational liquidity management choices can be sub-optimal for the banking system, as discussed in the preceding paragraph. Policy induced constraints, or the elements of policy that influence liquidity management choices, are discussed in Sections 2 and 3. By asking why it is that commercial banks in Guyana have never been confronted by serious liquidity crises despite the absence of carefully considered liquidity management strategies, Section 2 concludes that the role of market discipline in securing proper asset-liability management on the part of commercial banks is vitiated by the effective deposit insurance provided by government. Section 3 discusses the role of reserve and minimum capital requirements in bank liquidity management decisions, emphasising once again the optimality of those decisions. Section 4 examines the LAR and bank liquidity in the larger context of the current monetary control framework, with its implied exchange rate policy. The conclusion and recommendations follow in Section 5.

1. The structure of the liquidity problem

Because the expression "liquidity" is used in the discussion of different, if related, policy contexts at the Bank of Guyana, its meaning must be made clear: in particular, we note that the notion of 'excess liquidity' as used in the Bank's Reserve Money Programming (RMP) exercise is of concern from the perspective of *monetary policy/control*, while the LAR reflects the *prudential* concern with improved bank-level liquidity management. In what follows, *liquidity* shall be taken to mean the relative ease with which assets may be converted into cash to meet short term obligations such as deposit withdrawals - the greater the ease of conversion, the greater the liquidity of a portfolio; and illiquidity, or a liquidity problem, is said to arise if there

is a shortage of sufficiently liquid assets to meet these short term obligations. The risk of illiquidity may be traced to the very nature of banking business and to the specific economic environment in which such business takes place. The former will be referred to as the 'structural' elements of liquidity risk and the latter, which gives rise to the configuration of risk and return on which portfolio decisions are made, will be referred to as the 'portfolio' elements of liquidity risk.

1.1. Structural elements of liquidity risk

To the extent that a liquidity problem at any one financial institution may be transmitted throughout the entire (financial) system, supervisory resources are directed to ensuring that no one financial institution becomes illiquid. By the very nature of its business, however, every financial institution is confronted with this risk.

1.1.1. The Core (Structural) Element of Liquidity Risk.

Because short term interest rates are usually lower than long term interest rates, normal banking business is usually characterised by 'borrowing short and lending long,' resulting in a mis-match of *maturities* on the two sides of the (commercial bank's) balance sheet. While being an important source of profits for banks, this mis-match represents the core element of the liquidity risk that banks face: all other things (especially the quality and the riskiness of the portfolio) equal, had there been a complete matching of the maturities of assets and liabilities, risk (and profits) would have been considerably reduced and the risk of illiquidity would have been limited to the non-core or ancillary elements discussed below.

This mis-match of the maturities of assets and liabilities inherent in banking business may not necessarily lead to illiquidity. Despite their relatively shorter maturities, liabilities may not be redeemed at maturity, because, as may be recalled, the basis of the (fractional reserve) banking system is that depositors usually require only a fraction of their deposits at any one time, and this is precisely why banks and other financial institutions can invest in assets with longer maturities. To reduce this core element of liquidity risk therefore, prudential regulation should attempt to secure a controlled mis-matching of the maturities of assets and liabilities because there is no rule that would prevent (net) depositors from demanding their maturing "loans" to banks (deposits) at a rate that exceeds the rate at which banks' assets are maturing, thereby

triggering a liquidity crunch. In this regard, the use of a *gap report* or *maturity ladder* would indicate the magnitude of the risk associated with the mismatch of asset and liability maturities. An example of the maturity ladder is given in Appendix 1.

1.1.2. Ancillary (Structural) Elements of Liquidity Risk. Even if a back-to-back policy that exactly matches the maturities of assets and liabilities eliminated the core element of the liquidity problem, the following <u>ancillary</u> elements[3] of liquidity risk could yet precipitate a liquidity crisis:

▸ A bank may find itself confronted with a liquidity crunch if loan and overdraft repayments are not made, or if issuers of securities defaulted. Adequate <u>credit risk</u> management will ensure a proper appraisal of loan applications on their own and in relation to other loans *given prevailing market conditions,* thereby reducing the likelihood of bad loans creating liquidity shortfalls for commercial banks.[4]

▸ <u>Market risk</u> also enters through the financial sector's function of providing liquidity to non-financial companies when it 'transforms' their illiquid assets, viz. 'ability to repay' and physical assets tendered as collateral, into liquid liabilities in the form of loans and overdrafts[5] that can be used to make current payments. Recent experience in South Korea and Japan present examples of serious financial sector liquidity crises originating in the non-financial private sector. Essentially, this element of liquidity risk occurs because businesses are subject to changing market conditions which adversely affect borrowers' ability to repay the banks that have provided them liquidity in the form loans, as is currently happening in Guyana's rice sector. Market risk is compounded if the prices of whatever has been pledged as collateral are also adversely affected by these market conditions, as happens in business cycles.

▸ Liquidity problems may also derive from <u>interest rate risk,</u> even in the case of fixed rate assets and liabilities: if short term liabilities are used to fund longer term assets, the associated funding gap (i.e., the core element of liquidity risk) will occur in the *future,* when the cost of funds is unknown. In the case of variable rate assets and liabilities, liquidity problems are implicit in the reduction in earnings and erosion of banks' capital bases that are

the usual subjects of discussions of interest rate risk. Suppose, as is generally the case, that short term rates (such as demand deposit and three month treasury bill rates) are lower than longer term rates (such as fixed deposit and loan rates), that all interest rates are variable, and that longer term assets are fully funded by short term liabilities. Apart from the core liquidity shortfall that will arise when the short term liabilities mature, external funding might be required even with an *equal* increase in short and long rates if the increase in total interest cost exceeded the increase in total interest income, as would happen if the dollar value of maturing liabilities is sufficiently in excess of the dollar value of maturing assets. An example of this, using a 1 percent increase in interest rates on assets and liabilities, is given in the gap report in Appendix 1. Such a gap report may be used to deal with both the core and (this aspect of) the ancillary elements of liquidity risk.

While it is difficult to estimate the liquidity risk associated with the foregoing, it is quite likely that the *high levels of excess reserves* that are maintained by commercial banks in Guyana reflect their inability to separate and to manage each of the (core and ancillary) elements of liquidity risk. One may even go so far as to suggest that commercial banks will be able to hold lower levels of excess reserves, and therefore interest rates will decline, if the ancillary elements of liquidity risk were more effectively managed. It would therefore seem that efforts to enhance the individual bank's liquidity management would be made more effective in a larger supervisory context that addresses overall asset-liability management involving the management of credit, market and interest rate (and currency) risk. In addition to these supervisory initiatives, the use of market mechanisms (e.g., interest rate and currency futures contracts) to deal with risk should be promoted.[6]

1.2. Portfolio elements of liquidity risk

Prudential regulation of liquidity by a quantity restriction (i.e., the LAR) on banks' portfolios assumes that the optimal portfolios of banks will be relatively illiquid. Another problem is presented if optimal portfolios are indeed liquid but banks do not convert liquid assets into cash even in the presence of liquidity shortfalls: in Guyana commercial banks, except in one instance, have always been significantly in surplus on the LAR, but there is heavy (unsecured) interbank borrowing, especially on the part of the largest banks. To the extent that aggregate liquidity

needs are less than the aggregate liquidity available on the interbank market, the underlying asset-liability management would not represent a liquidity problem. If, however, this underlying asset-liability management strategy were actually optimal, other banks will rationally adopt it and the entire financial system will face a serious liquidity problem, the consequence of which will be either an (unplanned) increase in money supply or significant losses for depositors, or some combination of the two. To explain how banks with significant surpluses on the LAR can cause (aggregate or systemic) liquidity risk involves outlining why they optimally choose (and *hold on to*) very liquid portfolios over higher-return but less liquid assets, and how their profit margins are not squeezed by having to resort to interbank borrowing. The central bank's (real or perceived) stance on bailing out troubled banks also influences the choice of portfolios.

Consider a bank's forecast of its cash flow. In any one period, the (gross) cash inflows will depend on, among other things, the interest rates on loans and (government) securities.[7] With a risk of default of 70 per cent[8] for the marginal borrower, the bank can *expect* cash inflows to include the full amount of interest earned on riskless securities and 30 per cent of the interest due on outstanding loans. Thus, ignoring capital gains or losses,[9] the *expected rate of return* on securities is the 100 per cent of the interest rate paid on securities while the expected return on loans is [100 minus the risk of default] per cent of the lending rate. With the interest rate on securities and loans given at say 9 per cent 20 per cent respectively, a 70 per cent risk of default gives the expected rates of return on securities and loans as 9 per cent and 6 per cent respectively, making investment in short term government securities more attractive than investment in loans. (Appendix 2 shows that the argument also holds for *net, after tax,* expected rates of return). The case is made stronger when it is considered that investment in loans involves higher required reserves, which earn no interest, while investment in securities does not. This incentive[10] for commercial banks to invest additional funds in securities versus loans results in a high demand for government securities, and particularly for *short term* government securities (3-month treasury bills) since these both yield relatively higher expected returns and limit to no more than three months, individual banks' exposure to liquidity risk.

While it may not appear that any serious liquidity risk attaches to this kind of asset-liability management, if as a result commercial banks engaged in heavy interbank borrowing to meet withdrawal demand, their vulnerability to <u>aggregate, or systemic, liquidity risk</u> would be high, as explained above. In addition to this aggregate liquidity risk, lending banks' exposure is made

greater because interbank borrowing is unsecured. Why then wouldn't banks with an excess demand for liquidity either trade securities for liquidity or rediscount eligible paper with the central bank?[11] Again, this is because the (expected) marginal costs are lower with the interbank option. Thus, if there are market imperfections that distort the cost of reserves below the (scarcity) price, or if lending banks believed that the central bank or government will not allow any bank to fail, the interbank or overnight rate, which should reflect both the perception of risk and the relative scarcity of reserves, will be both sticky and relatively low even if tight monetary policy were being pursued.[12]

In the first instance, price distortion happens most naturally in imperfect competition. There being only seven commercial banks, operating to boot under an officially sanctioned Bankers Association,[13] the market structure is tailor-made for oligopolistic behaviour, if not outright collusion. Thus, with a rate of return of 9 percent on treasury bills, and a penalty rate of say 3 percent for early redemptions, banks have only to agree to *set* the interbank rate between 6 percent, the net return on treasury bills redeemed before maturity, and 9 percent, for interbank borrowing to be less costly than *rediscounting securities* (treasury bills) before they mature. The distortion of the interbank market also makes the *sale of securities* less attractive to banks with an excess demand for liquidity. When securities are traded for liquidity the rate of return on treasury bills is simultaneously the (opportunity) cost of acquiring liquidity and the return to having excess liquidity. The rate of return on an asset being inversely related to its price, banks with an excess demand for liquidity will want to sell securities at a relatively high price while banks with excess liquidity will want to buy securities at the lowest possible price. Because trading will have to take place at the latter price, the secondary sale of securities will not happen: at this lower price the implied rate of return, which is the cost of acquiring liquidity by selling securities, will exceed the interbank rate, and indeed this will be the case as long as interbank market rate is subject to collusive determination.[14]

Beyond shifting interbank borrowing risk from market participants to the government, a weak central bank bailout policy also supports commercial banks' choice of very liquid, low return, portfolios. Because banks that are unprofitable, or banks that have neglected to manage the ancillary elements of liquidity risk, get the same protection as banks experiencing only the 'core liquidity' problems that inhere in banking business, market discipline is compromised and investment in low return assets continues even when profit rates are being squeezed. Indeed, if

banks *expected* the central bank to issue treasury bills whenever profit rates were threatened, they would rationally defer lending any increases in core deposits, allowing sufficient pressure to build up that the Bank capitulates.[15] Such an unwritten commitment to preserving profitability amounts to weak, though indirect, bailout policy.

The combination of the portfolio and the structural elements of liquidity risk, taken with the somewhat crude regulation of liquidity management achieved by the LAR, leaves Guyana's financial sector especially vulnerable to liquidity risk. Why this has not translated into bank failures in Guyana's monetary history, and the mechanisms that could cause bank runs, are discussed in the next section.

2. Illiquidity and the potential failure of depository financial institutions (DFIs)

The history of bank failures in developed economies suggests that even the most sophisticated methods of liquidity and general asset-liability management might not be sufficient to prevent threats to the financial system. That Guyana, on the other hand, has never even had the threat of a bank run despite its crude liquidity management and despite the sudden tightening of monetary policy under the IMF's ESAF,[16] suggests therefore that something else may be at work, and that if this is at all related to the fact that markets are undeveloped, further financial sector development may yet precipitate a liquidity crisis which can lead to bank insolvency. In this section it is argued that the absence of a formal, properly priced, deposit insurance scheme, combined with an unwritten commitment to preserve the profitability of commercial banks and inadequate disclosure requirements, is sufficient to ensure that there will not be any bank failure.

In this discussion, solvency will be taken to mean the "the excess of assets over liabilities, and, hence, ... the adequacy of the [depository financial institution's] capital."[17] A bank or a depository financial institution might find that even though it is solvent, illiquidity may lead to its failure, or to 'liquidity insolvency' as it is termed in (World Bank, 1992), unless the threatened DFI can (i) liquidate enough of its assets and/or (ii) increase its *future* obligations (interbank borrowing, borrowing from the central bank, increasing deposit liabilities, or issuing shares) in time to meet those of its obligations that are falling due.[18] The first of these options is a function of the liquidity of the assets of the DFI, while the latter option is a function of the solvency of the DFI.

Because of the difference between the deposit and other liabilities of DFIs, namely that

(demand) deposit liabilities mature randomly whereas the maturities of other liabilities follow a known schedule, DFIs are especially vulnerable to liquidity insolvency even if their liquidity and overall asset-liability management were adequate. Indeed, it is possible for a bank to fail even if it both eliminated the core liquidity risk by back-to-back maturity matching and planned carefully for the (random and the deterministic) components of liability maturities. As noted by Santomero (1997), "If [deposit] withdrawals are purely random, as they are likely to be most of the time, they may be statistically predictable. However, if liability holders become concerned about the solvency of the institution, withdrawals may become systematic and jeopardize the liquidity and solvency of the entire industry."[19] In turn, withdrawals might become systematic on account of either 'sunspots' or 'fundamentals' (Alonso, 1996), and, to the extent that future obligations cannot be increased, combine with the illiquidity of assets (Diamond and Dybvig, 1983) to cause bank runs. Sunspots can be defined as "extrinsic uncertainty [or] random phenomena that do not affect tastes, endowments, or production possibilities,"[20] and translate into 'panic' withdrawals and 'mass hysteria' in the discussion of bank runs. The 'fundamentals' that are associated with systematic withdrawals include extreme seasonal or cyclical (Gorton, 1988) economic downturns and financial and non-financial institution failures, loan/asset losses by DFIs (World Bank Supervision Guidelines), and large and unexpected declines in the future value of (Alonso, 1996) and return on (Santomero, 1997) DFI investments. Essentially, depositors respond to weak fundamentals by rushing to withdraw funds before banks become illiquid, but that very act is what triggers bank failures. Alternatively, depositors may incorrectly infer from weak fundamentals that banks are in trouble and may again rush to withdraw their funds. Such bank runs are said to be caused by *asymmetric information*, and may be averted by appropriate disclosure standards and other information-increasing measures. Thus the reassurances of the U.S. President, the Chairman of the Fed, and the more recent reassurances by U.S. Deputy Treasury Secretary Larry Summers and Japan's Prime Minister Hashimoto, that their economies were strong despite the October 1997 stock market crash and the corporate failures in Japan, provided *credible* information to depositors, thereby averting financial sector crashes that could have been triggered by non-bank private sector illiquidity. More generally, (Diamond and Dybvig, 1983) argue that this non-bank private sector concern that banks may be unable to supply liquidity upon demand, triggering bank runs, may be addressed by offering some kind of liquidity guarantee in the form of deposit insurance.

This is all to say that runs occur because of the *public's perception* about the financial state of banks. This perception may be based on information derived from fundamentals, or on 'sunspots,' and the perception may be correct or incorrect. In Guyana, because of the effective deposit insurance, the market behaviour (particularly as it relates to market participants' demand for, and ability to process, information about the financial state of banks) that normally triggers bank runs, or 'liquidity insolvency,' may not be observed.[21] As markets develop and as banks are required to disclose more informative performance profiles, it will become more important to consider the introduction of formal, and correctly priced, deposit insurance. Indeed, the very discontinuation of the effective deposit insurance provided by government will impose a kind of market discipline that will in turn ensure that depository financial institutions observe more careful asset-liability management than now obtains.[22]

3. The LAR and other prudential policies

To the extent that the structure of risk and return yield very liquid portfolios, but still present a large aggregate liquidity risk, it would seem appropriate to consider the relationship between the LAR and other prudential policies designed to secure the kind of asset-liability management that will preserve the integrity of the financial sector. In this regard, the reserve requirement and the capital adequacy requirement will be examined.

3.1. The LAR and the reserve requirement

The LAR is functionally identical to the reserve requirement, and some central banks (e.g., the Bank of Jamaica, the Central Bank of Barbados, and the Bank of Israel) subsume a 'liquid asset requirement' under the reserve requirement by specifying liquid assets (other than central bank deposits and vault cash) as reserve assets. With the required reserve ratios being 16% and 14% of demand and time liabilities respectively, and with the LAR being 25% and 20% of demand and time liabilities respectively, the LAR effectively increases the reserve requirement ratios by 9% and 6% of demand and time liabilities respectively, and extends the range of eligible reserve assets to include other liquid assets. This does not necessarily make for a reduction in liquidity risk (or a contraction in money supply, as argued below).

Despite the high level of excess reserves earlier noted, the reserve requirement is binding in the sense that the regulatory stock of reserve assets is above the optimal stock, while the LAR is

generally exceeded. Moreover, banks' response to the two requirements is *jointly* determined, falling out of their objective of maximising expected portfolio returns subject to the binding reserve requirement constraint. The structure of the argument is as follows:

- In computing the reserve requirement, reserves are calculated as a weekly average of daily reserve balances held during the maintenance period;
- Banks may therefore allow their reserve balances to fall, and remain, as low as they wish during the maintenance period as long as they can build up high enough balances on the final day to ensure that the average balance equals or exceeds the reserve requirement;
- Given that overnight interbank borrowing at relatively low rates can provide reserves on the final day of the reserve period, and that investment in (liquid) treasury bills maximises expected returns, banks invest in very liquid portfolios, *thereby* exceeding the LAR as a matter of course.[23]

This strategy is even more attractive because investment in treasury bills reduces the non-earning required reserves below what would have been associated with the alternative strategy of investing in loans. Moreover, given that the optimal (as against required) stock of cash reserves must satisfy random withdrawal demand, this strategy is sustainable as long as the past pattern of withdrawal demand correctly predicts actual withdrawal demand, especially since the cash inflows from treasury bills are certain while the cash inflows from loans are not.

Banks will therefore wish to use reserves to purchase treasury bills, and equilibrium therefore involves the dynamic choice of reserves and investment in loans and treasury bills, subject to the reserve requirement. Thus, control of the overall asset-liability management of depository financial institutions is *fully* achieved by the total specification of the reserve requirement, and the LAR is superfluous unless it is increased enough to be binding. For example, making the reserve requirement a 'daily' one as against a 'weekly average' one reduces the scope for banks to use the collusive interbank market to support their high aggregate-liquidity-risk portfolio choices. Likewise, lowering the required reserve ratios after the DFIs have been able to separate the core and ancillary elements of liquidity risk will reduce the cost of lending (deposit creation), and the total reserves may even increase if the higher reserves associated with the created deposits exceeded the reduction in reserves associated with the lower required reserve ratios on

existing deposits. In addition, the reduction in the required reserve ratios will lead to an increase in the loan component of banks' portfolios and a reduction in the securities component. This all suggests that adequate liquidity management could be secured by the appropriate design of the reserve requirement,[24] *ceteris paribus*.

3.2. The LAR and capital requirements

Shareholder versus creditor risk is a central concern whenever businesses are highly leveraged. Thus, high capital requirements imposed on commercial banks are intended to ensure that the moral hazard that would give rise to the 'over-investment' of *creditors*' funds (i.e., deposits) in high risk/return assets, is reduced by increasing the losses to owners/shareholders of bank failures. The natural result of high capital requirements is that banks invest more heavily in lower risk securities. The tendency for commercial banks to optimally invest in treasury bills as previously noted is therefore reinforced by the high capital requirements. By virtue of this, capital requirements help to reduce the risk that banks may face a liquidity problem if they were to 'borrow short and lend long,' but at the same time the risk of an aggregate liquidity problem increases as long as the interbank rate is collusively determined.

Even if imposed to preserve the soundness of the financial system, the combination of high reserve and capital requirements and a non-competitive interbank market induce banks to invest in highly liquid portfolios, and to engage in heavy interbank borrowing that subjects the commercial banking system to significant aggregate liquidity risk even when the trading of securities for liquidity is feasible. Prior to this, the current monetary control framework makes available the liquid treasury bills in which banks invest, ostensibly to reduce the 'liquidity in the system.'

4. Bank liquidity management and monetary and exchange rate policy

While the LAR was designed to ensure that *banks* maintained a minimum of liquid assets, current monetary policy is driven by a concern that there is 'too much liquidity' in the *economy*, surpluses on the LAR (among other things) being taken as evidence of the latter.[25] In this section, the dynamic interaction of monetary policy (with its 'price stability' and 'balance of payments' concerns about the growth in spending), commercial banking system liquidity, and the liquidity of the non-bank public is examined, and inferences are drawn about the implied, though

inexplicit, exchange rate policy. For this purpose, it should be noted that the liquidity of the commercial banking system refers to the liquidity of commercial banks' assets, while the liquidity of the non-bank public refers to the liquidity of the non-bank public's assets, but that the two are not unrelated: commercial bank assets are funded largely by their deposit liabilities, which in turn are the assets of the non-bank public.

4.1. Monetary Policy

As currently conducted, monetary policy is designed to address balance of payments considerations and is formulated in the IMF's Enhanced Structural Adjustment Facility (ESAF) for Guyana.[26] When countries approach the IMF for assistance to meet their international payments' obligations, they must agree to adopt measures to reduce the growth of these obligations. On the demand side, fiscal, monetary and exchange rate policies must be adopted to restrain the growth in spending on (imported) goods and services,[27] which, from a somewhat monetarist perspective, increases with the non-bank public's holdings of *money*, or the non-bank public's *claims on the banking system*.[28] Monetary policy therefore seeks to control the growth of M1 or M2, and, to the extent that the 'liquidity effect' (by which spending will increase with the liquidity of the non-bank public's claims on the banking system) holds, to reduce the liquidity of the non-bank public's claims on the banking system. To this end, a monetary framework known as the 'sterilisation of excess liquidity' has been adopted, involving the primary sale of (short term) treasury bills, the proceeds from which are deposited in government accounts that, by agreement with the IMF, cannot be debited (spent). At issue here are whether this monetary control framework 'neutrally' limits the growth of money in the sense of yielding only the expected results, and whether it reduces the liquidity of the non-bank public's claims on commercial banks.

4.1.1. The Growth of the Non-bank Public's Claims on the Banking System.

4.1.1. The Growth of the Non-bank Public's Claims on the Banking System. Monetary policy is conducted by effecting changes in commercial banks' aggregate balance sheet via the alteration of individual banks' asset portfolios and consequently, though not as importantly, their liquidity positions.[29] For example, when the central bank wishes to restrain spending by the non-bank public, it might first act to reduce commercial banks' nonborrowed reserves.[30] A sale of securities by the central bank will lead to a reduction in nonborrowed reserves and an increase in

securities on the asset side of commercial banks' individual balance sheets, with the result that commercial banks' aggregate ability to lend decreases by the reduction in reserves *times the money multiplier*.[31] Thus, the reduction in banks' nonborrowed reserves, or the relative increase in securities holdings, on the asset side, leads to a (multiple) reduction in banks' ability to issue deposit liabilities on the liability side, and therefore to a reduction in the growth of the non-bank public's claims on commercial banks. All other things equal, the growth of money would have been effectively limited by central bank manipulation of the asset portfolios of commercial banks.

To the extent that money and spending can increase for reasons other than the expansion of credit in the economy, this operating procedure may be less effective than might be thought. In the following identity, money, or the sum of the non-bank public's holdings of currency (CC^{nb}) and their deposits with commercial banks (D^{nb}_{kb}), is variously defined as the sum of the *banking system's* Net Foreign Assets (*NFA*) and its Net Domestic Assets (*NDA*), which can be further decomposed into Domestic Credit (*DC*) and 'Other Items (Net)' (*OIN*); or the money multiplier (*mm*) times the monetary base, defined as the sum of the non-bank public's holdings of currency, commercial bank holdings of currency (CC^{kb}), and commercial banks' deposits with the central bank (D^{kb}_{BOG}); or the money multiplier (*mm*) times the monetary base, defined as the sum of the non-bank public's holdings of currency, and commercial banks' nonborrowed reserves (RN^{kb}) and their borrowed reserves (*RB*):

$$
\begin{aligned}
CC^{nb} + D^{kb}_{nb} &\equiv NFA + NDA \\
&\equiv NFA + (DC + OIN) \\
&\equiv mm \times [CC^{nb} + CC^{kb} + D^{kb}_{BOG}] \\
&\equiv mm \times [CC^{nb} + RN^{kb} + RB]
\end{aligned}
$$

In the first instance, the increase in the non-bank public's claims on the central bank and on commercial banks (i.e., money) may come from an increase in *NFA* or *OIN*, and not only from an increase in *DC*. Since any increase in the banking system's *NFA* or in *OIN* will spill into an increase in commercial bank nonborrowed reserves RN^{kb}, the potential for credit expansion and monetary growth increases, hence the 'sterilisation of excess liquidity' operating procedure.

Thus, as shown in Figure 1 on p. 13, the share of *NFA* in money has been increasing and correspondingly, the share of *NDA* in money has been decreasing, since 1990, a year after the IMF's ESAF; the share of *DC* in money decreased, up until 1994, at which point it began to increase gradually; and the share of *OIN* in money mirrored the share of *NDA* in money moreso than did *DC*. Since money grew in consonance with the increase in the share of *NFA* in money, it would appear that the non-credit expansion in money is being accommodated by the sterilization programme's restraint of credit, and in particular, that domestic savings are being 'crowded out' by foreign savings in the financing of investment.

Apart from concerns that may arise about using *short term* treasury bills in a *primary* auction to restrain the growth of credit,[32] there can be little doubt that, without the sterilization of liquidity, money growth would have been greater than it now is. The problem is that, because short term treasury bills are themselves highly liquid, monetary policy ends up *facilitating* the high level of commercial bank liquidity about which it is presumably concerned. An alternative operating procedure would have had commercial banks undertaking risk-reducing activities such as information gathering and processing so that they could increase the non-government security component of their portfolios. Guided by more sophisticated methods of liquidity management such as the maturity ladder, banks would have invested in loans and public and private sector securities, and would have even begun to trade securities, all within the larger context of an asset-liability management strategy that explicitly considered future liquidity requirements. There might have even been an increase in the demand for private sector financial (debt) instruments, financial innovation taking place without compromising liquidity concerns.

Figure 1: *Money and Shares of NFA, NDA, and Components of NDA in Money*
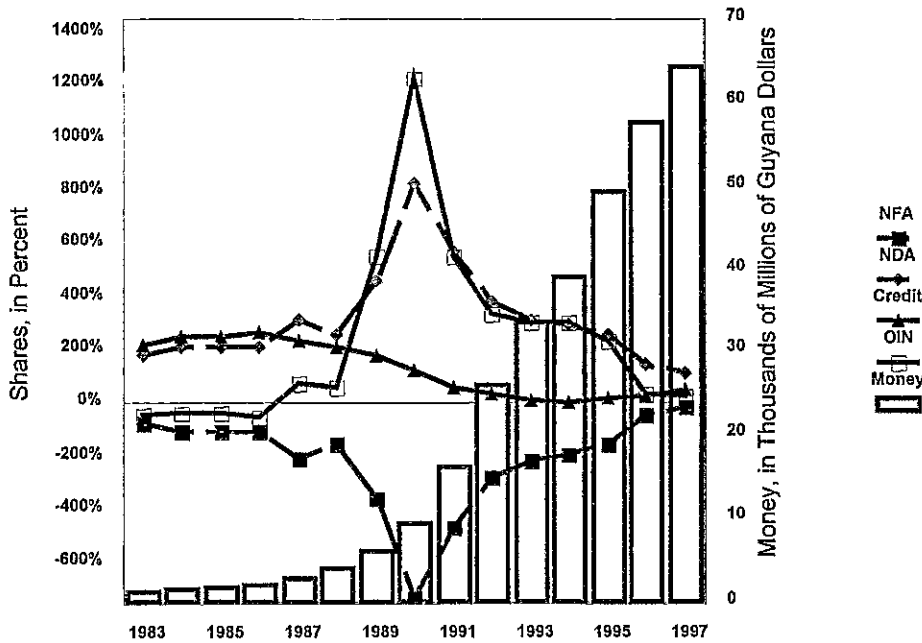
All of this would have been reflected in prices: the interbank market for short term liquidity would have become more competitive, the interbank rate reflecting the relative increase or decrease in nonborrowed reserves; and deposit and lending rates would have also been more competitively determined. There is therefore a trade off between the current monetary control framework and the development of more sophisticated, carefully considered, asset-liability and liquidity management strategies on the part of commercial banks.

4.1.2.   The Liquidity the Non-bank Public's Claims on Commercial Banks. Money, it will be recalled, can be defined as the non-bank public's claims on the central bank for currency, and on commercial banks for deposits. Apart from controlling the growth of these claims, the central bank might act to reduce the liquidity of the non-bank public's claims on commercial banks if it thought that spending increased with liquidity. To do so, the central bank can sell longer-term bonds, lowering the price and raising the yield. In response, the non-bank public would reduce their holdings of fixed-interest financial assets such as commercial bank deposits, and will purchase the newly issued bonds with the higher yield. This will generally happen through non-

bank financial institutions, insurance companies, and building and co-operative societies that wish to invest in the higher yielding bonds: by offering higher term deposit rates or lower premia for instance, non-bank financial institutions and insurance companies respectively will induce the public to shift out of more liquid commercial bank deposits. It is not clear, however, that this is happening.

For such a reduction in the liquidity of the non-bank public to take place, the non-bank institutional investors must be profit maximising, and must be able to process 'new information' about portfolio returns, given the movement in the relative asset rates of return associated with the sale of long term bonds. Importantly, if the (opportunity) cost of not investing in the higher yielding bonds can be 'passed on' to equity holders or to creditors, monetary policy to reduce the liquidity of the non-bank public will be confounded because non-bank institutional investors will not facilitate the shift out of commercial bank deposits. Instead, and as is largely the case in Guyana, only *commercial banks* will purchase the securities, and the liquidity of the non-bank public will be unaffected.

4.2. Exchange rate policy

Having argued in the previous two sub-sections that the monetary control framework does little to reduce the liquidity of commercial banks or of the non-bank public, it might be worthwhile to consider if an inexplicit exchange rate policy is operating to contain spending and inflation. It may be, for example, that the sale of treasury bills is sterilising foreign exchange inflows, a policy that involves the purchase (direct or indirect conversion) of foreign exchange by the central bank/exchange authority and the simultaneous sale of an equal amount of treasury bills from its own stock. Given the recent increases in export earnings on the current account, and with the capital inflows (i.e., the 'autonomous' decline in Guyana's net foreign assets) associated with increased loans, grants, and foreign direct and portfolio investment, the Bank has, as noted earlier, increased its holdings of Net Foreign Assets, thereby increasing the money supply. Even if this is not intended, an equivalent sale of treasury bills amounts to the sterilisation of foreign exchange, ensuring that the domestic currency does not appreciate and that money supply does not increase. Imports, investment spending and spending on consumer durables are therefore controlled.

There is some support for this view. Restrained growth in money supply apart, the

sterilisation of foreign exchange also stabilises the exchange rate in the face of seasonal and other fluctuations in the supply of and the demand for foreign exchange. If overdone, as is likely to happen if foreign exchange sterilisation is not a deliberate policy, the exchange rate will rise (the Guyana dollar will depreciate), and the exchange authority will have to sell foreign exchange. Foreign exchange dealers who do not actively manage foreign exchange risk, but who maintain open positions, also *expect* the central bank to intervene to stabilise the exchange rate: faced with an excess demand for foreign exchange, and not knowing to manage the risk of exchange rate losses, dealers refuse to adjust rates to reflect the relative scarcity of foreign exchange, signal queuing to the central bank, which in turn fulfills these expectations by selling foreign exchange to prevent the queuing from translating into Guyana dollar depreciation!

While the evidence to support the inexplicit foreign exchange sterilisation hypothesis is non-empirical, if the hypothesis indeed holds the authorities should consider abandoning the primary sale of treasury bills to 'mop up excess liquidity,' and consider explicit foreign exchange sterilisation in the absence of the control of capital inflows and fluctuations in export earnings. In particular, exchange rate and monetary policies should be distinguished to ensure that incentives are not created for less-than-satisfactory liquidity management on the part of commercial banks.

5. Conclusion and recommendations

A careful consideration of commercial banks' balance sheets is central to the management of core and ancillary elements of liquidity risk, and to the implementation of monetary policy. From the perspective of both prudential regulation and monetary control, the Liquid Asset Requirement seems less effective than may be imagined. Not surprisingly, (Gulde 1997) reports that for most countries with a LAR, optimal stocks of liquid assets generally exceed the regulatory requirement, as happens in Guyana. This high level of liquidity has been shown to be generated by an underlying asset-liability management strategy that is best explained as rational behaviour in the face of risk, policy induced constraints (particularly the reserve requirement) and imperfect competition, and is compounded by financial institutions' inability to separate credit, market and interest rate risks from the core element of liquidity risk (i.e., the mis-match of asset and liability maturities).

Regarding the proper management of risk, the supervision of liquidity management should be

presented as part of the supervising authority's concern with the overall asset-liability management of financial institutions, and commercial banks in particular. The core element of liquidity risk may best be addressed by requiring financial institutions to submit gap reports, which may also be used as a first step in the management of interest rate and market risk. In addition to these supervisory initiatives, the use of market instruments to hedge against risk should be promoted.

It would also appear that banks' overall asset-liability management will be enhanced if the effective or implicit deposit insurance provided by government were replaced by formally provided, properly priced deposit insurance. The informal deposit insurance essentially neutralises the effectiveness of increased (equity) capital requirements in reducing the moral hazard problems associated with 'too much' risk taking on the part of banks, and all but eliminates depositor interest in monitoring banks' asset-liability management. Indeed, this may explain the absence of 'competition' in the financial sector, the most important element of which is depositors' movement of funds from one bank to another in response *inter alia*, to perceptions about asset-liability management. Analogously, weak central bank bailout policy compromises the effectiveness of market discipline in maintaining the performance of financial institutions (see Bruni and Paternò, 1995).

The scope for elements of prudential policy to reinforce each other, or for there to be trade-offs between these elements, cannot be overlooked. Notably, overall asset-liability management may even be enhanced by lowering reserve requirements, thereby increasing the relative return to loans and securities in commercial bank portfolios. This, combined with a re-specification of the reserve requirement to make it a daily rather than a weekly one, eliminates the rationale for heavy interbank borrowing that generates the aggregate liquidity risk to which the system is subject.

Regarding monetary control, inducing commercial banks to exchange cash for assets does not necessarily reduce the liquidity of either commercial banks or of the non-bank public. The stock of public debt increases however and, because of the sterilisation programme, amounts to accommodating the foreign financing of investment by 'impounding' domestic savings. In its wake, this monetary control framework removes incentives for commercial banks to increase lending, thereby generating the portfolio elements of aggregate liquidity risk. If the monetary control framework is actually effecting the sterilisation of foreign exchange, spending is

constrained because the domestic currency is not allowed to appreciate. Apart from the danger of sterilising 'too much' foreign exchange, the costs of this exercise include the increased debt associated with the primary sale of treasury bills, and the opportunity cost of supporting banks' profitability at the expense of the continued exclusion of new borrowers, such as small business enterprises, from credit markets.

With all of these factors operating together, it will not be appropriate to expect isolated policy changes, such as the replacement of the LAR by a maturity ladder, to produce any significant improvement in the liquidity and overall asset-liability management of financial institutions.

Appendix 1: Simplified Weekly Gap Report - Sample Bank - in Millions

Item	1-90 Days	91-180 Days	181-270 Days	271-365 Days	1-2 Years	2-3 Years	3-4 Years	4-5 Years	Over 5 Years	Total
Loans	175	150	75	75	225	150	75	75	150	1150
Investments	100	150	50	50	250	50	50	75	75	850
Other Assets	25	0	0	0	25	0	0	0	50	100
Total Assets	300	300	125	125	500	200	125	150	275	2100
Deposits	300	225	175	125	275	75	50	25	75	1325
Money Market Liabilities	75	100	25	50	0	0	0	0	0	250
Long Term Debt	0	0	0	25	25	25	50	50	75	250
Other Liabilities	25	25	0	0	25	0	0	0	0	75
Capital	0	0	0	0	0	0	0	0	200	200
Total Liabilities	400	350	200	200	325	100	100	75	350	2100
Period Gap	-100	-50	-75	-75	175	100	25	75	-75	0
Cumulative Gap	-100	-150	-225	-300	-125	-25	0	75	0	0
Cum. Gap Limit (+/-)	150	200	300	300	300	100	100	100	100	0

Core Liquidity Risk Management

The **Period Gap** gives the 'maturity mis-match' of assets and liabilities, or the core element of liquidity risk. One approach to managing liquidity risk is to ensure that the **Cumulative Gap** for each time frame complies with the **Cumulative Gap Limit**, established in the bank's asset-liability management policy. In the above example, the 271-365 day gap is at the *maximum* acceptable level.

Ancillary Liquidity Risk Management

The larger the Cumulative Gap, the larger the potential interest income losses associated with adverse movements in interest rates and the larger the potential liquidity shortfall. Within each time frame, the report depicts the amount of items whose interest rate can be changed (i.e., can "reprice"). Certain items, such as demand and saving deposits, and non-performing loans, among others, have no contractual repricing date, and are accounted for likely "effective" repricing. For example, the portion of demand deposits determined to represent permanent ("core") funding is included in the 'over 5 year' time frame, while the remainder is included in the four time frames comprising the first year.

Level 1

Using the simplifying assumption[**] that *all* items (assets and liabilities) reprice the first day of the time frame, and that all interest rates increase on day one, with no subsequent rate changes, the pre-tax change in net income associated with a 1% increase in interest rates is calculated as [1% * Cumulative Gap]:

1st	Quarter	(1-90 Days)	-0.25	(-100 X 1% * 1/4)
2nd	Quarter	(91-180 Days)	-0.38	(-150 X 1% * 1/4)

[**] An alternative assumption would be that on average the items reprice at the midpoint of the time frame, which would result in income effects of half those shown

| 3rd | Quarter | (181-270 Days) | -0.56 | (-225 X 1% * 1/4) |
| 4th | Quarter | (271-365 Days) | -0.75 | (-300 X 1% * 1/4) |

Income Effect in Year One: -1.94   (In other words, because of the maturity mismatch, a 1% increase in the interest rate on all items will lead to a 1.94 million dollar decrease in net income).

Level 2

The assumption that the interest rate on assets and liabilities *both* increase by the same amount is relaxed. The net income effect of a change in interest rates will be calculated by taking the difference between interest income from assets and interest expense associated with liabilities, based on projected interest rate changes for each item, in each time frame. Computer simulations of the above table make this an easy exercise. Projections of interest rate changes are made on the basis of economic forecasts and experience.

<u>Source</u>: Adapted from "Asset and Liability Management." *Bank Supervision Guidelines*, Seminar for Senior Bank Supervisors, The World Bank, Jointly with the Federal Reserve System. August 1992, J: G10

APPENDIX 2: Nominal and expected rates of return

Financed by:	Deposits	Equity
Net return before taxes:		
Securities	1.00%	1.60%
Loans	13.00%	13.60%
Net return after taxes:		
Securities	0.55%	-2.45%
Loans	7.15%	4.15%
Expected net return before taxes:		
Securities	1.00%	1.60%
Loans	-1.70%	-1.10%
Expected net return after taxes:		
Securities	0.55%	-2.45%
Loans	-0.94%	-3.94%

To reinforce the argument in Section 1.2, the above table presents the net rates of return on assets before and after taxes. The calculation is based on the simple model outlined below, and assumes a 9% interest rate on securities, a 21% interest rate on loans, an 8% deposit rate, and a 7.4% dividend rate. With a 70% marginal default risk for marginal borrowers, the expected rates of return on loans and securities are respectively 6.3% and 9%. In this model, π, R, C, L, D, S, T, and OC are respectively profit, revenue, (interest) cost, loans, deposits, securities, taxes, and other costs or expenses (which include dividends). r is the rate of return on the assets/liabilities indicated by subscripts.

$\pi = (R - C)$, where $R = r_L L + r_S S$ and $C = r_D D + OC$. With a 45% tax on net income, and with other expenses being deductible, taxes will be given as:

$T = 45\% [(r_L L + r_S S) - (r_D D + OC) + OC]$.

After tax profit is therefore:

$\pi - T = (r_L L + r_S S) - (r_D D + OC) - [45\% (r_L L + r_S S - [r_D D + OC] + OC)]$

$= 55\% (r_L L + r_S S - r_D D) - OC$.

Thus, the expected net after tax rate of return on loans financed by deposits is determined by the first part of the right hand side of the above equation, by setting S equal to zero and L equal to D, and using the expected interest rate on loans. Factoring out $L = D$, the relevant rate is computed as $0.55 * ([1 - 0.7] * 0.21 - 0.08)$, which works out to be $(- 0.935\%)$ as given in the table.

The calculations indicate that a positive after tax expected net return (0.55%) is possible only when deposits are used to purchase securities. *This result is sensitive to the loan default risk and the rate of taxation of interest income from the different assets.*

Notes

1. The 'creation' of deposits does not violate the balance sheet identity between assets and liabilities: in a single bank transaction, a loan on the asset side is matched by a book entry crediting the borrower's deposit account on the liability side; or cash reserves go down and loans go up on the asset side of the lending bank while cash reserves and deposit liabilities both increase at other banks.

2. Illiquidity in non-bank financial institutions is possible, but less so than in the case of commercial banks, for which loans are largely associated with deposit (liability) creation.

3. Exchange rate risk is excluded from this discussion because a combination of rational expectations on the part of foreign exchange dealers and intervention by the Bank of Guyana in foreign exchange markets effectively prevents the exchange rate from moving in response to relative scarcity.

4. Credit risk monitoring involves the assessment of credit-granting standards and credit monitoring processes, asset quality and adequacy of loan loss provisions and reserves, concentrations of risk and large exposures, connected lending, and country and transfer risk. See the Basle Committee on Banking Supervision (1997).

5. Overdrafts can be thought of as revolving loans, except that interest is not calculated on the (declining balance of the) overdraft principal but on the net amount of the overdraft that is used, after accounting for repayments. Overdrafts are therefore cheaper for borrowers. At the end of November 1997, overdrafts and loans were respectively 19 percent and 30 percent of the aggregate asset portfolio of commercial banks.

6. See Andersen (1987). How liquidity management can benefit from commodity futures for tradables and non-tradables might also be considered.

7. More precisely, cash inflows depend on the type of loan or security, and on the dollar volume of these assets. Loans could be either simple, requiring repayment of interest and principal at maturity, or fixed payment, requiring repayment of both interest and principal through the period to maturity; securities could be either discount securities, which are usually short term bills that are purchased at a discount and repaid at face value, or coupon securities which require multiple payments of interest to the buyer on a regular basis and repayment at face value at maturity.

8. Based on independent telephone interviews of commercial banks. Because of the high capital requirements discussed below, we can ignore the moral hazard considerations that would otherwise make investment in loans more attractive (or less unattractive) than investment in treasury bills despite this high default risk.

9. The relevant secondary markets do not exist in Guyana, and this may actually reflect optimal behaviour on the part of banks. See Note 14.

10. Moreover, the high leverage of banks itself creates an incentive to invest in low risk assets, and this is reinforced by the higher capital requirements which increase the loss to shareholders (versus creditors) of risky investments.

11. Borrowing from the central bank is a 'last resort' option, and is therefore not considered.

12. Of course, the interbank rate would *a fortiori* be relatively low if, as argued in the section "Liquidity Management and Monetary and Exchange Rate Policy," monetary policy initiatives were not as effective in restraining the growth of money supply as might be thought.

13. While trade associations are useful, it is usually a violation of antitrust laws for members to even discuss price

(interest rates). No such laws exist in this case.

14. This is moreso because of the transaction costs involved in the sale of securities. Morever, banks concerned about the variability of portfolio returns and of net worth will know that if a significant segment of their portfolios is committed to treasury bills, the trading of securities on a secondary market will lead to fluctuations in interest rates and the value of treasury bills, with the result that net worth and portfolio returns will be likewise fluctuating.

15. See Rogoff (1989) for a thorough treatment of the role of central bank reputation in the conduct of monetary policy.

16. As mentioned in Note 16 however, monetary policy may not be as tight as is perceived. Despite the high costs of the current monetary management initiatives, interest rates are not as high as they might have been, in part explaining why the strictures of the IMF programme have not been fully felt.

17. "International Accounting Standard IAS 30," No. 7, p. 517. *International Accounting Standards, 1997.*

18. Selling assets to meet obligations involves an equal decrease in assets and in deposit liabilities, while increasing future obligations to meet current obligations involves an equal increase and decrease in liabilities.

19. pp. 7 - 8.

20. Cass and Shell, 1983, p. 194. Interestingly, the analogous discussion by Cass and Shell concerned the appropriate strategy for investors on the stock market: should investors be guided by economic and financial fundamentals or by the 'psychology of the market' or sunspots?

21. That there has been no bank failure may also be attributed to market structure: if banks operate as a cartel, as is generally believed, they may have been able to preclude 'panic equilibria' in the market for liquidity by distorting downwards the cost of liquidity to each other (the interbank market), and upwards the cost to the public (the loan market).

22. For further elaboration of the moral hazard problems associated with implicit deposit insurance, see Taylor (1997).

23. A simulation of reserve balances adjusted for interbank borrowing on the final day of the maintenance period revealed that without interbank funds borrowing banks would have been deficient on the reserve requirement.

24. See Barnea and Gheva (1996).

25. The Bank's liquidity forecast framework that is used to estimate the amount of 'liquidity' in the economy is essentially based on the framework that had been developed to explain the surpluses on the LAR.

26. The logic of the monetary approach to the balance of payments provides the basis for this approach. No attempt will be made to assess the IMF's framework.

27. The IMF is not concerned if this demand is financed by foreign savings in the form of loans, grants and foreign direct investment, and indeed it's efforts are in part directed at creating an economic environment that will make such foreign capital inflows 'sustainable.' In particular, the domestic savings' financing of investment is crowded out when this happens, and of course, 'excess liquidity' must be 'mopped up.' One might summarise the difference between foreign and domestic savings by noting the different price and income effects, but this will not be attempted here.

28. In particular, M1, defined as the non-bank public's holdings of currency plus demand deposits, and M2, defined as M1 plus time and savings deposits, represent the public's progressively less liquid claims on the central bank

(currency) and on commercial banks (deposits).

[29]. McKean (1949) has defined the 'liquidity position' to take account of the fact that at any point in time the liquidity of assets is going to be at least partially 'used up' by maturing liabilities. In this discussion, this distinction is ignored.

[30]. The reduction in nonborrowed reserves is usually reflected in increased interbank (overnight) rates. On account of the distortions already discussed, interbank rates are actually quite low, but this does not affect the present discussion.

[31]. This formulation assumes that vault cash is an eligible reserve asset for reserve requirement purposes.

[32]. These two concerns affect the *cost* of the monetary control framework. In the first instance, the use of short term instruments will usually warrant further issues to effectively reduce nonborrowed reserves. As has already been noted, commercial banks prefer short-term securities because the early maturity reduces their exposure to liquidity risk, *with the effect that formal liquidity management can be postponed and security trading avoided.* Regarding the increase in public debt on account of the primary issue of treasury bills, the obvious increase in the interest cost is compounded by Ricardian equivalence-type effects and by the opportunity cost associated with not using (i.e., sterilising) domestic savings. (By Ricardian equivalence, if non-bank debt holders expect the debt to be rolled over, increases in holdings of government debt will be regarded as increases in wealth and the restriction on spending will be attenuated).

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