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A Monetary Policy Framework for Sudan

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USAID-Funded Institutional Support to the Government of Southern Sudan

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Regime Options

There are several fundamentally different ways that countries can pursue a price level objective. One is simply to administer prices in accordance with that objective. This approach requires (ultimately, at least) state-administered investment, production, and distribution, and has historically been associated with central planning, inefficiency, low levels of income, and long lines for poor quality goods. The desire to allocate resources on the basis of the profit incentive and market-determined price signals of consumer demand and the cost of production require the abandonment of administered prices. This note discusses control of the value of money when the prices of goods and services are determined by the market.

When individual prices are market-determined, the aggregate price level (i.e., the value of money) is determined by the market so as to equate the public's demand for money with the supply of it. The achievement of an inflation target, therefore, requires a quantity of money consistent with the public's demand for it at the targeted price level.[1] The three most common general approaches to determining the quantity of money are: (a) to limit its creation by banks by directly controlling the amount of credit they may extend, (b) to limit its creation by banks by controlling the amount of reserves available to them, and (c) to fix the exchange rate of the currency to another currency or unit whose value behaves in the desired way and to allow the quantity of money to be determined by the public's demand for it at the value that has been fixed by the exchange rate.

The first of these approaches, which generally takes the form of an aggregate target for bank credit that is administratively allocated among individual banks, retains some of the features and disadvantages of central planning. By determining the growth in individual bank assets administratively, the incentive for individual banks to work harder to deliver better service more efficiently (i.e., at lower cost) is greatly diminished. The market is not allowed to determine the relative growth of individual banks on the basis of their success in satisfying their customers. Economic efficiency and growth are, therefore, better served by indirect techniques of monetary control, i.e., approaches b or c above.[2]

The approach of a fixed exchange rate has considerable advantages (it is easy to administer and does not require knowledge of the public's demand for money, which is particularly difficult to estimate during periods of economic reform), but requires that government borrowing be limited to amounts that can be raised from the public[3]. Fixing the value of money exogenously (e.g., to the dollar, Euro, SDR, gold, or a commodity basket) is not only the easiest monetary policy to administer, assuming that the fiscal deficit can be appropriately limited, but probably provides the quickest way to establish

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[1] For a more general discussion of these issues see any standard textbook on money and banking or monetary theory.

[2] The advantages of indirect techniques of monetary control are discussed in greater detail in Johnston and Per Brekk.

[3] A modest amount of borrowing from the central bank might be consistent with the monetary growth desired by the public under a fixed exchange rate.

faith in the stability of such money's value. If the rules of a fixed exchange rate are followed, the value of money will be the same as the value of the currency or basket of currencies or goods to which the exchange rate of the currency has been fixed.

Aside from dollarization (i.e., no domestically issued currency at all), a currency board is the simplest monetary regime with an externally fixed value to administer and has the highest credibility. A currency board simply buys and/or sells its currency in exchange for the currency or commodity(s) in terms of which its value is fixed. The rules of a currency board require the monetary authority to hold the asset to which the domestic money's value is fixed to the full extent of the currency it has issued (i.e., at least 100 percent backing). The board would accomplish this by issuing its currency only by buying the currency (or other assets) to which its value is fixed. If anyone holding its currency wishes to exchange it for the asset(s) backing it, the board must redeem its currency at the currency's fixed price (only small margins--bid/ask spreads--are allowed). These requirements, that the board must buy or sell its currency at a fixed price, ensures that the public has all, but just all, of the currency that it wants to hold at that price. In short, a fixed exchange rate as administered by a currency board supplies exactly the quantity of domestic currency the public wants to hold (i.e., equates the supply of and demand for money) by an automatic market mechanism, while ensuring aggregate price behavior equal to that of the unit to which the currency's value is fixed. Furthermore, there is no need for the monetary authority to estimate the public's demand for money in order to know how much it needs to supply to hit the desired price target.

A fixed exchange rate regime without the currency board restrictions would work in the same way to produce the quantity of money the public demands but would open the possibility for the central bank to buy and sell domestic assets as an additional instrument for influencing the quantity of money. The central banks monetary liabilities would no longer need to be fully backed by foreign assets. This has the advantage of accommodating various demand and external supply shocks without the need for adjustments in the domestic price level. However, it is subject to abuse or misjudgment that can result in a domestic money supply that is not matched with demand. Such a mismatch would put pressure on the fixed exchange rate and could result in the loss of the ability of the central bank to defend the exchange rate. For this very reason fixed exchange rate regimes that are not fully backed with foreign currency can be subject to speculative exchange rate attacks.

An alternative market approach to equating the supply of and demand for money is for the central bank to determine the money supply and allow the market to determine its value (i.e., to determine the price level). This approach contrasts with the fixed exchange rate approach in which the value of money is fixed and the market determines its supply, and obviously requires that exchange rates be market-determined. Controlling the quantity of money in an effort to stabilize its value requires a reasonably good estimate of the public's demand for money. This is a challenging task for any central bank.

In most economies for which estimates have been made, money demand has been found to have a relatively stable relationship with nominal income and interest rates (or more exactly, with the opportunity cost of holding money- -defined as the difference between the average rate of interest on financial market instruments and the average interest return on money). Estimates generally find a stable relationship between real money demand (money deflated by a general price index) and real income (nominal or money income deflated by the same price index) and an interest rate. These empirical

findings are in keeping with economic theory. For a given level of real income and interest rates, the demand for money tends to be proportional to the price level, i.e., other things equal, doubling the price level will tend to double the demand for nominal money and vice-versa. A stable price level, therefore, generally requires that the supply of money grow at about the same rate as real income.

The observed stability of the demand for money is far from perfect, however. Furthermore, improvements in payment technology and financial market development cause trends in money demand over time that tend ultimately to economize (reduce) the amount of money held in relation to income, while wealth effects tend to go in the other direction. In the earlier phases of financial development the demand for money tends to grow with income and improved payment system efficiencies that lower the cost of using bank deposits.[4] At later stages of development, the growing use of credit/debit cards and other modern means of payment reduce the demand for monetary aggregates such as M2, that exclude these means of payment. The usefulness of targeting the behavior of the quantity of money (an intermediate target) in order to achieve an inflation target (the ultimate target) depends on the accuracy with which the demand for money can be forecast. There is a large body of literature on the demand for money, and the subject will not be further considered here.[5]

The next section of this paper presents a framework for control of the money supply by a central bank operating in, or wishing to promote, a market economy and adopting a market-determined exchange rate. This is more or less the policy regime adopted by the Central Bank of Sudan (CBOS). For such a central bank, monetary control needs to be based on its control of the total of the quantity of currency held by the public and by banks, plus bank deposits with the central bank (base money), and its influence over the creation of deposits in banks in relation to their reserves.

The General Framework of Monetary Control

A common approach to the formulation of monetary policy is for the central bank to set an inflation target, estimate the economy's demand for money given the price level implied by the inflation target and the forecast for real GDP growth, and then manipulate the policy instruments at its disposal so as to create the amount of money these estimates suggest will be demanded. Because many different combinations of instrument settings will result in the same money supply, central banks generally attempt to use the combination that will minimize the cost to the financial sector and will maximize the stability of interest rates and exchange rates. For many central banks the determination of the desired increase in the money supply is likely to be made in the context of a stabilization program supported by the IMF.

[4] However, these very developments tend to reduce the currency/deposit ratio and thus increase the money multiplier. As a result, slower growth in base money is needed for a give rate of growth of broad money.

[5] See, for example, the classic article on this subject by Friedman (1969).

The Money Target

The CBOS can establish a money or base money target in the traditional way.[6] An inflation target is chosen, real income growth is forecasted (guessed)[7] and any factors that might influence the income elasticity of money demand (or velocity of circulation) are factored in. If inflation and interest rates are moderate and stable, a stable elasticity of one is a reasonable assumption (meaning the velocity, the inverse of k, would be constant).[8] The demand for base money can be stated as follows:

(1) $B^d \equiv kPq,$

Where

B ≡ Base money,
k ≡ income elasticity of demand for B (inverse of velocity),
P ≡ Price level, and
q ≡ real income.

Thus to a first approximation:

(2) $\Delta B^d/B = \Delta k/k + \Delta P/P + \Delta q/q$

This expression says that the rate of growth of base money demanded by the economy depends on the rates of growth of its demand, inflation and real income. Taking the target and forecasts used by CBoS for its policy in 2007, an inflation target of 8 percent, a forecast for the growth of real income over the year of 10 percent and a forecast for the rate of change in the demand for base money of 16 percent (slowing of velocity), produces a target growth rate for base money (which will be indicated by a superscript *) of 34 percent. This "target" is the rate of growth that will produce the desired inflation rate if the assumptions for q and k are correct.

Market equilibrium requires:

(3) $B^s = B^d$

When money supply does not equal money demand, market forces are set in motion that bring about equilibrium. If the exchange rate is fixed, equilibrium is achieved by adjustments in the money supply. If the money supply (or its growth rate) is fixed, equilibrium is achieved by adjustments in the price level (or inflation rate). More detailed and sophisticated models of inflation elaborate the transmission channels by which

[6] This is more or less the simplest model possible. As data and CBI experience improve, modestly elaborated models should be developed that include the real sector more explicitly (output gap), financial markets, the external sector and possibly the fiscal sector.

[7] It is appropriate and customary that the inflation target and real income forecast be agreed government wide for budget and other purposes.

[8] For the sake of simplicity, the following formulation is in terms of base money rather than M1 or M2. This assumes a stable multiplier relating B to an M. However, the multiplier is almost certain to increase over the next few years from improvements in the payment system, banks, and liquidity management capabilities.

these equilibrating adjustments are made. Such models provide more information on the pace with which monetary policy is transmitted to prices (lags in the effect of monetary policy on prices).

In reality, none of these assumptions or forecasts is likely to be correct, but the simple money demand, money supply framework provides a useful structure in which to discuss the factors that might cause the inflation outcome to be different than desired by policy or that might cause the policy settings needed for the inflation target to be different than initially thought. Central banks generally have a Monetary Policy Committee that is specifically responsible for monetary policy decisions.[9] Thus the framework can be a useful way to focus a discussion among members of the Monetary Policy Committee (MPC) and between them and staff on whether the current stance of policy is appropriate or not in light of the inflation objective.

The Money Supply

The framework of monetary control presented here builds on the link between the liquidity supplied by the central bank and the deposits and credit created by banks. In particular, it builds on the distinction between the initial creation of money balances--which is reflected in the balance sheet of the central bank (currency in circulation and bank current account or clearing deposits with the central bank)--and secondary money creation by the commercial banks in the form of deposits of the public. The distinction between the initial increase in base money and the secondary creation of broad money by commercial banks makes it useful to examine separately the balance sheets of the central bank and of the commercial banks.

Table 1. The Central Bank Balance Sheet

Assets	Liabilities
Gold and foreign currency **(FA)**	Currency
	Outside banks (C)
Claim on banks (CB)	Inside banks (VC)
Claims on Government	Deposits
Credits to Government (CG)	Banks current account (R_b)
Government securities (GS)	Banks term accounts (R_{bt})
	Government (R_g)
	Short-term Notes (SN)
Other Assets (OA)	Other Liabilities (OL)

[9] In the United States this committee, consisting of members of the Board of Governors and Federal Reserve Bank Presidents, is called the Federal Open Market Committee (FOMC).

For purposes of controlling the domestic monetary supply we are interested in those liabilities of the central bank that are a part of domestic money or are the basis of commercial banks "creating" the deposit part of domestic money or what is generally called high-powered money, or base money. Base money (B) comprises two elements: currency held outside banks (C), which is directly a part of the money supply, plus bank reserves (R), which include both cash held as assets by commercial banks (vault cash=VC) and current account or clearing deposits of the commercial banks with the central bank (R_b). Thus, base money is defined as:

(4) $B \equiv C + R,$

where $R \equiv R_b + VC$, and R_b is current account deposits of the commercial banks with CBOS.[10] This formulation is sometimes referred to as the "uses" of base money.

The initial creation of money balances, defined here as base money, helps finance the subsequent monetary expansion by the commercial banks. The secondary expansion of the money supply by the commercial banks is achieved through the "multiplication" of the initial amount of base money supplied to banks. The additional base money supplied to banks by the CBOS creates holdings of reserves by banks in excess of their requirements (of required and voluntarily held precautionary reserves) that are available to finance new loans. The new deposits of the public created along with new loans, when spent by the borrowers, are transferred to other commercial banks as new deposits. The part of these new deposits corresponding to excess reserves at these other banks can again be loaned out. The end result of this round-by-round process is that the amount of deposits created exceeds the original amount of resources placed with the commercial banks. The multiplication of bank deposits is limited by the amount of base money supplied by the central bank to the public (B), the amount of that base money deposited with banks (R), and the amount of such reserves banks wish to hold in relation to their deposits—which must be at least as much as needed to meet their minimum reserve requirements. These points are discussed in more detail in the following pages. These relationships and the banks' contribution to the public's money supply (i.e., D) are seen in the consolidated balance sheet of the commercial banks. This balance sheet is shown in Table 2.

Table 2. Consolidated Balance Sheet of the Banks

Assets	Liabilities
Foreign Assets (FA_b)	Deposits
	of non-bank public (D)
Loans (L)	of the Government (D_g)
	of other banks (D_b)
Securities (S)	of foreign currencies (D_f)

[10] In the subsequent discussions of the reserve requirement, it is argued that vault cash should be included along with current account deposits with the central bank in the reserves that can be used to satisfy the minimum reserve requirement.

Deposits	Credits
with other banks (D_b)	from the central bank (CB)
with CBOS ($R_b + R_{bt}$)	from abroad (C_f)
Currency (VC)	Other items net--including capital (OIN)

Several observations about Table 2 will deepen the understanding of this monetary framework. The most important observation is that only the deposits of the non-bank public (households, private enterprises, state enterprises) are included in the money supply (see the next paragraph for an explanation). As was done with the central bank's balance sheet, the banking sector's balance sheet can be "solved" for D so that the deposit component of the monetary supply is equal to all bank assets less other liabilities (other than D).

Net interbank deposits for all banks, which are not generally shown in the consolidated balance-sheet, are, of course, zero. The foreign assets less deposits of foreign currencies and any other liabilities in foreign currencies (for example, outstanding foreign debts) are the net foreign assets of the banking sector ($NFA_b = FA_b - D_f - C_f$). Loans and securities held by banks less deposits of the Government are the net domestic assets of the banking sector ($NDA_b = L + S - D_g$). This might also be broken into net domestic credit to the private sector plus net domestic credit to the Government. As a simplification, the text assumes that reserves that can be used to meet the reserve requirement consist of all deposits of banks with the central bank plus VC. With these observations in mind, and ignoring OIN, the following balance sheet identity can be written:

$$D + CB + D_g = NFA_b + L + S + Rb + R_{bt} + VC,$$

or

$$(5) \quad D = NFA_b + NDA_b + R_{bt} + R - CB$$

again where

$$R = R_b + VC$$

The definition of money used here (M) is very broad, encompassing all categories of the public's deposits with banks (D) and currency held outside banks (C) and is commonly referred to as broad money,

$$(6) \quad M \equiv C + D,$$

where D is the demand, savings, and time deposits of private enterprises, state enterprises and households. For both theoretical and empirical reasons, the money supply is generally defined as the currency and deposits of the non-bank public. Empirically, the definition of money that should be adopted for policy purposes is that monetary aggregate with the most stable demand in relation to real income, the price level, and interest rates.

In order to distinguish between the initial creation of money balances by the central bank and the secondary expansion of the money supply by the commercial banks, it is customary to represent the money supply as the product of base money and a variable that is called the "money multiplier,"

(7) $M \equiv m*B$

where m is the money multiplier. If there is a stable relationship between base money and the money supply, that is, if the money multiplier is constant or can be predicted, the money supply can be controlled by controlling base money. The first difference of equation (7) can be used to explain the changes in the money supply caused by changes in base money and the money multiplier. These changes can be approximated by the expression,

(8) $\Delta M = \Delta m*B_{-1} + m_{-1}\Delta B + \Delta m\Delta B,$

where Δ is the difference operator, i.e., $\Delta M \equiv M - M_{-1}$, and the indicator -1, as in M_{-1}, denotes the value of M in the previous period. The first term in equation (8) on the right hand side of the equation represents the contribution of changes in the money multiplier to the increase in the money supply, the second term represents the contribution of changes in base money, and the last term results from the interaction of these two factors.

The introduction of an assumption about the behavior of the multiplier converts the above identity into an equation that will be only as accurate as is the predicted behavior of m, i .e., ~~m~~, so that the predicted value of M is

(9) $M = ~~m~~B$

The behavior of ~~m~~ may be estimated econometrically on the basis of past behavior, which is not likely to be very reliable when changing from direct to indirect means of control (this is discussed in greater detail in the next section). It is more usual, however, to exploit knowledge of the structural factors embedded in the multiplier in order to refine estimates of its behavior. The structural components of m may be derived in a variety of ways. A straightforward approach is to substitute the definition of broad money from equation (6) and of base money from equation (4) into equation (7), which gives,

(10) $(C + D) = m*(C + R).$

Dividing both sides of equation (10) by D gives,

(11) $(C/D + 1) = m*(C/D + R/D)$, or

(12) $m = (c + l)/(c + r),$

where c is the ratio of currency outside banks to deposits held at banks by the public and r is the ratio of bank reserves to deposits. This formulation is interesting because it highlights the main factors that play a role in the money supply process. The money multiplier is described in equation (12) as being affected by two factors: the ratio of currency outside banks to deposits, which is assumed to depend predominantly on the

behavior of the public, and the ratio of bank reserves to deposits, which is a function of the behavior of the commercial banks and the central bank's minimum reserve requirement. Because r is less than 1, a decrease in c increases the multiplier as does a decrease in r. Finally, base money is created, and thus is controlled, by the monetary authorities. As indicated above, the strategy of monetary control based on this framework is to calculate what level of base money would be consistent with the target for monetary expansion under the financial program:

(13) $B = M^*/\text{~~m~~}$

where M* is the target level for broad money, and ~~m~~ is the central bank' s prediction of the multiplier. Armed with the resulting estimate of the base money target, and taking into account those factors affecting base money that are outside the central bank's control, the central bank can estimate the increase or decrease in the sources of base money that it does control that are required to hit the target. A strategy for controlling base money is developed in subsection D.

Managing the Money Multiplier

The above strategy assumes that the central bank can project the value of the multiplier with reasonable accuracy. The management of the money multiplier can be best understood by examining the factors that affect each of the determinants of the money multiplier. As may be seen in equation (12), the money multiplier is a function of the ratio of currency to deposits and of the ratio of bank reserves to deposits. An increase in the ratio of currency to deposits reduces the money multiplier, as it reduces the amount of base money in banks and thus curtails the opportunities for the banking system to engage in secondary money creation. Similarly, an increase in the ratio of bank reserves to deposits (r) means that some of the monetary creation potential of the banking system is being "sterilized." This again reduces the money multiplier.

The currency-to-deposits ratio reflects the public's preferences for one form of payment medium over the other, which will be influenced by the relative convenience and return (interest rate) from holding liquidity and making payments one way or the other. This choice, hence the C/D ratio, will depend primarily on the quality of bank deposit services (location of office, deposit interest rates, cost of funds transfers--i.e., non-cash payments--etc.) and seasonal factors and is little influenced by central bank monetary policy.[11] For the purpose of determining the appropriate setting of monetary policy instruments, the central bank's task is to estimate or forecast the likely behavior of the ratio, in order to take its impact on the multiplier into account.

The central bank enjoys considerable influence over the ratio of bank reserves to deposits. The nature of this influence is clarified by dividing bank reserves into that part banks are required by central bank regulations to hold (minimum reserve requirement, RR), and the rest, known as "excess reserves" (ER), or,

$R = RR + ER$.

Dividing both sides by D gives,

[11] Central bank policies more broadly may, however, influence the relative attractiveness of deposits (and non-cash means of payment) and hence the currency/deposit ratio.

$r \equiv rr + e,$

where rr is the ratio of RR to D and e is the ratio of ER to D. The money multiplier can, therefore, be written as,

(14) $m = (c + l)/(c + rr + e).$[12]

The minimum reserve requirement is fixed by the central bank, and hence rr is under the central bank's direct control.

The observed value of "e," can be a very useful indicator of the state of bank liquidity and thus of the central bank's impact on monetary growth. It summarizes the impact of all factors effecting base money whether within or outside the central bank's control. However, whether the observed value of "e" is high, and thus leading to increased growth in the money supply, or low, and thus leading to reduced growth in the money supply, depends on whether the observed value is above or below banks' demand for excess reserves. Thus evaluating the level of "e" requires estimating bank demand of excess reserves.

The ratio of excess reserves to deposits desired by banks reflects banks' preferences for liquidity and will be influenced by such things as the nature of the payment system, the exact nature of the reserve requirement (e.g., the use of the daily average reserve holdings versus the end-of-period level), the severity of the penalty for violating the requirement, the efficiency of financial and interbank money markets, and the interest rate on the best alternative to holding excess reserves that is forgone. An increase in lending interest rates, for example, that results from an increased demand for credit will make it more costly (in terms of opportunity cost) for banks to hold excess reserves. Thus an increase in a bank's lending rates will reduce its desired level of excess reserves. An increase in the interest rate the central bank charges on its advances will make such borrowing a more costly source of liquidity and will thus tend to increase banks' desired level of excess reserves (an alternative source of liquidity). Thus, an increase in the interest rate on advances from the central bank (relative to market rates) or a fall in market loan rates can be expected to increase the demand for excess reserves by banks, thus reducing the money multiplier.

There are thus a number of instruments that the central bank can use to influence the money multiplier. It determines rr, has some influence over e, and can generally estimate c with some degree of accuracy. Combining these, the central bank should be

[12] This relatively simple formulation assumes that the CBOS imposes a uniform reserve requirement on all deposits. A differentiated requirement would make the calculation and estimation of required reserves much more difficult. The ratio of each deposit type subject to a different reserve requirement to total deposits would need to be estimated, taking account of the possible effect of interest rates and other economic factors on shifts between deposit types. A uniform requirement, in addition to simplifying and improving monetary management, also is more efficient in the economic sense of not discriminating between types of deposits (bearing in mind that a reserve requirement that does not pay a market interest rate on the reserves held is a tax on the bank liabilities to which it applies). The above formulation abstracts from the complication introduced in the CBOS's reserve requirement regulation by allowing banks to satisfy with requirement with foreign currency deposits with the CBOS.

able to forecast the value of m with relative accuracy, but as mentioned above, this requires up-to-date information on the banking sector.

Controlling Base Money

Given the target for M and the forecast value of m, the central bank can derive the desired behavior of B. The factors that affect the behavior of base money can be analyzed by examining the balance sheet of CBOS (see Table 1 above). A very important assumption of this framework is that currency is freely provided on demand.[13] Thus the central bank is assumed to control the monetary base, i.e., the total of C + R, but not the mix, thus the amounts, of its individual components.

Data on base money and even more so on M2 is available only with a lag. Data on banks' excess reserves are generally available daily at the end of each day and data on interbank interest rates are generally available instantly and continuously throughout the day. Thus the strategy of monetary control outlined in the preceding paragraph can be usefully supplemented by monitoring and controlling the observed value of "e" relative to its estimated demand (the level desired by banks). Raising "e" above its desired level will reduce money market interest rates and increase money supply growth. Reducing "e" below its desired level will increase money market interest rates and slow monetary growth.

The items summarized in the central bank's balance sheet in Table 1 can be usefully set out in an equation with the "uses of B" on the left hand side and the "sources of B" on the right hand side. Netting Government deposits with both direct and indirect credit to the Government (NCG ≡ CG + GS - R_g), and Other Liabilities against its Other Assets (NOA ≡ OA - OL),[14] and equating CBOS's assets and liabilities gives,

(15) $B \equiv C + R \equiv NFA + CB + NCG - SN - R_{bt} + NOA$

Market-based instruments of monetary control are those policies or actions of the central bank that affect one or more of the right-hand terms in equation (15) as a way of influencing the value of the uses of base money (the right hand side, i.e., C + R). These instruments, and the effects they have on particular right-hand terms, are used, along with forecasts of the right-hand items the central bank does not control, in order to hit the base money target previously calculated. Each of these components of base money will be considered in turn, while the instruments by which they can be influenced or determined are discussed in section following.

Net Foreign Assets—NFA

The net foreign assets of the CBOS reflect its purchases of foreign exchange or conversion of foreign loans into its domestic currency. As Sudan has a market determined exchange rate and thus the CBOS has no obligation to buy or sell foreign

[13] Providing currency freely does not mean providing it free of charge. Currency should be provided by the central bank only in exchange for some other asset (e.g., reductions in reserve balances) one for one.

[14] These two items are shown separately in gross form in Table 1 because of the importance of each one for the control of base money.

exchange, changes in its net foreign assets (the difference between the foreign exchange it buys—FXP—and sells—FXS) should result from its desire to add to or reduce its foreign exchange reserves (or temporary interventions to smooth exchange rate fluctuations) and the effect that has on base money.[15]

(16) $\Delta NFA \equiv FXP - FXS$

If the CBOS buys foreign exchange, NFA is increased. If nothing else changes (i.e., if the initial increase in government deposits of Sudanese pounds are spent so that NCG remains unchanged) on the right hand side, base money will be increased by the amount of the purchase. The CBOS determines the amount it will increase by deciding the size of its foreign exchange sales.

Credit to banks—CB

The CBOS's advances to banks (the next term in equation 15) are a source of base money largely under the control of the central bank. CBOS lends a large amount to banks. It can influence the amount of credit provided under its standing credit facility by setting the interest rate charged and other conditions (e.g. collateral) for these loans. An increase in credit to banks will generally directly increase base money.

Net Credit to Government—NCG

The CBOS lends limited amounts directly to the government at the initiative of the government. It can also do so indirectly by buying government securities (GS) in the secondary market. Changes in the level of government deposits with the CBOS (R_g) also change NCG and base money by a like amount but in the opposite direction, and careful forecasts of these amounts should be prepared by the Government and communicated to CBOS. The amount of government securities held by the CBOS (GS) is under its direct control. Purchases of such securities from the public (including banks) by the CBOS will increase the amount of base money, while sales from its existing holdings will reduce B. In most developed economies, these so-called open market operations are the primary instrument by which central banks control base money. Thus Net Credit to the Government consists of components controlled by the government, which must be forecast, and components controlled by the CBOS.

$\Delta NCG \equiv \Delta GS + \Delta CG - \Delta R_g$.

Short-term Notes—SN

Because it does not generally hold government securities in its portfolio,[16] and because of excess liquidity in banks, the CBOS conducts open market operations in its own security (notes). Increases in these notes outstanding will reduce base money and visa verse.

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[15] The exchange rate is basically determined by domestic interest rates relative to international rates, inflationary expectations, oil production and prices, and competitiveness. Hence, in the long-run, the real exchange rate cannot be determined by intervention in the foreign exchange market by the central bank.

[16] Sudan has structural excess liquidity. The CBOS has created this situation by persistently buying more foreign exchange than is needed to support desired monetary growth.

Term deposits of banks R_{bt}

When banks deposit funds in the CBOS's term deposit facility, they are no longer available for lending and base money is reduced. The CBOS influences the amount of such deposits by the interest rate it offers for such deposits.

Net Other Assets—NOA

Other Assets less Other Liabilities, i.e., other assets (net), should be negligible, or at least changes in NOA should be negligible. The value and behavior of NOA should be determined from historical data and its behavior in the future closely monitored. If this behavior becomes a significant cause of changes in base money, the components of NOA should be identified and examined in order to understand the factors giving rise to their behavior.

Thus, the CBOS can control the growth in base money by forecasting the behavior of those sources of base money growth that it does not control (parts of NCG, and NOA) and setting accordingly the sources it does control (FXS, FXP, GS, SN). CB and R_{bt} fall a bit in between as CBOS controls them indirectly via the interest rates (and other conditions) it sets on standing facilities. They are meant to limit interest rate and liquidity fluctuations and not as instruments of base money control.

$$(17) \quad FXP - FXS + \Delta GS - \Delta SN + \Delta CB - \Delta R_{bt} \equiv \Delta B^* - \Delta CG + \Delta R_g - \Delta NOA$$

where ΔB^* is the base money target growth and ΔCG, ΔR_g, and ΔNOA are the projected values of those variables that CBOS does not directly control. Thus the CBOS controls the growth in base money by determining the size of its net foreign exchange sales, its net loans to banks (loans less term deposits), and of its sales of MOF bills it owns and its own notes (bills) plus the influences it exerts on the money multiplier outlined earlier. These constitute its instruments of monetary policy. These instruments are examined in greater detail in the next section.

Instruments of Control

The indirect instruments with which central banks control the money supply can be divided into statutory (or regulatory) ones, such as minimum reserve requirements (which are, in fact, rather direct) and those that are market based.[17] Market-based instruments may operate more slowly and uncertainly, but they are the most compatible with market allocation and efficiency. The ultimate aim of market-based instruments is the control of base money via control of the amounts of NFA, CB, SN, and NCG. How such control over NCG is achieved, for example, (whether through shifts of government deposits from the CBOS to commercial banks—R_g to D_g—and back again, or through purchases and sales of government securities) is of secondary importance. The importance of the particular manner in which the quantity of base money is controlled

[17] This terminology is taken from Lindgren, which provides an excellent discussion of the transition to market-based instruments of monetary control.

resides in the efficiency of the instrument and other secondary consequences of its use. These are discussed in this section.

Foreign exchange operations

The net purchase or sale of foreign currency by the central bank for domestic currency (the first two terms in equation 17) directly increases or decreases base money. This activity is a form of open-market operation and has the same effect on the monetary base as do open-market operations (OMO) in domestic securities, which are discussed below. With a floating exchange rate the central bank generally acquires foreign exchange as required by its foreign exchange reserves objectives and as a result of temporary intervention to smooth exchange rates leaving OMO in domestic securities to control base money.

Reserve requirements

Minimum reserve requirements (rr in equation 14) can have a very significant effect on the money multiplier. In addition, however, if the central bank does not pay market rates of interest on the required reserve balances it holds, they reduce the earnings banks receive on their assets. If they are not remunerated, required reserves constitute a tax on the deposit liabilities of banks to which they apply. These considerations suggest several general principles for the design and use of reserve requirements.[18] Reserve requirements should be low or pay interest at market rates; a heavy tax will discourage the development of the banking sector. Reserve requirements should be uniform; this is a canon of good (neutral) taxation and simplifies forecasting the multiplier, hence simplifying monetary control. Reserve requirements should be defined so as to be enforceable and to provide some flexibility to banks in the management of their reserves (e.g., they should be met by daily average, rather than absolute minimum, amounts). They should be satisfied by domestic currency vault cash and current account deposits with the central bank only (not FX). Reserve requirements should not be used actively. In general, as with most taxes, they should be set at a predictable and stable level.

Open-market operations—short-term notes

Open-market operations (OMOs)—the sale or purchase of securities by the central bank to withdraw or inject base money—have become a favored instrument of monetary policy not only in developed countries but increasingly also in developing countries. This preference includes the use of OMOs both for temporary adjustments to the monetary base or to offset changes in other sources of the monetary base and to provide for long-run growth in the monetary base.

Several reasons explain this preference. First, open-market operations are a very flexible instrument: in developed financial markets, the central bank can buy and sell securities for whatever amounts it wants. Second, in such markets, OMOs can be carried out continuously, even several times within a single day. Third, with OMOs it is the central bank that has the initiative, whereas in the case of lending to banks, for example, it is the financial institutions that decide whether and how much to borrow. Fourth, OMOs are voluntary transactions and do not have the taxation affect that reserve

[18] See Coats (1980)

requirements have. Open-market operations can be carried out in either primary markets (i.e., through new issues and redemptions) or in secondary markets (purchases and sales of pre-existing securities). Purchases and sales are generally by auction. In countries with secondary markets having many potential transactors, central banks generally prefer to operate in these markets. But operations in primary markets, though not quite as flexible, have the same sorts of effects, and are the dominant form in countries with less developed financial markets.[19]

Most commonly, OMOs are undertaken in government securities (the third term in equation 17) because of their homogeneity and negligible default risk. A central bank sale of government securities it owns will reduce base money. If the central bank does not own government securities and needs to absorb market liquidity (i.e., reduce B) it might ask the government to over issue securities beyond the Government's own borrowing needs in order provide the central bank with a portfolio of government securities. The funds raised by the government in such an operation would be impounded in a blocked account at the central bank. Since net new issues of government debt would be serving a dual purpose in this situation, the need for close coordination between monetary policy and public debt management is particularly important. Alternatively, when the central bank does not hold government securities OMOs are sometimes carried out using the central bank's own securities (the fourth item in equation 17). The issue and sale of a central bank note (an increase in a central bank liability) reduces base money. In addition, OMOs in secondary markets can also be undertaken in private sector securities, although the central bank needs to ensure that the paper involved is of good quality.

OMOs in government securities have the further advantage that they can help stimulate the development and growth of secondary markets in government debt. The existence of a money market is to some extent a precondition for the use of OMOs; the public (including banks) must be prepared to buy and sell government securities. But OMOs increase the demand for such transactions, familiarize market participants with their mechanics, and stimulate the development of lower-cost arrangements for conducting them.

The benefits of an efficient money market extend far beyond its contribution to the central bank's ability to use market-based instruments of monetary control. Financial resources, like an economy's other scarce resources, must be used efficiently if the economy is to function effectively and to yield the standard of living of which it is capable. In addition to directing the economy's savings to their most productive uses at the lowest possible cost, an efficient financial system minimizes the amount of savings that are needed for the smooth operation of the economy (i. e., working capital of banks, firms, house holds and government). Smoothing spending in the face of uneven revenues, and financing inventories at the least possible cost, requires the ability of a firm (e.g., a bank) to adjust its liquid asset holdings quickly, easily, at low cost, and with minimal risk. A well-functioning money market contributes to that ability.

[19] Sometimes, the term "OMO" is used to refer exclusively to operations in secondary markets. To distinguish them from operations in the secondary market, operations in the primary market are sometimes called "open-market type" operations.

Standing Facilities

Whereas Open Market Operations (OMO) are conducted at the initiative of the central bank, on a multilateral basis and at specific times, Standing Facilities (SF) are available at the initiative of the commercial banks, on a bilateral basis, and are normally available at any time.

"When…financial markets, and more broadly financial systems, are not well developed, central banks have to place greater reliance on standing facilities than on open market operations. In that regard, standing facilities can act as a safety valve in response to unexpected liquidity developments or to various obstacles or inefficiencies that prevent a smooth redistribution of reserves via the interbank market. The safety valve function is also important when the liquidity forecasting framework is weak…."[20]

The purpose of standing credit (the fifth term in equation 17) and deposit facilities (the sixth term in equation 17) is to provide assurance to banks that they can manage their excess liquidity within a modest range of interest rates that straddle prevailing market rates. The standing lending and deposit facilities will provide an interest rate spread between placing and receiving funds from the central bank overnight. To maximize this safety net function, the rate spread should be small. On the other hand, the spread should be wide enough to encourage banks to develop an interbank market and manage their liquidity with each other in the first instance, rather than always dealing with the central bank.

Standing credit and deposit facilities are meant for occasional rather than regular use. Excessive use of either is an indication of general excess or deficient liquidity in the economy, which should be removed with open market operations.

Management of government deposits

Base money can also be controlled by shifting government deposits back and forth between commercial banks and the central bank. This instrument has the advantage of being under the full control of the central bank (assuming that the MOF delegates to it the responsibility for the distribution of government deposits between itself and commercial banks). Government deposits can be shifted quickly and easily between the central bank and commercial banks, which makes this instrument quite flexible and useful for offsetting short-term swings in the amount of other sources of base money. To use this instrument, the government must determine the banks in which it will place or from which it will withdraw funds and the interest rates paid on them. A market-oriented approach to placing deposits with commercial banks is for the government to hold regular deposit auctions. As this deposit management instrument is an alternative to buying and selling securities (open market operations), its use has the disadvantage of discouraging the development of a secondary securities market, if one does not already exist.

[20] "Monetary Policy Implementation at Different Stages of Market Development" International Monetary Fund, Monetary and Financial Systems Department, October 26, 2004. See also: Bank for International Settlements, 1999, "Monetary Policy Operating Procedures in Emerging Market Economies", Policy Paper No. 5.

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