MONETARY POLICY OPERATING PROCEDURES IN EMERGING MARKET ECONOMIES

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Implementing monetary policy in emerging market economies: an overview of issues

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Introduction

This paper provides an overview of monetary policy operating proce-dures in emerging market economies.[1] Most of the discussion reflects the situation in mid-1998. The emphasis is on general principles although in practice country-specific factors condition actual procedures. Yet there has been a certain convergence in monetary policy instruments and procedures in recent years, not only in industrial countries but also in most emerging market economies. Major forces for change have been the rapid development and deepening of a variety of financial markets and instruments, the diversification of financial institutions and the globalisation of intermediation.[2]

As long as the financial sector was relatively closed and dominated by commercial banks, monetary control was exercised by the setting of only two parameters: reserve requirements against demand deposits at commercial banks and the discount rate on bank borrowing from the central bank. This is what is defined in the South African paper as the classical cash reserve system. Adjustments in either parameter would induce banks to change the terms of their loans and deposits, leading

[1] This overview draws heavily on central bank answers to a questionnaire and on policy papers prepared for a meeting of senior central bank officials on this topic, held at the BIS in early 1998.

[2] Extensive overviews of monetary policy operating procedures in industrial countries can be found in Borio, Claudio (1997): "The implementation of monetary policy in industrial coun-tries: a survey". *BIS Economic Papers*, No. 47; and Kneeshaw, John T. and Paul Van den Bergh (1989): "Changes in central bank operating procedures in the 1980s". *BIS Economic Papers,* No. 23. Both studies contain extensive further references to articles on monetary policy implementation.

to changes in the economy-wide stock of money and in turn aggregate spending. Even more rudimentary techniques based on quantity controls rather than on price signals proved effective as long as financial markets remained underdeveloped and insulated from foreign influences.

Once new financial markets developed and market integration progressed, bank intermediation became less dominant. Households placed part of their savings outside the banking sector, enterprises started tapping non-bank sources of funding and banks, too, had to gain a foothold in the new markets, on both the supply and the demand side. In this new environment, the setting of bank interest rates came to depend on conditions in financial markets. Moreover, aggregate spending became sensitive to more than just bank-determined interest rates. In order to control the new channels of financial transmission new procedures had to be developed, focused on influencing the behaviour of all market participants and price formation in a variety of short-term money and interbank markets.[3] As paraphrased in the Bank of Israel's paper, "It is not enough to clear the landscape, one also has to construct new modes of travelling through it".

Although the experiences and the choices made in individual countries vary widely, a number of common trends in the modernisation of operating procedures can be detected. First, the deepening of financial markets and the growth of non-bank intermediation have induced, if not forced, central banks to increase the market orientation of their instruments. In most cases (but with a few notable exceptions identified below), *a higher proportion of reserves is now supplied through operations in open markets,* with the use of standing facilities limited to providing marginal accommodation or serving as emergency finance. This, however, does not imply an erosion of the power of standing facilities in affecting liquidity conditions; indeed, it is often the marginal changes in bank liquidity which have the greatest impact on interest rates. Secondly, the increased importance and flexibility of the price mechanism in the new market environment have induced many central banks to *focus more on interest rates* rather than bank reserves in trying to influence liquidity. A third trend is that, reduced market segmentation, and thus the greater

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[3] The various channels through which monetary policy affects the economy in emerging market economies are discussed extensively in "The transmission of monetary policy in emerging market economies". *BIS Policy Papers,* No. 3.

ease and speed with which interest rate changes are transmitted across the entire spectrum of yields, has enabled central banks *to concentrate on the very short end of the yield curve* where, given payment and settlement arrangements, their actions tend to have the greatest impact. The move to real time gross settlement systems in several countries may increase the short-term focus of policy implementation even further. Fourthly, the greater market orientation of the central banks' instruments has been associated with a preference for *flexible instruments*. In the highly volatile financial environment marking several of the emerging market economies, flexibility in the design of the policy instruments may be particularly important. Much of this greater flexibility has come from the growing use of repurchase operations. Finally, awareness of the important role of market psychology and expectations has increased markedly. This has implications for the degree of *transparency* which central banks need to influence interest rates, their reliance on market information in formulating policies and their own tactics in *signalling* policy changes to the market.

The financial landscape

The financial landscape is one of the major factors shaping the choice of monetary policy procedures and instruments. For the central bank two important aspects of the financial environment are (a) the structure of financial markets and (b) the counterparties to central bank operations.

Structure of financial markets

Only in the most advanced economies does a fully developed structure of liquid markets offer the monetary authorities a choice of markets in which to operate and a guarantee that actions in one market will rapidly and predictably spread to other markets. In most other countries, the financial landscape is more rudimentary.

Which markets should be of greatest importance for monetary policy implementation? The *interbank market* has traditionally been key: a smooth functioning of this market reduces reliance on the central bank for settling interbank transactions. Moreover, active trading in this market by all banks will ensure a quick and even spreading of the

impact of policy-induced changes in liquidity. In the Hong Kong Special Administrative Region of China, for instance, improved efficiency of interbank payment flows enabled the Monetary Authority to abolish in late 1998 a deposit facility it had offered to commercial banks until then. A deep interbank market in foreign exchange in Singapore has been the backdrop to the active use of foreign exchange swaps as the primary monetary policy tool of the Monetary Authority.

By contrast, a highly segmented or fragmented interbank market can prevent greater reliance on market operations. Incomplete interbank development can be observed in several countries. In Colombia, the taxation of interbank transactions serves to fragment the market; in Israel, a regulation prohibiting interbank transactions in liquid assets had to be scrapped before the market could develop; in Korea, an uneven distribution of funds across the various institutions inhibits the development of transactions among them. In Russia, the interbank market is segmented with different layers of banks and interbank rates, sometimes on a regional basis; a breakdown in the payment and settlement system following the financial crisis of mid-August 1998 further exacerbated the inefficiency of the Russian interbank market and severely hampered the central bank's efforts to manage liquidity in the ensuing months of financial turbulence. In South Africa, access to accommodation and settlement accounts at the central bank used to be restricted to only a few banks, which hindered the development of a broad interbank market and constrained the central bank's operations in that market. In Peru, the high degree of dollarisation has meant that the local currency interbank market is very thin. Sometimes, the underdevelopment of the interbank market is partly the central bank's own doing. In particular, high reserve requirements on banks' liabilities, especially when they include interbank deposits, tend to inhibit interbank activity. Similarly, easy and cheap access to central bank standing facilities slows the growth of interbank liquidity management.

Monetary policy implementation is also greatly facilitated by the presence of one or more developed *markets for high-quality securities*. Often, these securities involve short-term paper issued by the central government (usually Treasury bills). Where stocks of such securities are limited – sometimes due to the absence of government deficits or, as in the case of Indonesia, the prohibition on domestic borrowing by the government – central banks have often issued their own paper. The

issuance of central bank paper is very important in Brazil, Chile, Colombia, Hong Kong, Indonesia, Korea, Peru, Poland and Thailand.[4]

High-quality securities markets can play two important roles in monetary policy implementation. First, the central bank can use these markets to conduct open market operations: while primary issuance serves to withdraw liquidity, secondary market operations enable the central bank to inject liquidity too. Secondly, high-quality securities can serve as collateral for rediscount operations or direct central bank lending. Conceptually (although not in legal terms since the underlying securities change ownership), securities perform a similar role in repurchase operations. The need for collateral for central bank lending operations is a very important motive for the Hong Kong Monetary Authority's programme of issuance of Exchange Fund bills and notes (another is the desire to establish a benchmark yield curve for private sector debt issues).

In most emerging market economies, a range of securities markets has developed, albeit to varying degrees of depth and liquidity. An important factor that has hindered the more extensive use of open market operations is the virtual absence of secondary market trading in a majority of countries. Many reasons can be cited for this illiquidity: a tendency to hold securities until maturity; the lack of a supporting institutional trading framework (brokers, dealers, discount houses, monitoring and information systems); insufficient standardisation of terms and conditions; and an immature settlement system for securities. Colombia, India, Indonesia, Korea, Peru, Poland, Saudi Arabia and Thailand identify one or more such problems in their domestic money markets.

Counterparties in central bank operations

The commercial banks are usually the counterparties to central bank operations. Two reasons may explain this. First, banks are the financial institutions which keep reserves in deposit accounts at the central bank. Secondly, banks are often the institutions directly regulated and super-

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[4] Although the Colombian central bank planned to phase out the use of central bank paper in 1998 (and to discontinue it altogether in 1999), the fear of driving up already high secondary market rates on government securities, should these be used in market operations, compelled it to continue relying heavily on its own paper in open market operations in the second half of 1998.

vised by the central bank. Where credit risk is involved in monetary policy operations, the central bank may be reluctant to transact with institutions it does not directly control.[5] Beyond these factors, there are very few general rules.

One distinguishing factor is sometimes the type of operation or instrument. Access to standing facilities is typically limited to commercial banks. Lead times in announcing the terms and conditions of the regular keynote operations or basic refinancing operations may allow a more diversified set of counterparties, including banks, non-banks and dealers, than is the case for fine-tuning on emergency operations. In Indonesia, there are different counterparties depending on the security auctioned. The new operational system in South Africa (introduced in March 1998) restricts participation in tenders of repurchase transactions to banks, while outright operations are conducted without counterparty restrictions. National characteristics, as well as the degree of maturity, of financial markets (e.g. use of dealers and/or brokers) may often play a role too (e.g. the exclusive use of discount houses in the keynote operations of the Bank of England). Sometimes, selecting only a limited number of counterparties is intentional, so as to promote an environment of more intense competition in which financial institutions strive to achieve the status of central bank counterparty. One further important aspect may be the signalling impact of operating directly with banks or indirectly via other financial intermediaries. For instance, preference may be given to executing interbank operations via brokers rather than with a limited number of individual banks if the central bank wants all banks to be aware that it is intervening in the market. Choosing the broadest range of counterparties for a particular operation may also be useful for ensuring the rapid signalling of the central bank's policy stance. The number of counterparties can also differ substantially from one country to another. Among industrial countries, for instance, a sharp contrast exists between Germany, where all institutions subject to reserve requirements can participate in regular auctions, and the United Kingdom and the United States, where the number of counterparties in the keynote operations is very restricted.

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[5] In some countries legal constraints are imposed on the type of institution with which the central bank can deal. In Israel, for instance, the central bank can only extend domestic currency loans to, receive deposits from or deal in foreign exchange with commercial banks.

Relying only on banks as regular counterparties raises a number of issues for central banks in emerging market economies where the banking sector is often dominated by a small number of banks. In particular, they need to guard against collusion (e.g. during auctions). One such safeguard, adopted by the Central Bank of Brazil, is to limit the maximum allotment per bidder. The Bank also looks at other indicators (e.g. the dispersion of bids, the demand-to-offer ratio) to detect non-competitive practices. In Thailand, the central bank can cancel a bid if there is evidence of non-competitive behaviour. In Korea, the central bank can suspend a bank displaying non-competitive behaviour or cancel its counterparty status.

A major challenge for the central bank is dealing with a banking sector that is vulnerable or operates in a volatile environment. For instance, in the wake of the increased credit risk of their counterparties in the call market, commercial banks in Korea became reluctant in late 1997 to deal with other financial institutions, greatly increasing the volatility of call rates. The central bank therefore decided to include these institutions in the range of participants in its liquidity-providing and absorbing auctions. The issue may be of particular relevance in countries in transition with a legacy of low deposit mobilisation, directed credit, monobanking and financial market underdevelopment. Weak corporate governance, the lack of publicly available information, rudimentary risk management skills, lax supervision and market failures imply a weak financial system in many countries. These features not only undermine the efficiency of policy implementation, but also expose the central bank to a variety of credit (because of the lack of sufficient high-quality collateral) and other risks (e.g. adverse selection in that only weaker banks resort to central bank finance). Because credit auctions have often been used to give banks their first exposure to market mechanisms, they need to be designed carefully to overcome the various shortcomings of the financial infrastructure and to promote the markets in which indirect policy implementation can take place in more efficient and less risky ways.

Strategies and tactics in monetary policy implementation

When considering how best to achieve the objectives of monetary policy, the central bank has to make a number of choices with respect to

Table 1

Institutional aspects of operational procedures

	Policy decision body	Frequency of meetings	Operation department competency
Hong Kong[1] . . .	Exchange Fund Advisory Committee	Monthly	..
India	Board of Directors	Weekly	Advisory capacity
Indonesia	Monetary Council[2] Board of Directors[2]	Bi-weekly Weekly	..
Korea	Monetary Board[2]	Half-monthly	Choice, timing, size of operations
Malaysia	Management Committee	Weekly	Choice of instruments, timing
Singapore	Senior Management and relevant Department Heads	Weekly	Choice of instruments, size and timing of operations
Thailand	Governor upon recommendation of Money Market Committee members	Twice a week	Some discretion with respect to choice and timing of operations
Brazil	Monetary Policy Committee	Monthly and ad hoc	Advisory capacity
Chile	Central Bank Council	Quarterly on a regular basis	Choice of instruments, timing and size of operations
Colombia	Board of Governors[2]	Weekly	Advisory capacity
Mexico	Board of Governors and relevant Department Heads	Daily	Maturity of operations
Peru	Central Bank Board	Weekly	None
Israel	Governor	Monthly	Extensive
Poland	Monetary Policy Council	Monthly	Advisory capacity
Russia	Board of Directors	Weekly	Limited discretion
Saudi Arabia . .	Senior Management	Regular	Advisory capacity
South Africa . .	Governors Committee	15 times per year and ad hoc	Broad direction and choice of instruments

[1] Hong Kong operates a rule-based currency board system. In consultation with the Exchange Fund Advisory Committee, the Financial Secretary exercises control over the use of the Exchange Fund which is deployed for the maintenance of the exchange value of the HK dollar and the stability of the financial system. [2] Including Government participation.

the strategy to be followed and the more specific tactics to be adopted in executing policy. The institutional setting may have a bearing on strategies and tactics. Some of the country details are given in Table 1. Significant differences appear to exist in the frequency with which the primary decision-making body meets. In general, where this frequency is high, the authority of the central bank department responsible for conducting monetary policy operations is more limited than where the policy decision body meets at longer intervals.

Whatever the institutional set-up, a number of strategic issues will need to be faced by the policy-makers, relating to: the selection of intermediate and operational objectives of monetary policy; the choice of key or target operating interest rate; and the degree of volatility of key interest rates to be allowed.

Intermediate targets

In many countries, financial liberalisation and development have eroded the once important role of explicit intermediate targets in monetary policy implementation. In the industrial world, most central banks have chosen either to make the exchange rate the dominant policy indicator or to have their policies guided by a sometimes wide range of indicators of development in the financial markets and the real economy. In recent years, several central banks have geared policy to an explicit forecast of inflation. Among the emerging market economies, Chile and, since 1999, Poland are examples of countries in which the central bank has shifted its focus towards formulating more explicit inflation targets. Very few central banks, with the major exceptions of the newly established European Central Bank and the Swiss National Bank, attach much importance to a broad money growth target in either deciding upon or explaining monetary policy.

In the emerging market economies, intermediate targets for specific monetary aggregates continue to be specified in several countries (see Table 2), suggesting that the shift away from explicit money targets has been somewhat less pronounced. Sometimes, money targets are seen as the most effective way of constraining government finances. Nevertheless, many countries using money targets do so only in an indicative way, supplementing them with other variables such as interest rates, exchange rates and expected inflation.

Table 2
Intermediate targets of monetary policy

	Main target(s)	Supporting indicators
Hong Kong . . .	Exchange rate[1]	
India	M3[1]	Interest rate; exchange rate; credit
Indonesia	M1, M2, credit[1]	Interest rates
Korea	M3[2]	M2; MCT (M2 + CDs + Money in Trust); interest rate; exchange rate
Malaysia	None	Money supply (M1, M2 and M3); exchange rate; credit
Singapore	Exchange rate target band	Interest rates
Thailand	Broad M2	Interest rates; M1; M2; credit
Brazil	Monetary base; amplified monetary base; M1; M4[1]	
Chile	None	Overall consistency of spending and output with target inflation and external balance
Colombia	Monetary base	Exchange rate; interest rate
Mexico	Monetary base[1]	Exchange rate; expected inflation
Peru	Monetary base	Interbank rate; exchange rate; balance required reserves
Israel	None	Inflation expectations; M1; budget deficit; current account; aggregate demand
Poland	Broad money[1,3]	
Russia	Exchange rate band	M2
Saudi Arabia . . .	Exchange rate[1]	Inflation and balance of payments
South Africa . . .	M3[1]	Private sector credit; interest rates; foreign exchange reserves; effective exchange rate

[1] The target is made public. [2] Adopted following the financial turmoil in late 1997. [3] Dropped in early 1999 when explicit inflation targeting was adopted.

Operating targets

The daily implementation of monetary policy is guided by operating targets. Unlike in industrial countries, where the choice of operating

target has almost universally been narrowed down to a short-term interest rate, Table 3 suggests that in the emerging market economies the shift towards interest rate targeting has not been as pronounced. In several countries, *bank reserves* or the somewhat broader concept of the *monetary base* continue to serve as the operational focus of monetary policy implementation. This may reflect a perception in these countries that bank reserves have a reliable and predictable influence on the broader monetary aggregates (i.e. that the money multiplier has remained stable or that the classical cash reserve system is still relevant). A second interpretation may be that price signals are less reliable than in more stable and well-developed financial systems. The Bank of Mexico argues that the rapidly shifting level of interest rates in an unstable inflation environment (or in the immediate aftermath of a financial crisis) provides a noisy and perhaps distorted echo of the stance of monetary policy. The central bank may then prefer to achieve a quantitative target rather than a price target. Often, too, disinflation episodes are supported by IMF programmes in which targets tend to be defined in terms of critical items of the central bank's balance sheet – partly because these elements are more directly under central bank control.[6]

However, many central banks have found that movements in the monetary base have been volatile and not always closely related to economic or broader monetary conditions. In addition, financial deregulation and liberalisation have enhanced the role of the interest rate in the monetary transmission mechanism. For these reasons, almost all of the central banks surveyed in Table 3 have chosen to assign to a short-term money market interest rate at least an important subsidiary role in their day-to-day policy implementation. Even in those countries subscribing to a monetary target, such as Russia and Peru, movements in interest rates are carefully considered in order to manage day-to-day liquidity. The most notable exception is Mexico where interest rates were not given an operational role in the policy framework put together in the wake of the peso crisis of late 1994/early 1995. The Bank of Mexico targets a particular level of the sum of the daily positive and negative (overdraft) settlement balances held by commercial banks at the central bank.

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[6] An example is the loan agreement between Thailand and the International Monetary Fund concluded in the wake of the country's 1997 financial crisis, which sets a ceiling on net domestic assets of the central bank, resulting in an upper limit to the size of the monetary base.

Table 3
Operating targets of monetary policy

	Main target(s)	Subsidiary objectives
Hong Kong . . .	Exchange rate	
India	Bank reserves	Bank rate; 3 to 14-day repo rates
Indonesia	Currency and bank reserves	Interbank rates
Korea	Bank reserves; Overnight call rate	Exchange rate
Malaysia	Three-month central bank intervention rate	
Singapore	Exchange rate	Interbank rate
Thailand	Monetary base	Interbank, overnight and one-month repo rates; exchange rate
Brazil	Overnight repo rate (SELIC-rate)	
Chile	One-day interest rate in real terms[1]	
Colombia	Overnight rate	
Mexico	Cumulative balance of bank reserves[1]	
Peru	Monetary base	Interbank rate; exchange rate; balance required reserves
Israel	Interest rate on short-term loans to and deposits of banks	
Poland	Short-term interest rate[1,2]	
Russia	Minimum target for net foreign assets; maximum target for net domestic assets of the central bank during the month and the exchange rate daily	Treasury bill yield; overnight interbank rate
Saudi Arabia . . .	Bank reserves and overnight repo rate	
South Africa . . .	Overnight Bank rate until March 1998; overnight repo rate thereafter	

[1] The target is made public. [2] Dropped in early 1999 when explicit inflation targeting was adopted.

Interest rates and the exchange rate are thus allowed to move freely according to market conditions. Up until late 1998, experience with this operating framework showed that even marginal changes in the

cumulative reserve target could bring about significant and rapid price adjustments in money and foreign exchange markets. Financial turmoil in late 1998, however, seemed to erode the signalling power of a "short" overall position imposed on the banking sector.[7] Unless there is evidence of speculative activity, the Bank of Mexico's tolerance for volatile overnight rates has generally been great.

Which interest rate as operating target?

Which money market interest rate should the central bank focus on as the main (or subsidiary) operating target? Often, the operating target is the overnight rate, which is mainly determined in the interbank market for settlement balances: this is the case in most industrial countries and in several of the emerging market economies included in Table 3 (e.g. Colombia, Hong Kong, Israel, Korea, Russia, Thailand and South Africa). The reason for this preference may be practical: the overnight rate is usually the rate which the central bank can control most easily. Being the monopolist supplier of bank reserves (settlement balances) and being able to affect the demand for them through a system of required reserves and/or by determining the terms of interbank clearing and settlement, the central bank can in theory control the overnight rate with a high degree of precision.[8] Indeed, its greatest influence is almost invariably exerted in the overnight market.

Yet central banks may be hesitant to focus policy exclusively on the overnight rate. First, the overnight rate can be prone to sudden changes that reflect technical adjustments (e.g. related to the details of the system of reserve requirements, seasonal factors, errors in projecting the autonomous sources of liquidity) which the central bank may not want to counteract. Central banks may be concerned that their tolerance of (very short-term) swings will be misinterpreted as changes in the stance of monetary policy. Secondly, the structure and characteristics of the financial system may be such that the overnight rate plays a relatively

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[7] In addition, in order to increase its ability to directly affect interest rates, the Bank of Mexico imposed mandatory (remunerated) deposits on the banking system in September 1998 (see the section on reserve requirements).

[8] Another interesting explanation of the growing operational significance of the interest rate is that growing central bank independence has made it possible to substitute the operational efficiency of targeting an interest rate for the politically expedient practice of choosing a quantitative monetary target.

modest role in the monetary policy transmission mechanism. In those cases where interest rate changes are not transmitted smoothly or predictably from the overnight market to the other segments of the money market, central bank control of the overnight rate may not have the desired effects over the entire yield spectrum.

Money market rates with longer than overnight maturities may be more relevant for the pricing of loans and deposits or as benchmarks for longer-term financing. If control of the overnight rate comes at the cost of greater volatility of rates at the more relevant maturities, overall monetary control could be compromised.[9] The experience of the United States and the United Kingdom illustrates this point. The Bank of England has adopted the short-term interest rates in the one to three-month maturity range as its operating target because commercial banks' base rates are linked closely to longer-term money market rates. By contrast, the (overnight) federal funds rate is the benchmark for the pricing of loans, making this rate the natural focus of monetary policy operations in the United States.

In the emerging market economies, similar contrasts can be observed and this may well have implications for the tactical choices made by individual central banks. In Brazil, Korea, Saudi Arabia and South Africa, the overnight rate serves as the benchmark for the short end of the yield curve, while in Israel the overnight rate on central bank loans (until 1996) and on deposits (since 1997) determines the prime rate charged by commercial banks which, in turn, is key to the pricing of domestic currency loans and deposits throughout the banking sector. In Hong Kong and Mexico, one to three-month rates are the main benchmark interest rates.[10]

Given that the ability to set objectives at more than one maturity is quite limited, central banks may select a short-term interest rate with a longer maturity than the overnight rate as their operating target (as in the United Kingdom). In India, for instance, the three to 14-day repo, seven day rate is considered an important (subsidiary) operating target. In South Africa, the seven-day repo rate was initially the focus of policy

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[9] While trying to influence rates at somewhat longer money market maturities, the central bank may rely on techniques such as averaging of required reserves and standing facilities to give greater stability to overnight rates (see below).

[10] However, the Hong Kong Monetary Authority has adopted the overnight US federal funds target rate as its operating target.

when the new operating system was introduced in early 1998; in the course of the year, however, the overnight repo rate was retained as the operating target. The choice of operating variable may also be related to the design of the central bank's instruments. If the central bank supplies most bank liquidity through operations of a specific maturity, it is likely to have a large and direct influence on rates at the corresponding maturities and may choose to adopt these rates as its operating objective.

Focusing on longer-term rates, however, has its costs. First, control will be significantly less than in the market for bank reserves, given that the central bank is not likely to exert a dominant influence on either the supply or the demand side. Secondly, the central bank may wish to leave price formation in these longer-term markets free because it wants to use the information from (freely determined) interest rates in these markets to monitor private sector views and expectations. Finally, concentrating on longer-term markets may greatly increase volatility of the overnight rate. For instance, where the need for end-of-day settlement balances is the binding variable in banks' demand for reserves, the attempt to meet operating objectives at longer than overnight maturities may imply accepting or encouraging potentially large movements in the overnight rate.

Volatility and interest rate corridors

How much volatility should the authorities allow for in the key operating rates underlying their policy strategy? Under normal circumstances, most central banks attach importance to a smooth trend in their key short-term interest rates and are willing to apply their instruments towards reducing volatility. First, as already argued, volatile interest rates can obscure the policy signals. Secondly, more orderly market conditions are often seen as promoting a more rapid and more predictable transmission of monetary policy. Thirdly, less volatile interest rate conditions may help financial institutions better assess and manage (and reduce their exposure to) interest rate and market risks. Finally, securities dealers who finance their activities by frequently borrowing in very short-term markets stand to benefit greatly from stable rates in these markets; in turn this may promote the development of the money markets in which the dealers operate.

At the same time, there are several reasons why few central banks advocate eliminating interest rate volatility altogether (even if they have had perfect control over the market rate). First, too strict control over interest rates may deter the development of money markets. The South African paper cites this reason for not including arrangements to constrain interest rates in its new operating system. Moreover, in deciding on its policy stance, the central bank may want to let short-term interest rates reflect the build-up of liquidity pressures. Too little volatility may cloud these market signals. Finally, in crisis situations, quick and sharp adjustments in interest rates may be necessary. The facilities or practices in place to restrain their movement may then delay the authorities' ability to respond to the crisis. Especially in countries with some degree of market segmentation, the monetary authorities have welcomed an overnight rate that can sharply and rapidly react to, for instance, exchange rate pressures. In effect, allowing the volatility in the overnight rate to absorb such temporary pressure could enable the authorities to preserve stability in more crucial money market rates.

In the market for bank reserves, the central bank could use a number of techniques to contain the volatility of interest rates: these will be discussed in greater detail in subsequent sections. One technique used in several countries is the averaging of reserve requirements over the maintenance period. Changes in liquidity of a more technical nature could then be absorbed by adjusting the balance in the banks' required reserve account at the central bank without giving rise to interest rate changes. Another technique is the use of standing facilities to define an interest rate corridor, bounding the fluctuation range for interest rates.[11] Typically, the ceiling of the corridor is a lombard-type credit facility, whereas the floor is a deposit facility with a low rate of return. If no such deposit facility exists, a subsidised lending facility (e.g. a discount window at below-market cost) could serve the same function (as it does, for instance, in Brazil and Germany prior to the launching of the euro): banks would have an incentive to pay back these loans if excess liquidity pushed market interest rates below the initial level of the discount rate. Of course, the central bank could fine-tune its market operations to smooth the movement of the overnight and other money market rates. Indeed,

[11] Because of the likelihood of major uncertainty at the start of monetary union in Europe in 1999, with potentially significant implications for interest rate volatility, the European Central Bank decided to introduce an interest rate corridor through the use of standing facilities.

in many countries the central bank tries to steer the overnight interest rate even when a formal interest rate corridor exists. Obviously, the analytical demands and the degree of precision of liquidity projections need to be much higher in cases of more active interest rate smoothing, especially in a volatile environment in which autonomous changes in liquidity can be large and sudden.

Brazil, Colombia and, until September 1998, Hong Kong have put in place formal interest rate corridors for limiting the fluctuations of the overnight rate.[12] Except for Colombia, where the corridor is established through the sale of central bank paper and repurchase operations in Treasury bills, formal standing facilities are used to define the corridor. In Hong Kong, the previous corridor system was binding at the end of the day when the banks could access the Monetary Authority's Liquidity Adjustment Facility (LAF). During the day the Facility was closed and interbank rates could move beyond the margins set by the LAF bid and offer rates. This arrangement offered the twin advantage of creating greater interest rate stability while still allowing the central bank to identify sources of liquidity pressure in the course of the day. A more informal corridor has been adopted by the Reserve Bank of India: a floor tends to be set to the overnight rate by the fixed tender rate on liquidity-absorbing repos, while the above-market Bank rate on the export refinance facility and the general refinance facility defines a ceiling. In principle, the Bank of Israel could enforce a corridor using its lending operations and deposit facilities.

Special characteristics of the facilities supporting the corridor can have implications for its effectiveness. In some countries the maturity of the loan or deposit facilities is different from that of the interest rate for which they are assumed to define a ceiling or floor. Access to the facilities is usually subject to some restrictions. In Hong Kong, the degree to which banks can obtain credits from the Monetary Authority depends on their holdings of Exchange Fund notes and bills. Moreover, a schedule of discount rates (related to the Base rate) is applicable for different percentage thresholds of holdings of Exchange Fund paper. Typically,

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[12] Modifications were made to the interest rate corridor systems in Brazil and Hong Kong in the second half of 1998. In Brazil, the cheaper credit facility was closed between early September and mid-December in the face of heavy capital outflows, thus forcing the commercial banks to seek funds from the more expensive credit window. In Hong Kong, the deposit facility was discontinued, while the credit facility and the interest rate charged on it were renamed the Discount Window and the Base rate.

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only a very limited amount of credit can be obtained (and thus repaid in conditions of excess liquidity and falling interest rates) in the case of subsidised lending facilities. Often, penalty rates are charged to frequent borrowers.

A related issue is the ideal size and frequency of interest rate adjustments. Very few central banks in the emerging market economies have adopted a formal position in this respect. In the interest of promoting orderly market conditions, several central banks express their preference for a policy of small, gradual changes at regular intervals (e.g. Brazil, India, Indonesia, Korea and Saudi Arabia). Fears of overshooting, and thus of having to backtrack and lose credibility, can also motivate the preference for changing the operational interest rate only by small amounts. Moreover, if the central bank is credible and transparent, changes tend to be infrequent as the market often moves in anticipation of a central bank initiative. However, it is worth bearing in mind that the central bank may not have much discretion in this area and that external market conditions (Poland) or the degree to which the inflation target is being reached (Israel) largely dictate the size and frequency of interest rate adjustments. Similarly, in those cases where tight exchange rate pegs are adopted, such as Argentina, Hong Kong and Singapore, the exigencies of the exchange rate regime mean that sudden jumps in interest rates may have to be accepted. Political factors can also play a role: in view of the high profile of the Bank rate in South Africa prior to March 1998, the Reserve Bank usually adjusted this rate only in large and infrequent steps.

Monetary policy and the public sector

Policies of the public sector and the monetary authorities may not be consistent. Potential general areas of conflict that could impinge on the operational efficiency of the central bank include the public airing by the Treasury or Ministry of Finance of views that are contrary to those held by the central bank, the imposition of exchange rate regimes that complicate monetary policy, and the stance of fiscal policy in general. There are, however, also a number of areas in which the relationship between the public sector and the central bank may lead to specific operational problems; those discussed here often arise as a result of state-owned

financial institutions, the central bank's role as banker of the public sector and public debt management.

State-owned financial institutions

In many countries, large *state-owned banks and/or a government-run postal system* continue to play an important role in the banking system. In some countries, local or regional banks have been established by powerful local governments. Often, too, financial institutions, such as development banks, have been set up with the objective of financing projects given high political priority. Such banks could complicate the implementation of monetary policy in two important respects. First, explicit or implicit deposit guarantees or bailout promises may make these institutions less responsive to interest rate adjustments or to the policy signalling of the central bank. The Saudi paper later in this volume notes that: "The presence of government-sponsored institutions which are under little pressure to maximise profits tends to diminish the responsiveness of loan and deposit rates to monetary policy." Moreover, their interest rates may be set by government agencies at levels that reflect political objectives but are incompatible with market conditions. (In addition, there is the more general problem that the presence of these institutions in the market could have implications for the soundness of the financial system and force the central bank to subordinate its monetary policy objectives to safeguarding or redressing the soundness of the financial system.) Monetary policy implementation may thus be constrained, be less predictable, or require the use of direct controls in the central bank's dealings with state-owned institutions.

A second impediment to efficient policy implementation is that these institutions may be prone to conditions of either excess liquidity or liquidity shortage. In some cases their main function is to collect the public sector's tax receipts or to manage the accounts on which salaries of public sector employees are paid. At particular periods they may consequently hold large amounts of liquidity. Moreover, state guarantees may attract many depositors to these institutions, further aggravating the problem. Other state-owned banks may have a tendency to overinvest in longer-term government paper, causing them to face a quasi-permanent state of low liquidity. The structural liquidity imbalances experienced by different types of state-owned financial institution are likely to

complicate the efficient distribution of bank liquidity in the interbank market and to cause sharp fluctuations in the overnight rate when the imbalances are particularly marked. The central bank may then be forced to continue relying heavily on standing facilities, even though it may prefer to manage liquidity through market-based procedures.

For most emerging market economies, problems with state financial agencies or state-controlled financial institutions do not seem to have arisen, or have been corrected in the past. Even though state ownership of financial institutions is still relatively substantial in several emerging market economies, their behaviour is considered to be broadly compatible with that of private commercial banks. Only in the cases of Poland and Russia do state savings banks appear to derive a privileged position from their extensive network of branches and from state guarantees, reducing the efficiency of monetary policy. In Saudi Arabia, too, specialised credit institutions can lend at government-influenced interest rates, although this practice does not appear to constrain the implementation of monetary policy. The same applies in India and Korea, where interest rates of the postal savings system are set by the government but often shadow the rates offered by commercial banks.

Public sector accounts at the central bank

The *banking relationship between the central bank and the public sector* can be an important component of bank liquidity changes. At periods of intensive revenue collections and disbursements, the transfer of public funds to and from the central bank could act to disturb the level of bank reserves. Even when no flow of funds between the central bank and the commercial banks accompanies public sector transactions, and overall bank liquidity thus remains unchanged, public sector operations could complicate liquidity management if they give rise to pronounced liquidity imbalances among commercial banks and in turn to frictions in the interbank market. Moreover, active financial management by the Treasury of its own funds using commercial financial institutions could interfere with the management of short-term interest rates by the central bank.

In general, however, how far deposits and withdrawals by the public sector complicate liquidity management depends on the extent to which these transactions take place through changes in the balances of the government accounts held at the central bank, as well as on their

predictability. Government access to credit from the central bank is a further complication. A summary of arrangements with respect to central bank deposits from and credit to the central government is provided in Table 4.

Although in all countries under consideration the government holds some deposits at the central bank, the extent to which the central bank acts as government banker varies widely. In Brazil, India, Israel, Korea, Poland, Russia and Saudi Arabia, (virtually) all central government trans-actions lead to changes in the deposit liabilities of the central bank; by contrast, in Hong Kong only the surplus on the Treasury's account, and in South Africa a small balance (given that the Reserve Bank does not pay a remuneration), are kept on the books of the central bank. Moreover, in a number of countries (e.g. Hong Kong, India, Malaysia, Mexico, Russia, Saudi Arabia and Thailand), special government bodies, state governments and/or public enterprises are allowed to maintain accounts at the central bank.

The quasi-universality of the central bank as banker for the govern-ment sector in emerging market economies (as well as in industrial countries – only in Austria and Sweden does the central bank not hold government deposits) is rather surprising given that government revenues and expenditures can display erratic and variable patterns and as a result can give rise to major problems in managing bank liquidity. The desire to delegate the portfolio management of the large financial resources under government control to a neutral, non-commercial entity is probably an important reason why the central bank tends to be chosen as the main banker of the central government.

To alleviate problems of liquidity management, some countries have taken steps to improve the predictability of swings in government depo-sits at the central bank through formal or practical arrangements. For instance, in Brazil, income tax receipts and disbursements via the central bank follow a pre-specified schedule; special, large transfers require prior notification. In Mexico, a one-day notice of transfers has to be given, while in Peru a committee including representatives of the central bank, the Treasury and the Banco de la Nación (the government's main banker) convene on a monthly basis to forecast government budget transactions; greater detail is provided in the weekly forecasts of the Banco de la Nación. In Malaysia, frequent meetings are held with the Treasury to discuss the cash flow needs of the Government and prior notice has to

Table 4

Relationship with the central government: lending, deposits and debt management

	Lending	Deposits				Debt management
		All	Only part	Special arrangements	Transfers at central bank discretion	
Hong Kong . . .				*		
India	*	*				*
Indonesia	(*)		*	*		
Korea	*	*				(*)
Malaysia	*		*		*	*
Singapore			*	*		*
Thailand	(*)		*			*
Brazil	(*)	*		*		
Chile				*		
Colombia	(*)		*	*		*
Mexico	*		*	*		
Peru			*	*		
Israel	*	*				
Poland		*				*
Russia		*				
Saudi Arabia . .	*	*				*
South Africa . .	*		*		*	

Notes: **Brazil:** Central bank is prohibited from buying newly-issued Federal debt but can renew its existing stock of Treasury bills and notes. **Colombia:** No credit has been granted since 1992 other than in exceptional circumstances at the central bank's discretion. The central bank administers public debt but does not decide on terms/timing. **Hong Kong:** Most government deposits are kept at commercial banks, but surplus funds can be deposited at and managed by the Monetary Authority. **India:** Advances for temporary mismatches. Overdrafts exceeding ten consecutive working days to be phased out as from April 1999. **Indonesia:** Possibility of credit to public enterprises for food price stabilisation and liquidity credits to banks for financing special government programmes. **Israel:** Bridging loans restricted in size relative to the budget, as well as loans for repaying long-term loans to the central bank. The Bank may finance government excess foreign exchange spending by buying government bonds. **Korea:** Central bank administers issue/redemption of government securities but timing and terms are decided by the Ministry of Finance and Economy. **Malaysia:** The Central Bank Act 1958 stipulates that any advances to the government should not exceed 12.5% of the budget revenue and must be paid no later than three months after the end of the financial year in which it is granted. The central bank determines the lending rate. The government has never used this facility. **Mexico:** Overdraft is limited to 1.5% of the budget; purchases of government paper only by placing bids at the primary auctions and for replacing maturing debt. Purchases from secondary market only through public auction; terms and timing of issue/redemption of government securities; administered by the central bank, are decided by the Ministry of Finance. **Poland:** Direct credit is to be disallowed in 1998. **Russia:** The central bank administers public debt but does not decide on terms/timing. **Saudi Arabia:** Lending for temporary cash requirements only. **South Africa:** Direct lending possibility has not been used in the last decade; some limited direct government purchases are possible. **Thailand:** Central bank can buy government securities to finance a budget deficit. These securities can be issued for an amount of up to 20% of the government's budget and 80% of repayment of principal.

be given in cases of large transfers. In Colombia, an agreement regulates the average government balance to be kept at the central bank. In Indonesia and Singapore, arrangements for the collection or transfer to the central bank of tax receipts are designed to smooth movements in the government's account. In Israel, a law specifying the pace of fiscal deficit reduction and a predictable seasonal pattern of government spending and revenues minimise the surprises in budget execution. In Korea, the introduction of a new government scheme in early 1997 involving the use of surplus funds held at the central bank for lending to financial institutions was associated with the creation of a mechanism for consultation with respect to the timing and the scale of these transfers. In Thailand, large deposits and withdrawals usually occur on a regular schedule.[13]

The experience of many industrial country central banks is that, notwithstanding attempts at coordination, swings in the government's financing position have frequently disrupted the central bank's management of liquidity. One solution is to prevent the government placing balances (or surplus balances that exceed projected levels) with the central bank or in the overnight market. Another solution is to penalise the government by paying a lower interest rate on excess balances.

At certain times, cooperation between the central bank and the Treasury with regard to the depositing of government funds could be a useful tool of monetary management. For instance, several Asian economies had to cope with large capital inflows before the recent crisis: as public finances showed significant surpluses, the depositing of government funds at the central bank helped to sterilise part of the rising stock of international reserves at the central bank.

Several central banks have the authority to shift at their own discretion the Treasury's deposits between their books and the commercial banks. This can be a very useful weapon of monetary management especially in those circumstances where the timing and expected short duration of disturbances in bank reserves make it difficult to offset them

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[13] In the United States, the Treasury tries to keep a steady working balance at the Federal Reserve, and to place additional funds in special accounts at commercial banks that have agreed to accept them. Various requirements apply to these special accounts, making banks at times reluctant to accept excess Treasury cash and thus creating volatility in the Treasury's working balances at the Federal Reserve.

through operations in securities markets. Moreover, transfers of government deposits can affect bank reserves and thus have a direct impact on short-term interest rates. This practice is very common in Canada; in the emerging market economies, the transfer of government deposits has been applied in Malaysia and South Africa. In South Africa, transfers are rather passive in the sense that they seek to neutralise the impact on bank liquidity of changes in the distribution of government funds between the central bank and the commercial banks. In Malaysia, by contrast, transfers of government deposits between the central bank and the commercial banks have been used as a more active instrument of monetary policy.

Government borrowing and the central bank

In many industrial countries, *direct central bank credit to the government* (e.g. central bank loans or central bank purchases of government debt) has been limited to avoid a potential loss of monetary control.[14] In the emerging market economies, lending to the central government (or even to local governments or public enterprises as in India, Indonesia and Mexico) continues to be more widespread. However, open-ended access to credit facilities at the central bank no longer exists: in all countries limits are imposed on the amount, maturity, purpose or frequency of recourse to central bank credit. Therefore, credit to the public sector in the major emerging market economies would not appear to be as important a constraint on monetary discipline as in the past. Moreover, as recourse to central bank credit diminishes, experience in industrial countries has shown that governments become more keen to manage the bulk of their liquidity outside the central bank. This limits the impact on bank liquidity of flows in and out of the Treasury's account at the central bank.

    Public debt management can also have implications for monetary policy implementation. The timing and size of public sector debt operations which are most advantageous from the perspective of the public sector may conflict with the central bank's strategies of bank liquidity management. The conflict could be most acute in countries with high

[14] In the United States, for instance, the Federal Reserve System is not allowed to participate in auctions of new Treasury issues and, in refunding operations, cannot subscribe for more than the amount of maturing securities it holds.

inflation and substantial government borrowing requirements, given that the high interest rate policy which the central bank would like to pursue is likely to lead to tensions between the latter and the Treasury, particularly when the maturity of government debt is rather short. Often, pressure is put on the central bank to stabilise yields at relatively low levels. Another problem can arise when the central bank is heavily relied upon to develop securities markets for government financing. The South African paper indicates that, in those cases where the central bank is also a market-maker in government debt, this function may be difficult to separate from its monetary policy-motivated operations. The problem in South Africa was resolved in 1998 by creating primary dealers.

To defuse potential conflicts in debt management, many countries have set up mechanisms of coordination and consultation between the central bank and the Treasury; less often, the management of public debt is fully delegated to the central bank. In Colombia, Korea, Mexico and Russia, the central bank administers the public sector's debt programme, although the main responsibility for deciding on the terms and timing of new issues rests with the Treasury. The central bank acts in an advisory capacity or participates in debt management committees in Brazil, Mexico, Poland, South Africa and Thailand. In India, Malaysia and Saudi Arabia, debt management is largely in the central bank's hands.

Autonomous factors of bank liquidity

The previous section described some of the difficulties that can arise if the central bank is the Treasury's main banker. Government transactions then directly affect the central bank's balance sheet, in turn necessitating offsetting measures to insulate bank reserves from undesired flows in and out of the Treasury's account. However, such government transactions are not the only items which can change the central bank's balance sheet and over which it has little control. Other exogenous factors that can cause such changes are net foreign assets, currency in circulation and special items, such as valuation changes. These sources of liquidity creation/withdrawal largely beyond the control of the central bank are often grouped under the heading "net autonomous position". By contrast, those balance sheet items that are closely under the central bank's control – mainly lending to banks and operations in open markets –

are usually classified as the "net policy position". Bank reserves are influenced by both the autonomous factors and the policy variables. This conceptual framework often underlies the forecasting exercises which many central banks conduct on a regular basis and with planning horizons ranging from one day to several months (Table 5). The length of the maintenance period for required reserves sometimes conditions in a major way the choice of a particular planning horizon.

For most of the early part of the 1990s many emerging market economies are likely to have experienced structural (i.e. autonomous) surpluses of bank liquidity. In the light of rapid international reserve growth, a very large autonomous source of liquidity inflows was net foreign assets. In currency board regimes, such as Argentina and Hong Kong, where a tight link exists between foreign exchange reserves and

Table 5
Liquidity forecasting features

	Planning horizons	Most unpredictable item
Hong Kong . . .	2 days (revised almost on a real-time basis)	Net foreign assets
India	2 weeks	Government
Indonesia	Weekly	Net foreign assets
Korea	15–16 days	Government and currency
Malaysia	1 day	Government and currency
Singapore	No formal forecasts	Government
Thailand	1 month and 1–2 days	Government
Brazil	1 month	Net foreign assets
Chile	1 month (daily revisions)	Net foreign assets
Colombia	1 week	Bank reserves
Mexico	1 day	-
Peru	1 month and 1 day	Government
Israel	1 month (daily revisions)	Net foreign assets
Poland	2 days, 2 weeks, 1 month	Government and net foreign assets
Russia	No formal forecasts	Government
Saudi Arabia . .	No formal forecasts (but short-dated liquidity is watched)	-
South Africa . .	1 to 6 months (regularly revised)	Government

domestic money creation, net foreign assets in principle are the prime determinant of bank liquidity. In industrial countries the importance of net foreign assets tended to be much more modest over this period, possibly reflecting the greater reliance on floating exchange rates in the major developed countries.

By contrast, net lending to the government is likely to have given rise to autonomous bank liquidity outflows in several countries. In Asia, fiscal surpluses in the first half of the 1990s tended to boost the positive balances in government accounts at the central bank. The Latin American case may have been one of significantly improving fiscal discipline in the 1990s, requiring less recourse to central bank financing.

Currency in circulation often has been an important factor absorbing bank liquidity. Especially in those economies recovering from a past history of high (Brazil, Peru) or suppressed (Poland, Russia) inflation, the public's readier acceptance of banknotes has made currency one of the more dominant exogenous causes of changing bank liquidity – a manifestation of remonetisation. As inflation stabilises and financial deepening proceeds, the impact of changes in currency holdings on liquidity growth is likely to decline (although the spread of automated teller machines has tended to increase the use of currency for trans- actions in some industrial countries). The impact of this factor indeed tends to be smaller in the most advanced emerging economies and in the industrial countries in general.[15]

Even though ex post particular exogenous components of the central bank's balance sheet may show on average a strong tendency to add to or subtract from bank liquidity, their behaviour ex ante may be very difficult to predict. (For this reason, the terms "structural" or "medium- term" trends should be used with caution.) Table 5 shows which balance- sheet components central banks consider most difficult to forecast. Often, government spending is identified as the hardest item to predict. Difficulties in forecasting the impact of government financial operations on the central bank's balance sheet frequently reflect the absence of reli- able arrangements to make the flow of government funds in and out of central bank accounts easier to predict (see the previous section), as well

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[15] Another autonomous factor affecting reserves could be «float», which is generated when cheques are processed more slowly (i.e. debited more slowly from the account of the banks on which the cheques are drawn) than the agreed schedule for crediting the reserve accounts of the bank presenting the cheques.

as the impact of the seasonal and random fluctuations in the government's cash position on the residual credit lines which the government has with the central bank in many countries. Net foreign assets also remain hard to predict in several countries. For instance, in Colombia special factors such as foreign exchange receipts from the privatisation of public utilities can at times make the forecasting of net foreign assets particularly uncertain.

Demand for central bank reserves

In practice, institutional rules governing the relationship between commercial banks and the central bank establish the demand for bank reserves and hence play an important role in the design of operating procedures. In some countries, payment system rules require that banks maintain settlement or working balances at the central bank that are adequate to clear their expected end-of-day obligations: the chosen size of these balances is in part dictated by the conditions under which banks can obtain central bank credit for this purpose. More often, however, banks are obliged to keep larger central bank reserve balances than they would hold for settlement or working purposes. These institutional characteristics allow the central bank to predict a baseline demand for reserves which, in combination with a forecast of the autonomous liquidity position, enables it to calibrate its operations aimed at supplying bank reserves.

Reserve requirements normally constitute the binding variable determining the marginal demand for central bank reserves for the majority of emerging market economies.[16] This is not surprising given the high reserve requirement ratios in place in many countries. However, three exceptions are noteworthy. Hong Kong has no statutory reserve requirements. In Mexico the average requirement is zero.[17] And in Russia, banks' use of their holdings of required reserves for settlement

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[16] At certain periods the binding constraint can become the need to hold settlement balances.

[17] As noted above, a mandatory deposit at the Bank of Mexico was imposed on commercial banks in early September 1998. The banking system was required to deposit 1.2 billion pesos each trading day until a total of 25 billion pesos was accumulated with the distribution per bank being a function of the individual banks' total liabilities at the end of June 1998.

purposes is limited in practice by the large amount of paperwork involved.

The demand for bank reserves tends to be rather interest inelastic, especially at the end of the reserve maintenance period when the demand curve may be completely vertical. Averaging provisions for required reserves, discussed in greater detail below, may allow some greater interest rate sensitivity of the banks' demand for reserves, especially during the early and middle part of the maintenance period. Nevertheless, the additional degree of interest sensitivity is in practice limited, in particular when required reserve holdings are only slightly higher than the typically basic level of precautionary clearing and settlement balances banks would want to hold in the absence of a system of reserve requirements. Moreover, individual banks may not want to accept very large deviations from their average reserve position for fear of not being able to adjust their position later in the maintenance period – this concern would tend to grow as the number of days remaining in the maintenance period becomes smaller – or for fear of having to do so at an interest rate which may turn against them, a concern which large banks that account for a large share of interbank activity may experience in particular. In practice, therefore, banks tend to pursue a smooth pace of reserve accumulation, largely independent of interest rate movements.

At times, the demand for reserves could also be unstable. When interest rate expectations shift rapidly, banks may want to maintain reserve positions which are quite different from those that result under circumstances of stable interest rate expectations. Similarly, where reserves are determined by the current level of bank liabilities (contemporaneous reserve accounting; see below), unexpected changes in the latter could cause sudden adjustments in reserve positions.

Both low interest rate elasticity and an unstable demand for reserves compel the monetary authorities to manage their reserve-supplying operations more actively. Errors in supplying the appropriate level of reserves then tend to trigger sharp interest rate movements.

Settlement balances

If procedures are in place allowing banks to continue transacting with each other once settlement positions can be determined with a fair degree of accuracy (e.g. pre-settlement rounds), if interbank markets

work smoothly and if central banks stand ready to offset unexpected, last-minute imbalances, banks would keep only minimal settlement balances at the central bank. However, these conditions are often not fulfilled, with some of the most commonly cited factors explaining the need for settlement balances including seasonal factors, errors of estimating the payment volumes and uncertainty surrounding government transactions.[18]

Appendix Table 1 contains the main institutional arrangements and settlement systems in place in the countries surveyed. Two points are worth mentioning. First, several countries already operate a real-time gross settlement (RTGS) system, or combine both RTGS (for large transactions) and discrete time net settlement (for smaller transactions). The move to RTGS systems in the industrial countries has spread more widely. An important issue to address when moving to an RTGS system is how to provide the intraday credit needed to make the system work smoothly. In Hong Kong, intraday credit is extended automatically, provided banks hold a sufficient stock of Exchange Fund paper as collateral. In Korea, banks can apply for a limited amount of collateralised half-day call loans. In Saudi Arabia and Singapore, intraday repos support the RTGS system. In Poland, part of the banks' required reserves can be used for settling on a gross and real time basis. The new RTGS system introduced in South Africa also relies on intraday financing through changes in the banks' required reserves. Secondly, in order to avoid the use of end-of-day facilities (very often at penal rates), central banks in some countries provide liquidity not only during the day but also during afternoon pre-settlement sessions. The instruments used to alleviate end-of-day imbalances and accommodate the marginal liquidity needs are shown in Appendix Table 1 and are described in greater detail in the section on standing facilities.

Reserve requirements

Most countries impose reserve requirements on demand, savings and time deposits. Such requirements often apply uniformly to all types of deposit, sometimes on the grounds that differential ratios can be

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[18] Other factors can be country-specific. For instance, in Russia, the deficiencies of the current settlement system may force banks to hold settlement balances in order to be able to react to frequent changes in the payment system.

circumvented by banks' shifting deposits from one category to another. In many cases, however, differential ratios are applied to serve particular objectives. For instance, some countries have higher ratios for short-term deposits so as to lengthen the maturity of deposits (Brazil, Colombia, Israel, Peru, Poland, Saudi Arabia and Thailand). Higher ratios are sometimes imposed on foreign currency deposits compared with domestic currency deposits in some countries (Peru and Thailand). Prudential and liquidity reasons often explain this differential. In Poland, however, the statutory ratio for foreign currency deposits is lower than that for domestic-currency-denominated deposits, although the intention is to unify the required rate for all types of deposit. Several countries apply marginal reserve requirements which apply to the *increase* in a balance-sheet item, not its level. Typically this is done to maximise the effect on bank behaviour while minimising the average cost to banks (see Appendix Table 2 for details). In the context of the widespread domestic use of dollars, the Central Bank of Peru, for instance, uses the marginal reserve requirement on banks' dollar deposits as a monetary instrument to prevent excessive expansion of credit, but it is not frequently changed.

Reserve requirements can serve at least four functions.[19] It is useful to contrast their use in emerging market economies, with that in the industrial world.

- They can help to stabilise the overnight interest rate in the face of changes in liquidity conditions that are sometimes purely technical in nature (the *buffer function*). This is the main role that the requirements play in industrialised countries. As explained below, there is conflicting evidence on whether this is also the case in emerging market countries.

- Since reserve requirements often represent the major determinant of the demand for central bank reserves, they can be adjusted to offset the supply of liquidity generated through autonomous factors (the *liquidity management function*). Few industrial countries use the reserve requirements for this purpose, while nearly half of the emerging market countries seem to do so.

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[19] In a number of countries, reserve requirements play a prudential role, acting as a kind of deposit insurance by protecting banks against illiquidity. Similarly, they can be used to manage international capital flows.

- They can be used actively (i.e. not just in response to liquidity developments) as a means of changing the stance of monetary policy *(monetary control function)*. This was the case years ago in only two industrialised countries, but remains the case in some developing countries. (Although the liquidity management and monetary control functions are conceptually distinct, particular policy actions typically contain hard-to-disentangle elements of both.)
- If non-remunerated, or remunerated at below-market rates, reserve requirements can be regarded as a source of revenue for the central bank *(seigniorage)*.

The functions that reserve requirements seem to fulfil in the countries under review are shown in Table 6 and the main features of the system in place in Table 7. In both tables the respective items for the average of industrialised countries are also presented (see Appendix Table 2 for more details).

From the perspective of the *interest rate buffer function* there are two features of the reserve requirement system that are similar in emerging market and industrialised economies. First, in all emerging market economies with reserve requirements except Russia, Saudi Arabia and Singapore, banks need to meet the reserve requirement only on average during the maintenance period.[20] Averaging is important for the interest rate buffer function because it permits banks to use part of their balances of required reserves to offset short-term or seasonal changes in liquidity conditions during the maintenance period. Higher required reserve balances tend to make the banks' demand for reserves more stable, as they would increase the day-to-day flexibility within the maintenance period (and reduce the need for often hard-to-forecast excess reserve balances). By contrast, low reserve requirements complicate reserve management by banks as they increase the risk of an overdraft, or the need to find funds in a thin market, resulting from an unexpected reserve outflow late in the day and make it more difficult to work off a large excess on a particular day over the course of the remainder of the maintenance period. However, several central banks limit the degree to which banks' daily reserve holdings can deviate from the average

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[20] Operating procedures changed in South Africa in March 1998, introducing the possibility of averaging of reserve requirements over the maintenance period.

Table 6

Functions of reserve requirements[1]

	Interest rate buffer	Liquidity manage-ment[2]	Monetary control	Seignorage income[3]
Indonesia		Yes	Yes	Yes
India		Yes	Yes	Yes
Korea	Yes	Yes		Yes
Malaysia	Yes	Yes		Yes
Singapore		Yes		Yes
Thailand			Yes	Yes
Brazil			Yes	Yes
Chile				Yes
Colombia		Yes		Yes
Mexico	Yes	Yes		
Peru		Yes	Yes	Yes
Israel				Yes
Poland	Yes			Yes
Russia		Yes		Yes
Saudi Arabia		Yes	Yes	Yes
South Africa	Yes[4]	Yes		Yes

Memorandum item:
Number of countries with reserve requirements citing this function

	8/11	3/11	0/11	10/11

[1] There are no reserve requirements in place in Hong Kong. [2] Defined here as a situation in which the requirement is adjusted to absorb the liquidity created by autonomous factors or to create or enlarge a liquidity shortage. [3] Defined here as a situation in which remuneration is considerably below market rates. [4] Since March 1998.

required level. These limits appear to be more common in the case of emerging market economies than in the industrial world (e.g. Brazil, Indonesia, Israel, Malaysia and Mexico). Secondly, the buffer function is more effective if the maintenance period lags the calculation period so that both the banks and the central bank know with precision the amount that must be held as reserve requirement. In cases of semi-lagged or simultaneous reserve accounting, errors in forecasting required reserves (and therefore the level of excess reserves) on the part of either the central bank or the commercial banks can sometimes lead to very sharp adjustments in the overnight rate. Carry-over provisions, allowing errors in one maintenance period to be offset in the subsequent

one, are used in industrial countries with semi-lagged or simultaneous reserve accounting (e.g. France and the United States).[21]

However, two other features could impair the interest rate buffer function in emerging market economies when compared with industrialised countries. The first concerns the maintenance period, which has to be long enough for banks to benefit from the averaging feature of the reserve requirement and effectively arbitrage over the period. For most industrial countries, the maintenance period is one month. As shown in Table 7, the maintenance period is shorter in many of the emerging market economies under review: only one week in Brazil and Indonesia, and two weeks in India, Korea, Malaysia, Singapore and Thailand. The second feature concerns the inclusion among reservable assets of items other than deposits at the central bank which can compromise the interest rate buffer function. The most common such asset is vault cash, which is included in required holdings in some of the countries permitting averaging.[22] There is greater use of vault cash in emerging market economies.[23]

The differences just described suggest that reserve requirements may play a more limited role as an interest rate buffer in the emerging market countries than in the industrial world. Indeed, the reserve requirement system appears to perform this function only in relatively few countries (India, Korea, Malaysia, Mexico, Poland and South Africa in its new system). Emerging market economies could be relying on other means to ensure the stability of the interest rate. In particular, the wide availability of standing facilities (see the next section) may be used to perform this function.

Central banks in emerging market countries tend to use reserve requirement variations to *offset autonomous influences* on bank liquidity more frequently than in industrialised countries. Furthermore, in some cases the management of reserve requirement ratios is also directed to *control monetary policy*. The phasing-out of direct controls on bank credit has often involved the imposition of high reserve requirements as a transitional measure to control liquidity.

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[21] In August 1998, the United States shifted to a lagged reserve accounting system.
[22] In Germany, vault cash was excluded in the requirement from 1995.
[23] One reason, noted by the South African Reserve Bank, is the central bank's desire to minimise the administrative costs of excessive daily shipments of vault cash between the banks and the central bank.

Table 7
Main features of reserve requirements[1]

Country	Range of ratios (%)	Aver- aging	Maintenance period		Frequency of changes since 1990
			Duration	Lag with respect to calculation period	
India	3–11	Yes	2 weeks	2 weeks	Frequently
Indonesia	3–5	Yes	1 week	2 weeks	Twice for Rupiah deposits; 3 times for FX deposits
Korea	1–5	Yes	2 weeks	7 days	4 times
Malaysia[2]	13½	Yes	2 weeks	1 month	8 times
Singapore	3	No	2 weeks	2 weeks	Once
Thailand	6	Yes	2 weeks	2 weeks	Once
Brazil	15–75	Yes	1 week	1 week	Very frequently
Chile	3.6–9	Yes	1 month	No	None
Colombia	5–21	Yes	14 days	2 days	Very frequently
Mexico		Yes	28 days	No	Infrequent
Peru	7	Yes	1 month	No	Once
Israel	0–6	Yes	1 month	No	
Poland	5–20	Yes	1 month	1 month	10 times
Russia	8–11	No	1 month	1 month	Very frequently
Saudi Arabia . .	2–7	No	1 month	2 weeks	None
South Africa . .	2	Yes	1 month	15 business days	5 times
Memorandum item:					
Industrial countries	*Most countries below 3%[3]*	*All except two[4]*	*Most countries one month*	*Most countries no less than 2 weeks*	*Infrequent*

[1] There are no reserve requirements in place in Hong Kong. In the case of Mexico, these features correspond to the zero-average reserve requirement. See Appendix Table 2 for other features.
[2] Situation as of the end-1997. In 1998, the statutory reserve requirement was reduced in stages to 4% at yearend. [3] Austria: 3–5; Italy: 15; United States: 3–10. [4] Australia and the United Kingdom.

There are substantial differences among the emerging market economies in the frequency of changes in reserve requirement ratios. Four countries, namely Brazil, Colombia, India and Russia, have very frequently adjusted their ratios, for the purposes both of offsetting autonomous liquidity developments and of controlling the growth of

broader monetary aggregates. The Reserve Bank of India changes reserve requirements frequently to moderate reserve money expansion, so that the supply of broad money can be kept under control.[24] The Central Bank of Brazil used high reserve requirements to contain the growth of credit during the implementation of the Real stabilisation plan launched in July 1994. In Colombia, reserve requirements were reduced in late 1998 to alleviate shortages of liquidity and remuneration was introduced. In Russia, the central bank regularly revises the compulsory reserve requirement ratios, taking into account the immediate objectives of monetary policy, in order to regulate the liquidity of the banking system and keep the money supply within preset parameters. Malaysia and Poland change their ratios rather less frequently. In the period 1989–96 Bank Negara raised the ratio eight times in order to absorb excess liquidity from the banking system.

In contrast, the ratios are changed only infrequently in Indonesia, Korea and Peru, mainly to accommodate "structural changes" in liquidity conditions of different sources. Bank Indonesia, for instance, changed the ratio of reserve requirements only during 1996 and 1997. It first increased the ratio from 2% to 3% in February 1996 and again to 5% in April 1997 to promote monetary stability and induce banks to operate more prudently. However, the reserve ratio of foreign currency liabilities was reduced from 5% to 3% in October 1997 as part of efforts to support the exchange rate. The Bank of Korea increased the ratios to absorb the excess liquidity generated by substantial current account surpluses during the late 1980s. More recently, the ratios were reduced in order to improve banks' profitability and to support their competitiveness in deposit-taking vis-à-vis non-bank financial institutions not subject to reserve requirements.

In Singapore, the reserve requirement was kept unchanged at a relatively high level between 1975 and the middle of 1998. This helped sterilise automatically part of the large inflows of foreign exchange in the late 1980s and the first half of the 1990s. Given that banks had much improved their liquidity management systems, the Monetary Authority of Singapore decided to halve reserve requirements to 3% of the liabilities base in July 1998. However, banks must have this minimum balance on

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[24] See, for instance, the discussion in the Indian paper of how the cash reserve ratio was used to neutralise the monetary impact of growing government deficits prior to 1992.

account at the end of each day of the maintenance period. Although the system of zero average reserve requirements was retained, a measure was taken in Mexico in August 1998 which in some respects was similar to an increase in required reserves. Commercial banks were required to make a special (remunerated) deposit at the Bank of Mexico, the maturity of which was not preset. The measure was aimed at tightening liquidity conditions and facilitating an increase in interest rates which under the existing arrangements had become more difficult to implement. As explained in greater detail in the Mexican paper later in this volume, a sizable accumulation of international reserves during 1996 and 1997 had moved the "structural position" of the Bank of Mexico vis-à-vis the money market from surplus to deficit. Under those conditions, the signalling mechanism used by the central bank had progressively lost power.

Whenever not remunerated at market interest rates, reserve requirements amount to a tax levied on banks.[25] This is an important source of income for central banks *(seigniorage)*, in both industrialised countries and emerging market economies in general, even in those countries in which at least some deposits are remunerated (India, Brazil, Peru and Poland).

While reserve requirements in emerging market countries play more diverse roles than in industrialised countries, there are clear signs of convergence to lower levels and less active reliance on them. The need to reduce the tax on bank (as opposed to non-bank) intermediation has been one important motive. In Israel, Korea, Singapore and South Africa, there has been a marked movement towards ratios that are both lower and less dispersed. The central banks of India and Russia have indicated an intention to move in this direction.[26] One major concern in this shift towards lower reserve requirements is its ability to trigger a spurt of credit growth. In Mexico, for instance, the replacement of reserve requirements by liquidity requirements and their subsequent lowering in the late 1980s and early 1990s is sometimes claimed to have played a role in precipitating the peso crisis in late 1994.

[25] For this reason, the newly established European Central Bank decided to remunerate banks' reserve holdings at a market rate.

[26] Reductions in reserve requirements in Colombia, Malaysia and Russia in late 1998 were not motivated by tax considerations, but were aimed at easing liquidity shortages. By contrast, the cash reserve ratio was raised in India in mid-1998 to resist exchange rate pressure and drain liquidity.

Yet perhaps the most important reason for the continuing use of reserve requirements to offset autonomous liquidity factors has been the large-scale inflows of short-term capital which many emerging market economies experienced in the years prior to the financial crises that have hit several economies since 1997. Among the many monetary policy instruments central banks used to cope with these flows, reserve requirements often played a prominent role because of the automaticity with which they sterilised a proportion of the inflows. This was the case in many Latin American countries, and also in Indonesia and Malaysia. However, the effectiveness of reserve requirements tended to decline over time as investors found other channels, not subject to reserve requirements, through which to conduct their transactions.

Supply of reserves: standing facilities

Central banks in most industrialised countries have in recent years come to rely more on discretionary market operations in managing liquidity, and less on standing facilities (Table 8). Driving forces behind this development have been the growing maturity and diversity of financial markets and the process of interest rate liberalisation. Movement away from standing facilities can also be discerned in most emerging market countries although the trend has not gone as far (see Table 9 for an overview of existing arrangements). Indeed, certain reforms in some countries have in recent years tended to enhance the role of standing facilities as a tool of liquidity management.

A first development of note in the area of standing facilities has been the movement away from facilities designed to support particular sectors. In India, central bank refinance facilities were sector-specific and thus played an important role in directing resources to desired sectors; this was reformed in April 1997 with the introduction of the General Refinance Facility.[27] With this reform, the Bank Rate (whose significance had been eroded by the proliferation of differential interest rates) reacquired its key role as a signalling instrument for monetary policy, becoming the reference rate for the entire financial system. In Korea, by

[27] There is also an export credit refinance facility under which banks are eligible for special export credit refinance. In addition, concessional refinance is provided for certain institutions such as development or cooperative banks.

Table 8
Use of central bank standing facilities

	Are standing facilities more important than open market operations?[1]	Greater use of standby facilities in emergencies?	Functions				
			Signalling central bank's policy intention	Limiting rise/fall in market rates	Basic financing	Emergency settlement	Marginal accommodation
Hong Kong . . .	Yes						✓
India	No	Yes	✓	✓	✓		
Indonesia	No	Yes				✓	
Korea	No	Yes			✓[2]		
Malaysia	No	Yes				✓	
Singapore	No					✓	
Thailand	No		✓				
Brazil	Yes	No	✓	✓			
Chile	No	No	✓				✓
Colombia	No	Yes			✓	✓	✓
Mexico	No					✓	✓
Peru			✓			✓	✓
Israel	No		✓				
Poland	No		✓	✓		✓	
Russia	Yes		✓		✓		✓
Saudi Arabia . .	No	No					
South Africa . .	No		✓	✓			✓

Notes: **Brazil:** Access to central bank credit from the TBC discount facility greatly widened (and conditions eased) in June 1996. At present, commercial banks kept short of bank reserves (via primary central bank debt auctions) thus forced to the discount window. **Hong Kong:** The Monetary Authority operates the Discount Window and allows banks unrestricted access to day-end liquidity assistance using Exchange Fund Bills and Notes as collateral. **India:** General refinance facility introduced in April 1997 with a move away from sector-specific refinancing. **Indonesia:** Standing facilities used to help banks with a liqudity problem; open market operations for achieving monetary target (base money). **Korea:** Not used to manage liquidity because rediscounts sector specific). However, in cases of serious financial market instability, limited additional liquidity can be supplied to individual financial institutions experiencing difficulties. **Malaysia:** Two types: rediscount and advances. Not used frequently. **Mexico:** Facilities used to operate the system of zero reserve requirements whereby overdrafts should be compensated with a deposit on a different day. **Peru:** In the context of a dollarised economy, liquidity in domestic currency is provided by net purchases of foreign currency. **Poland:** Banking system in general over-liquid. **Russia:** Refinancing rate is the most important central bank rate. **Saudi Arabia:** Repos have the attributes of both open market operations and standing facilities as they are used by banks at their own discretion. **Singapore:** No regular credit facilities exist, but shortfalls in the banks' Minimum Cash Balance are allowed. **South Africa:** New arrangements after March 1998 implied a movement away from the discount window to discretionary market operations. A marginal lending facility defines an upper limit to the overnight money market rate. **Thailand:** Discount (or loan) window is last resort facility for banks and finance companies.

[1] In managing short-term bank liquidity. [2] Discount system (viz. aggregate credits ceiling) is closely linked to the support of small and medium-sized enterprises.

contrast, because the rediscount system was designed to support small and medium enterprises at an interest rate well below market rates, the central bank has not been able to use standing facilities to adjust market liquidity and signal changes in the monetary authorities' stance. The policy move to place the interest rate into the centre of operations implied a more frequent use of open market operations in liquidity management.

A second significant evolution concerns the role of access to the discount window in supporting weak banks. In many countries, it is weak banks that have tended to rely most on central bank discount facilities.[28] Before 1996 in Brazil, for example, it was mainly those banks which could not get finance from the interbank market that resorted to the central bank's rediscount facility. Reforms in June 1996 eased the conditions of access to the discount facility (TBC), which effectively provides a floor to the interest rate corridor.

The use of standing facilities as a tool of monetary policy serves several functions. The first is to *signal the central bank's policy intentions*. In some cases, the standing facility will provide an interest rate which serves as a pivot for other interest rates. The refinance rates in India and Russia serve this function. In other cases, standing facilities effectively define an interest rate corridor, with a ceiling set by a credit facility and a floor determined by the rate at which the central bank borrows (or accepts deposits). In the special currency board case of Hong Kong, the Liquidity Adjustment Facility basically set a floor and a ceiling on overnight inter-bank rates prior to September 1998. The LAF bid and offer rates were set by the Hong Kong Monetary Authority with reference to the US federal funds target rate. Within this corridor, interest rates responded to pressure on the foreign exchange market.[29] In Brazil, the interest rate corridor is set each month by the Monetary Policy Committee; weekly central bank debt auctions are used to provide additional signalling to short-term interest rates. The Brazilian paper notes that the relatively

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[28] Even in the United States, discount window borrowing came to be seen as a sign of weakness after several episodes of bank financial stress between the mid-1980s and early 1990s: at present, banks are very reluctant to use the discount window, priced below-market, regardless of the market cost of funds.

[29] As noted in footnote 12, the LAF bid rate was removed in September 1998 and the LAF offer rate was renamed the Base rate. The latter is determined as the average of the five-day moving averages of overnight and one-month HIBORs, subject to a floor set by reference to the US federal funds target rate.

Table 9
An overview of standing facilities

	Market ceiling	Market floor	Below market	Notes
Hong Kong . . .	..	..	..	There is a two-tier Discount Rate structure: Basic Rate for up to 50% of banks' holdings of Exchange Fund paper; Basic Rate plus 5%, or overnight rate, whichever is larger, above that amount
India	Refinance rate	RBI repo rates	Concessional refinance for certain sectors	
Indonesia	Rediscount of domestic letters of credit		Discount facilities	Domestic letters of credit for exports
Korea	Temporary credits		Aggregate ceiling credits (= 5%)	Temporary credits at call rate of previous half-month plus 2%
Malaysia	Rediscount rate			
Brazil	Lombard rate (TBAN)		Discount rate (TBC)	
Chile	Liquidity credit line (three sections)	Deposit rate		
Colombia	Rediscount rate			
Mexico				Overdrafts that exceed the limit carry a penalty rate of twice the market rate
Peru	Rediscount rate (= 16%)			
Israel				Discount window loans at increasing interest rates according to a commercial bank's utilisation of these loans
Poland	Lombard (rediscount rate)			
Russia	Lombard, Repos Session 2	Rate on deposit facility		

inexpensive discount window may divert banks short of funds from the interbank market to the central bank: in normal circumstances, recourse to the TBC by the major commercial banks takes place almost every day and in large amounts. In September 1998, however, the central bank decided to discourage capital outflows by forcing the banks to borrow only from the more expensive TBAN window. Access to the TBC window was restored in mid-December (but subsequently closed again as the domestic currency came under renewed pressure in early 1999). The Israeli paper also touches on the link between standing facilities and interbank market development: reforms in the late 1980s changed the discount window mechanism (replacing unlimited access at a given interest rate with a "ladder of windows", each one carrying a higher interest rate) and encouraged an interbank market in liquid assets (with the central bank acting as a clearing agent).

In many cases, the width of interest rate corridors depends on the underlying situation. For example, pressure in several foreign exchange markets in recent months has led many central banks to accept greater day-to-day movement in overnight interbank interest rates. Hence the corridor has widened recently in several countries (Table 10).

The second major function of standing facilities is to *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. In order to preserve the special or exceptional feature of recourse to standing facilities, central banks have often incorporated several restrictions in the design of the facilities, which include (Table 11):

- limiting the volume of funds to be borrowed;
- limiting access to a certain number of consecutive days;
- setting the interest rate on the facility above market rates.

The safety valve function continues to be important in several countries where the primary emphasis is on market operations, largely because of the difficulty of forecasting the demand for bank reserves.

Supply of reserves: market-based operations

Reliance on market-based operations creates a need for forecasts of the liquidity which the central bank will have to provide in order to

Table 10

Spread between rates on central bank deposits and credit facilities

	General features	Response of spread to crisis situations
India	Spread between general refinance rate and rate on CRR balances is 500 b.p. at present	
Indonesia	Spread between SBI and SBPU rate tended to stabilise around 300 b.p. between 1993 and July 1997	Spread tends to narrow
Korea	Rediscount rate 5%: as deposits with the central bank non-remunerated, the spread has been 500 b.p.	Although the overnight rate rose in the recent crisis, the rediscount rate was held constant
Brazil	Spread between TBC and TBAN was 288 b.p. before October 1997	Crisis led central bank to double interest rates and the spread widened, reaching 500 b.p. by December 1997
Chile	Spreads between deposit rate and first and last sections of the liquidity credit lines are 250 and 330 b.p. respectively	Interest rates on all sections of liquidity credit line went up by 180 b.p. (in real terms). Floor rate remained constant
Colombia	Spread between deposits and credit facilities is 700 b.p.	
Mexico	Spread depends on market rates	
Israel	Interest rate on banks' excess reserves deposited with the central bank is about 120 b.p. below the monetary loans rate	Upward pressure on exchange rate in 1997: impact of central banks' deposits at an interest rate 30 b.p. above the monetary loans rate
Poland	Spread between lombard rate and intervention rate is about 4 to 5 percentage points	
Saudi Arabia . . .	Spread between official repo and reverse repo rate is 50 b.p.	

equilibrate the market for bank reserves. Such forecasts range between one day and two months in both industrial and emerging market economies (see Table 5 for information on the latter) and are often subject to significant revisions.

Table 11
Standing facilities: credit from the central bank

Country	Pricing				Uniform or discriminatory	Conditions for access
	Posted	Related to market rate by formula	Float-ing	At discre-tion		
Hong Kong . . .		✓			The HKMA reserves the right to charge a different Discount Rate to individual banks (e.g. banks believed to be facilitating market manipulation)	Exchange Fund Bills and Notes required as collateral. Pricing: see answer to Table 9
India	✓				Bank rate for 1st 4-week period; bank rate plus 100 b.p. for 2nd four-week period	Limited 0.25% of aggregate deposits. Must have gap of 2 weeks without borrowing after an 8-week bottowing spell
Indonesia		✓			Statutory reserve shortfall: 150% of average o/n JIBOR for 1st day and 400% for following days; for discount facility: 150% of average o/n JIBOR; for negative balance: 150% of average o/n JIBOR for 1st day and 500% for following days	Banks which are facing liquidity difficulties in their daily activities as a result of massive deposit with-drawals (due to a loss of public confidence in the banking system)
Korea		✓	✓		Uniform	Daily ceiling of 50% of required reser-ves; half-month ceiling of 100% of required reserves
Malaysia		✓		✓		Collater arequired. Maturity of 3 months; or 12 months with more special collateral

Table 11 (cont.)

Country	Pricing				Uniform or discriminatory	Conditions for access
	Posted	Related to market rate by formula	Float-ing	At discre-tion		
Singapore		✓	✓	✓	For shortfalls in Minimum Cash Balance (MCB): penal rate equiva-lent to highest o/n interbank rate transacted during the week, subject to a minimum of S$100 or such larger amounts as the Authority may determine for every day during which the MCB shortfall continues	
Thailand	✓				Uniform	Collateral of eligible securities (up to 90% of face value for a max. of seven days) required. Quotas based on deposit taking/borrowing from the public. Loan requests are closely scrutinised
Brazil			✓			Volume of central bank assistance close to amount of bank reserves held at the central bank (must have Federal securities as collateral)
Chile	✓				Liquidity credit line in three sections withincreasing rates	Limited to 12% of required reserves

Table 11 (cont.)

Country	Pricing				Uniform or discriminatory	Conditions for access
	Posted	Related to market rate by formula	Float-ing	At discre-tion		
Colombia		✓		✓		Access possible only under special circumstances
Mexico		✓	✓		Uniform	Limits according to each bank's capital or liabilities
Peru	✓				Uniform	Limit equivalent to the capital of the financial in-stitution; maximum maturity of 30 days; no institution can ask for rediscounts for more than 90 days in the last 360 days
Israel	✓					Collateral required
Poland	✓					Collateral required
Russia	✓					Lombard credit requires collateral and has no formal restrictions on access. The setting of the lombard rate is at the Bank's discretion
Saudi Arabia . .	✓*					
South Africa . .	✓					Collateral of offi-cial paper required. Interest rate at a premium over repo transactions

* Official repo rate is posted at SAMA's discretion and the market-related repo note is set with reference to the short-dated rates.

Market operations available to the central bank fall into five general categories:

- *Repurchase transactions against domestic currency assets*. In cash-flow terms they are equivalent to collateralised lending. Temporary purchases ("repos") inject liquidity, while temporary sales ("reverse repos") withdraw liquidity.
- *Foreign exchange swaps* are equivalent to the above but are against foreign currency. Liquidity can be injected by a spot purchase of foreign currency combined with an equivalent forward sale and can be withdrawn by a spot sale/forward purchase.
- *Outright transactions* in the secondary market.
- *Issue of short-term paper*. Primary market issuance of either central bank paper or government paper.
- *Interbank market transactions*, including taking deposits or making (possibly unsecured) loans.

Table 12 summarises the use made of these instruments by different central banks. The most widely used instrument is domestic currency repos, followed by foreign exchange swaps. The issuance of short-term paper and secondary market transactions are also significant. By contrast, direct interventions in the interbank market are relatively infrequent.

How central banks decide on the mix of instruments to use depends on many factors (cost of transactions, availability of market paper, flexibility of operation, nature of the operation (e.g. regular versus fine-tuning), the state of the public finances, etc.). One important general consideration may be that the need to send the market clear signals favours the use of one or two particularly visible instruments (which the market has learnt to monitor) even if greater flexibility might dictate a wider range of instruments. A second general point is that central banks use different instruments to address different situations.

In Mexico, for instance, repos are the main type of transaction (outright sales of government securities being somewhat less important). These transactions take place every day at noon, and serve the purpose of satisfying the forecast liquidity needs of the system. However, late-day adjustments (afternoon pre-settlement round) to offset forecast errors are made through central bank auctions of credits or deposits. Similarly, the Reserve Bank of India has widened the variety of instruments in response to liquidity conditions and the requirements of market

Table 12

Discretionary operations: an overview

	Reversed transactions			Outright transac-tions	Issue of short-term paper	Interbank market transac-tions
	Domestic currency assets		Foreign currency assets			
	Inject	With-draw				
Hong Kong[1] . . .						
India	*	*	*	*		
Indonesia	*	*	*2	*3	*	
Korea	*	*		*	*4	
Malaysia				*	*	*
Singapore	*	*	*	*	*	*
Thailand	*	*	*	*		
Brazil	*5	*5			+6	
Chile	*	*			*	
Colombia	*				*	
Mexico	*	*		*		
Peru	*	*	*		+7	
Israel	*8	*8	*		*	
Poland	*	*			*	
Russia	*			*		
Saudi Arabia . .	*	*	*			
South Africa[9] . .	+	+	*	*		

Note: + indicates main liquidity management operation with a signalling function.

[1] Given its currency board system, the Hong Kong Monetary Authority carries out money market operations only in exceptional circumstances. [2] Swap facilities for certain exporters. [3] Only buying securities. [4] Monetary Stabilisation Bonds. [5] Used only in unusual or emergency situations. [6] Weekly central bank debt auction. [7] Primary auction of Certificates of Deposit of the central bank. [8] Repo-like instruments. [9] Since March 1998.

participants. The Bank of Korea uses reversed transactions to meet temporary shortages or surpluses of bank reserves, while using outright transactions in government securities and early redemption of central bank paper (MSBs) to offset structural liquidity imbalances. Singapore with its deep foreign exchange and interbank markets frequently uses foreign-exchange-related instruments and regularly intervenes in the interbank market (Table 13).

Crisis situations, in particular, may demand different instruments. For example, in Indonesia repurchase agreements became more active when

Table 13
Market-based operations at the central bank's discretion

	Instruments	Markets	Operating procedures
India	Dated securities including zero coupon bonds and T-bills	Money, government securities and forex markets	Reversed transactions. Forex swaps and outright securities transactions
Indonesia	Bank Indonesia certificates (SBI) and money market securities (SBPU)	Open market operations	A corridor for daily SBI auctions is set; auctions for selling SBI and purchasing SBPU are organised
Korea	Government bonds and government-guaranteed securities, Monetary Stabilisation Bonds (MSBs)	Secondary markets in government securities	Outright transactions. Reversed transactions and primary issues of central bank paper
Malaysia	Government and central bank paper	Interbank market	Auctions
Singapore	Public sector paper	Open market operations (purchase and sale; SGS repos)	Weekly auctions of T-bills and auctions of government bonds according to a published annual calendar
Thailand	State enterprise bonds, Financial Institutions Development Fund Bonds, Bank of Thailand bonds	Repo market and foreign exchange market	Weekly auctions of Bank of Thailand bonds since 1995. Reversed transactions and forex swaps
Brazil	Central bank debt (and Treasury securities)	Primary market for central bank debt and for liquidity management	Daily auctions of primary debt
Chile	Central bank paper	Open market operations	Reversed and outright transactions. Primary issues of central bank paper
Colombia	Central bank paper*	Open market operations	Primary issues of central bank paper and repurchase agreements
Mexico	T-bills (CETES) of varying maturities; long-term government bonds (BONDES); also AJUSTABONDS and UDIBONOS	Open-market operations in CETES. Intervention in the money market takes place daily	Reversed transactions. Outright transactions in government securities. (Also auctions of credits and deposits)

Table 13 (cont.)

	Instruments	Markets	Operating procedures
Peru	Certificates of Deposit of the central bank (CDBCRP)	Open market operations	Primary auctions of CDs. Reversed transactions. (Forex intervention)
Israel	T-bills	Market for T-bills	Reversed transactions and transactions in T-bills. Forex swaps
Poland	T-bills		Only repo transactions are possible
Russia	Treasury bills	Secondary market in short-term government paper	Outright transactions in T-bills; forex operations. Reversed transactions
Saudi Arabia . . .	Treasury bills, FRNs and government bonds	Foreign exchange and debt markets	Repos; forex swaps; official deposit place-ments
South Africa . . .	Government and central bank paper	Money market	Daily tenders

* After 1999, operations will have to be done through operations using government paper in the secondary market.

the auctions of money market securities were suspended during the recent turmoil. In Brazil, the extent of the fallout of the East Asian and Russian crises compelled the central bank to conduct repo operations (which are rare under normal circumstances) to provide liquidity to the system.

Auction procedures

Market operations of all kinds involve some kind of auction. However, the modalities of auctions vary considerably. One dimension is whether the central bank fixes *volumes or prices*. The most liberal solution is for the central bank to auction a pre-announced volume of paper: in this system the interest rate is quite free. However, concern that such a procedure might yield excessive volatility of interest rates has discour-aged many central banks from pre-announcing volumes that they wish to transact. In contrast, a fixed price tender prevents the market from influ-encing the interest rate. In repurchase transactions many central banks

use fixed rate tenders. The German Bundesbank used to offer both, relying more in recent years on variable rate tenders (but switching to fixed rate tenders when it wanted to send a strong signal on interest rates). Fixed price tenders may limit the information the central bank can extract from the market (although the distribution of banks' bids could provide some information). In effective terms, however, this may not depart too far from the competitive ideal because tendering can be frequent and the central bank can adjust the rate from tender to tender in the light of the volume demanded. In recent years, the frequency of tenders has increased (with the average maturity declining), thus allowing market forces to exert greater influence. Least sensitive to market conditions are tap sales at fixed interest rates that can be maintained for prolonged periods of time. Here, the dividing line between market operations and standing facilities becomes very blurred. However, tap sales may be made available at an interest rate that is related to levels prevailing in a preceding auction. Finally, in some cases, non-competitive bids can be made, i.e. a certain volume is bid/offered at the weighted average yield (in the case of a multiple price auction) or at the uniform yield resulting from the bids or offers made by competitive bidders during the auction.

The second practical issue is the choice of *auction type*. A key distinction is between single or uniform price auctions (i.e. bidders pay a uniform price that exhausts the whole issue – the "Dutch" allocation method) and multiple or discriminatory price auctions (i.e. successful bidders pay their individual bid – the "American" procedure). One argument in favour of uniform price auctions is that the single price that emerges can provide a very clear and precise signal about money market conditions and central bank intentions – which multiple prices must inevitably blur.[30] In circumstances where a clear interest rate signal is not desired (e.g. when the central bank does not want to be seen as having an interest rate objective or when interest rates reflect very temporary imbalances in the interbank market), variable rate auctions may be preferred.

The choice between the two methods will also depend in practice on the assessment of the different possibilities for collusion under the

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[30] One way to increase the information content of multiple prices is to derive a reference rate, calculated as the weighted average of the bids and offers accepted in tenders. Several central banks follow this practice in determining their official tender rate.

various systems. Some have argued that multiple price auctions provide greater incentives to collude – by pooling bids, bidders can reduce the risk of overbidding. Others have argued that collusion can be more easily enforced in a uniform price auction. It is perhaps for this reason that most Treasury bill auctions are of the discriminatory type. Another concern has been the so-called "winner's curse": as winners at a multiple price auction have to pay their own bid, they may try to minimise the chances of over-assessing the security's resale value by lowering their bids. The average price reached at a multiple price auction may then be less than the single low price that results from a single price auction.

The present practices of central banks are summarised in Table 14. Several central banks use a variety of auctioning techniques. The South African paper notes that, in the new operating environment adopted in March 1998, the Reserve Bank planned to conduct variable rate auctions, using fixed rate auctions only when clear market signals were required. Financial turmoil shortly after the new system was introduced, however, upset these plans. In late May, the central bank fixed the repo rate, rather than have it determined by market forces. New pressure on the rand in June 1998 compelled the central bank to rely again on variable rate tenders. The Bank of Mexico deliberately avoids giving interest rate signals, and uses auctions only to offset autonomous influences on liquidity. Noteworthy, too, is the Korean case. Repos to absorb liquidity use the Dutch method, in which the highest interest rate tendered is uniformly applied to all successful bidders, whereas those injecting liquidity are auctioned at multiple prices.[31] An important recent change in the industrial world was the change in the Bundesbank's variable rate tender from discriminatory to uniform price auction.

Repurchase transactions

Repurchase transactions have become the main policy instrument in many countries because of their great flexibility. Compared with outright open market operations they do not require a liquid underlying market for securities, they only have an indirect impact on the prices of the underlying securities, and no link needs to exist between the maturity of the underlying securities and that of the repurchase transaction.

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[31] A change in this practice was under consideration in early 1999.

Table 14
Auction procedures

	Fixed rate (F) and/or variable rate (V)	Single (S) or multiple (M) prices	Secret (S) or open (O)	Notes
Hong Kong . . .	*	M	O	Yields of Exchange Fund papers provide a benchmark for the pricing of private sector debt issues
India	F, V	S, M	S	The cut-off rate on 91/364-day T-bills is emerging as benchmark rate for floating rate instruments
Indonesia	F, V	M	O	Announcement of quantity, maturity and interest rate. Result of auction has direct impact on the interbank money market rate
Korea	F, V	S, M	O	Auction results including total amount of successful bids and the average interest note are announced publicly
Malaysia	F, V			
Singapore	F	S, M		SGS auction results include total amount applied, average yield in allotment, cut-off yield and price, and percentage of applications at cut-off allotted; results are published on same day
Thailand	V			Auction results include total amount of bid, average yield and high/low accepted yields; benchmark for short-term paper

Table 14 (cont.)

	Fixed rate (F) and/or variable rate (V)	Single (S) or multiple (M) prices	Secret (S) or open (O)	Notes
Brazil	V	M		Maximum and medium interest rates and total demand are disclosed
Chile	F, V	S, M		Single (multiple) price to sell paper (to lend money). Information disclosed: amount demanded and allocated (offered) and highest cut and average rates
Mexico	V	M	O	During auctions bidders receive information about amount allotted to them and the interest rate at which the last amount was allocated to any bidder
Peru	V	M	S	The day after the auction, information in global terms (i.e. total amount received, amount accepted) is available for the participants of the auction
Israel	V (F planned)	M	S	Results are published immediately. Results influence short-term interest rates for borrowers and depositors
Poland	F, V	S, M	S	
Russia	F, V	S, M		Refers to operations in the Treasury bill market
Saudi Arabia . . .	F, V			Securities are offered to the market at predetermined maturities and prices

Table 14 (cont.)

	Fixed rate (F) and/or variable rate (V)	Single (S) or multiple (M) prices	Secret (S) or open (O)	Notes
South Africa . . .	V	M		The results published include amount allotted, amount of offers received, highest price bid, the price at which bids were fully allocated, the lowest price, the average price and the average rate

* Fixed coupon rate for Exchange Fund Notes. Exchange Fund Bills are issued at discount.

Moreover, repos are cost-effective, as a temporary reserve adjustment can be accomplished with a single operation, rather than with two outright operations.[32] Owing to their flexibility, standing facilities are often organised on the basis of repurchase. Another advantage some see in repos is that they are based on the standardisation of the underlying contract by the markets. Generally, the underlying assets are domestic fixed rate instruments, usually government or quasi-government paper (although other domestic paper could be used).

The only major exception among the major industrialised economies to the growing importance of repos as the primary tool for adjusting the marginal supply of liquidity is the Bank of Canada, which brings about daily liquidity adjustments by transferring government deposits between its balance sheet and that of clearing banks. In the United Kingdom, outright purchases of eligible bills are still very important.

Most emerging market economies have given repos a major role in the day-to-day management of bank reserves. This practice, however, is still rather new (beginning in many countries only after 1992) and further development continues. A very active market in repos and reverse repos

[32] In some cases, multi-day repos may allow for withdrawal from the contract before the maturity date, further enhancing the flexibility of the instrument (albeit complicating the reserve forecasting exercise).

has developed in India, Korea, Mexico and Thailand; they are also regularly used in Indonesia, Poland and Saudi Arabia. Repurchase transactions have become the main instrument to regulate liquidity in South Africa's new system. In Israel, the auction rate on repo-like instruments has become the key short-term interest rate in the economy. Repos were introduced in Russia in October 1996. Peru only started to use one-day repos in September 1997 as there had been no eligible collateral paper, but wider use is expected in the near future as a government securities market develops.

However, not all countries have chosen to make repos a major instrument of liquidity management. In Brazil, repos are not used under normal circumstances, the authorities relying instead on standing facilities. Repos have been used in recent instances only in "unusual or emergency situations". The Brazilian paper mentions two such cases. In one case, the sale of a major commercial bank in early 1997 involved a substantial inflow of foreign exchange which was sterilised by a repo operation. In the second case, as mentioned before, repos served to deal with the impact on the Brazilian stock and money markets of the East Asian and Russian crises. In Malaysia, there was an explicit move away from repos back to daily money market tenders, essentially because of a lack of suitable paper.

As noted above, the *underlying eligible assets* are mainly government fixed income securities. Each country usually defines in non-ambiguous terms which paper qualifies as collateral. Government securities are used as collateral in India, Poland, Russia and Thailand. In South Africa, the underlying eligible assets consist of central government bonds, Land Bank bills and Reserve Bank bills. The Bank of Korea permits not only government bonds, but also government-guaranteed securities and, with effect from May 1998, its own debentures (MSBs) to be used in repos. In Saudi Arabia, a limited amount of banks' holdings of government development bonds and floating rate notes can be used in addition to Treasury bills for repo operations. India has recently decided that a number of public sector bonds and private corporate debt securities may be allowed under certain conditions in order to develop the secondary markets in these securities. In Israel, the underlying collateral for its repo-like instruments are the bank deposits held with the central bank. More recently, government bonds were also accepted as collateral. In Peru, the central bank's own paper serves as collateral.

One recurrent problem seems to be the lack of eligible underlying paper on the market (e.g. Peru until recently, Indonesia, Malaysia and Thailand) or the depletion of the stock of eligible collateral paper (Israel, Mexico, Poland). As this situation is usually associated with thin or narrow markets in government securities, some central banks have responded by widening the range of eligible paper (Israel, Poland). In Mexico, the central bank began to use credits guaranteed by the government, commercial bank and development bank securities as collateral.

A wide range of *counterparties* can be used in repo operations. In Mexico and Poland, only banks normally transact with the central bank, whereas in India and Poland primary dealers are used. In Korea, banks, merchant banks, investment and trust companies, and securities companies are accepted as counterparties. While level-playing-field considerations would tend to favour many counterparties, efficiency considerations may call more for a system of primary dealers.

Maturities of repos also vary widely, extending up to 91 days in Korea. However, in most countries the maturity is substantially shorter (less than one week in India, Israel and Russia; two to four weeks in Mexico and Poland). The more complete maturity profile at the short end would seem to reflect the adaptability of the repo instrument to the requirements of managing short-term liquidity.

Finally, repos are often valued because of their efficacy in *signalling* the intentions of the central bank to the market in a transparent way. For instance, in the unsettled exchange rate environment following the mid-1997 financial crisis, the Bank of Thailand kept the repo rate firmly at over 20%: this was meant to clearly communicate to the market the Bank's desire to stabilise the currency. Signals may also be given by changing the underlying conditions of the repos, for example by allowing new participants, adding or withdrawing the underlying collateral assets or changing the auction procedures.

Foreign exchange swaps

When domestic securities markets are not deep but the foreign exchange market is very liquid, central banks may want to engage in foreign exchange swaps for liquidity management purposes. In this way, they gain the efficiency and flexibility of the repo instrument without exerting direct influence on the spot exchange rate to which outright

foreign exchange operations would give rise. The desire to develop a deeper and better functioning foreign exchange market may also be an important reason for active central bank involvement in the foreign exchange swap market.

Despite the similarity with regular repos, a number of important risks may be involved in the use of foreign exchange swaps in liquidity management. First, the value of the underlying asset – foreign exchange – may be prone to sudden valuation changes. When the domestic currency is under pressure and reserves are low, the temptation to use foreign exchange swaps to acquire spot foreign exchange for intervention to support the currency may be great: if this line of defence fails, however, the central bank will incur sizable losses with the unwinding of the forward leg of the foreign exchange swap. Secondly, in many emerging market countries, forward markets are not deep enough to generate market prices for foreign exchange swaps. The central bank may then be forced to determine the swap rate itself. Not only would this have important announcement effects (and influence the spot exchange rate), but it could also expose the central bank to losses. Finally, the central bank might have a very narrow choice of counterparties in the swap operation as only a limited number of large banks might be active in the foreign exchange markets.

Although swaps are used by many countries (including India, Israel, Malaysia, Saudi Arabia and Thailand), they are used regularly only by a few countries. In Singapore, the bulk of liquidity management is done through foreign exchange swaps, much in line with the practice followed in Switzerland, where budget surpluses (or small deficits) and the tendency of banks to hold public sector securities in their portfolio until maturity have constrained the development of other open market operations.

In most countries, however, swaps are used only occasionally and only under special circumstances. Foreign exchange swaps used to be an important instrument in Thailand. More recently, however, the domestic money market was effectively segregated from the offshore market when temporary capital controls were reintroduced in May 1997. Bank Indonesia recently announced special swap facilities to reduce the currency risks faced by exporters and to provide short-term dollar liquidity to the market. In Saudi Arabia, swaps were used to provide emergency liquidity during a regional crisis. In South Africa, "special currency swaps" have been concluded from time to time with banks. In Colombia, foreign

exchange swaps are possible by decision of the Board of Governors under special circumstances.

Transparency about foreign exchange operations varies widely among central banks. A few central banks do not treat foreign exchange swaps as confidential (e.g. Israel, South Africa). The Reserve Bank of India publishes the data on operations in the foreign exchange market within a fairly short interval; in Thailand, the lag is only two weeks. South Africa has published data with a lag of only two days since February 1998. Many central banks, however, remain reluctant to reveal their forward market exposure. Swap operations are often kept confidential in order to avoid signalling pressure on the currency.

Primary market issues

Several central banks issue short-term paper, either their own or that of the government. Central bank paper is auctioned in several countries (Brazil, Korea, Peru, Poland and Thailand). The lack of "desirable" collateral for other transactions (e.g. for repos) may be a factor in the selling of central bank paper (Peru, Poland). Auctioning central bank paper may also be useful to indicate/signal the central bank's views about desired changes in the interest rate (Brazil). The Bank of Thailand Bond Programme which started in August 1995 was set up to create some form of benchmark yield curve and to replace illiquid issues of state enterprises by more liquid Bank paper. A special situation has emerged in Israel, where the Treasury agreed to issue a small volume of short-term notes that can only be used for serving monetary policy needs and not for financing the budget.

Outright transactions

Outright transactions in the secondary market, that is the firm purchase and sale of securities, remain important instruments in many countries, particularly to offset structural liquidity surpluses or shortages that are large and persistently in the same direction (Korea), i.e. in circumstances where reserve shortages/surpluses are expected to be large and to extend a number of maintenance periods into the future. In order to conduct outright operations that are best suited to the particular circumstance of intervention, the central bank may wish to hold a fairly wide range of qualified securities. For instance, surges in capital inflows may be best dealt with through sales of short-dated paper. However, the

effective use of outright sales depends on the liquidity of the underlying market for these government securities – and in many countries deep and diverse markets do not exist. In Thailand, for instance, the use of outright transactions is still limited because of a general shortage of government securities and because bonds issued by state enterprises were too small in size and too diverse in issues and credit ratings to enable the development of a liquid secondary market. A final constraining factor was that most government and state enterprise bonds were in effect "locked up" in mandatory holdings by banks and finance companies to meet liquidity or prudential requirements.

Signals and transparency

The policies of central banks have become more transparent in recent years, and the heavier reliance on market interest rates has led to greater attention to the signals that their policy actions send to the market. Many central banks have become convinced that increased transparency regarding their operations and clear communication to the public help build broad-based public understanding and support for monetary policy. A more specific result of greater transparency could be that the demand for reserves becomes more interest elastic, easing the problem of controlling the overnight rate. The various techniques used to promote transparency through the signalling of the central bank's intentions and procedures in the emerging market countries are shown in Table 15.

There are, however, many shades of opinion about the virtues of transparency. There is perhaps a consensus in favour of as much transparency as possible in the *general* aspects of policy – the objectives pursued and regular procedures (such as auction procedures). As indicated in Table 2, many central banks in emerging market economies make their main intermediate target public. It is also considered important to have market participants focus on the right issues and to understand, in general terms, how the central bank implements its policy. If the public knows what the central bank's reaction function is, it may be able to anticipate the central bank's moves and facilitate policy-making.

There is less agreement about the optimal degree of transparency in the very short-term and specific aspects of policy, although even here the

Table 15
Signalling mechanisms

	HK	IN	ID	KR	MY	SG	TH	BR	CL	CO	MX	PE	IL	PL	RU	SA	ZA
Interest rate signals																	
Announcement of target .					*				*	*				*			
Regular tender									*					*			
Fixed rate	*	*	(*)	*	*	*					*						
Variable rate		*	(*)	*						(*)							*
Other market operations .				*			*				(*)					*	
Standing facilities		*		*			(*)	*	*	*		*	*	*	*		
Quantity signals																	
Reserve accumulation . . .											*			(*)			
Maturity				*													
Other				*	*		(*)									*	

Notes: **Chile (CL)**: Changes of the target interest rate level are announced in an open and clear way to the market. Sometimes accompanied by changes in posted interest rates on standby facilities, signalling a permanent shift of the monetary stance. **India (IN)**: Fixed and variable rates: the cut-off yields in the auction are emerging as benchmark short-term rates. Standing facilities: Bank rate. **Indonesia (ID)**: Tenders: The result of the auction has a direct impact on the interbank money market. Standing facilities: Bank Indonesia sets a corridor for SBI auctions. **Israel (IL)**: Standing facilities: The Bank of Israel signals by adjusting its interest rates on discount window loans. **Korea (KR)**: Other market operations: Issues on early redemptions of MSBs, outright transactions of government bonds and repos with short-term maturities. Maturity/other: For example, the BOK advances the bidding time for reverse repos or offers a larger quantity or longer maturities than expected in the financial markets when it seeks to lower market interest rates. **Malaysia (MY):** Signalling via interest rate targeting is sometimes supplemented by official statements and quantitative prudential measures. **Mexico (MX)**: Other open market operations: Signals can also be sent through the announcement of maximum or minimum rates for auctions. Reserve accumulation: Signals are sent through the daily announcement of an objective for the sum of the cumulative balances of the banks' accounts at the central bank. **Peru (PE)**: Standing facilities: Signalling of the stance of monetary policy is done through the rediscount rate (the central bank discount window). **Russia (RU)**: Standing facilities: the refinancing rate. Other: Direct meeting with market participants. **Saudi Arabia (SA)**: Other market operations: Signalling is done via the overnight repo rate. **South Africa (ZA)**: Variable rate: Signalling is done through changes in the amount allotted. **Thailand (TH)**: Other market operations: Signalling is done primarily through a change in the repo rate. Standing facilities: The change in the Bank Rate is rare and thus has a strong announcement effect. Other: Press conferences/interviews have also been used to communicate policy intentions.

recent trend, at least in industrial countries, is towards much greater transparency. Since February 1994 the Federal Reserve, for example, has made public announcements of changes in its federal funds rate target, rather than sending its signals through the operations of the Open Market Desk. Similarly, the Bank of Japan has made explicit announcements about the desired level of the overnight call rate after years of signalling policy changes implicitly via the path of the accumulation of reserves.

In the emerging market economies, the degree of transparency varies significantly. Transparency is near-complete in Mexico. In Saudi Arabia, the limited interest rate sensitivity of credit demand and supply reduces the immediate importance of transparency. The National Bank of Poland prefers to retain some opacity about its intentions so as to create the necessary degree of uncertainty that could help deter excessive capital inflows. The Monetary Authority of Singapore does not make public the composition of the currency market against which, or the range within which, the local currency is stabilised, arguing that non-disclosure permits better control of the exchange rate.

There are two distinct disadvantages of being very transparent about short-term objectives: one is the loss of flexibility (leaving no room for market forces or central bank uncertainty about what to do). The Central Bank of Peru, for instance, has an explicit inflation target but does not disclose its base money objective, so as to give itself some discretion to revise the latter, should circumstances so require. The other disadvantage is that too explicit a signal may raise political pressures that can delay a necessary policy move.

For these reasons, a number of central banks have devised techniques which, over short periods of time and in response to actual conditions and expectations, allow the market itself to decide small movements in rates. The Bank of Japan, for example, avoids making announcements too precise (e.g. "a little above the discount rate, on average"). This approach can help depoliticise the interest rate setting process and thus give the central bank more time to frame its stance as economic conditions unfold. For instance, a rapid spurt in growth or in inflation revealed in monthly statistics can lead the market to push up interest rates; this may allow the central bank some time (e.g. to await for further statistics) before deciding on its own stance.

Perhaps a more fundamental view is that central bank credibility can demand action that, from time to time, surprises the market. A central bank's "bark" will be more menacing if it occasionally "bites" by catching the market off-balance. Not all central banks would agree. But the general point remains that questions of tactics – often context-dependent and difficult to generalise – pervade any discussion about operating procedures. In drawing together common elements across countries, as this paper has sought to do, this should not be forgotten.

Institutional arrangements and settlement balances

	Settlement balances system[1]	Arrangement to alleviate end-of-day imbalances	Marginal accommodation by the central bank[2]		Notes
			Type	Frequency of use	
Hong Kong . . .	RTGS	Pre-settle-ment round with intraday repos	Discount Window	Unlimited	For collateral requirements and pricing: see Table 9
India	N		Refinance facilities	Frequent	
Indonesia	N		Discount/ overdrafts	Limited	
Korea	RTGS, N		Temporary credits	Limited	N for small-value trans-actions and RTGS for large-value trans-actions and final clearing of the N system
Malaysia	N		Overdraft/ borrowing		
Singapore	RTGS	Intraday moni-toring and intraday repos		Limited	
Thailand	RTGS, N	Repo afternoon session	Loan or discount window	Limited by quotas	N for clearing cheques from commercial banks
Brazil	N	Intraday monitoring	Rediscount (TBC), Lombard (TBAN), emergency loans	Active in rediscount	
Chile	N		Liquidity credit line	Infrequent	
Colombia	G	Repos	Rediscount	Infrequent	
Mexico	RTGS, N	Pre-settlement round with central bank auctions of credits/deposits	Overdrafts/ surplus during maintenance period		

Appendix Table 1 (cont.)

	Settlement balances system[1]	Arrangement to alleviate end-of-day imbalances	Marginal accommodation by the central bank[2]		Notes
			Type	Frequency of use	
Peru	G	Intraday monitoring	Rediscount	Infrequent	
Israel			Loans		
Poland	RTGS		Lombard	Limited	RTGS only for large transactions
Russia	N	Overnight settlement credit; repo session 2 at penal rate	Lombard facility, repo session 1 and 2, overnight settlement credit		RTGS in Moscow area since 1st January 1998
Saudi Arabia . .	RTGS	Pre-settlement round	Fixed price FX swaps, repos and overdraft at penal rate	End-of-day accommo-dation is frequent	
South Africa . .	RTGS from March 1998		Loans	Infrequent	

[1] N = discrete-time net settlement; G = discrete-time gross settlement; RTGS = real-time gross settlement. [2] The type of marginal accommodation provided by the central bank is only indicated in this table. For further details, see Tables 8, 9, 10 and 11.

Appendix Table 2

Overview of reserve requirement systems

	India	Indonesia	Korea	Malaysia	Singapore
Definition	Total demand and time liabilities (net of interbank credit)	Demand, time and savings deposits	Deposit liabilities except for cover bills and financial debentures	Deposits and inter-bank borrowing	Deposit liabilities
Use for settlements . .	Yes				Yes
Eligible assets	Cash balances with RBI	Deposits in central bank	Deposits in BOK; up to 35% of reserves may be held as vault cash	Deposits in central bank	Deposits in central bank
Marginal requirements	Imposed from time to time depending on liquidity conditions	No	In case of excessive credit expansion, up to 100%		No
Averaging	Yes	Yes, subject to daily minimum	Yes	Yes, subject to daily maximum and minimum	No[1]
Carry-over	No	No	No	No	No
Type	Lagged	Lagged	Lagged	Lagged	Lagged
Maintenance period (end-day)	14 days	1 week	Half-month 22nd & 7th (next month)	2 weeks 15th & 30th	2 weeks Wednesday
Calculation period (end-day)	1 day – Friday of previous fortnight	1 week	Half-month 15th and end-month	2 weeks	2 weeks Wednesday

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Appendix Table 2 (cont.)

	India	Indonesia	Korea	Malaysia	Singapore
Lag	14 days	2 weeks	7 days	1 month	2 weeks
Remuneration	Yes (4% p.a.), excluding the statutory minimum of 3%	No	None	No	No
Penalties	Yes[1]	Yes[1]	Yes[1]	Yes	Yes
Range of ratios	Up to 11%. Minimum of 3% in CRR	3–5%[2]	1–5%	4%	3%
Last change	August 1998	April 1997 for rupiah deposits; Oct. 1997 for FX deposits	Feb. 1997	Sept. 1998	July 1998
Frequency of changes since 1990	Very frequently in a range of 9.5–15%	Twice (Feb. 1996 and April 1997) for rupiah deposits; three times (Feb. 1996, April and Oct. 1997) for FX deposits	Four times (Feb. 1990, April 1996, Nov. 1996 and Feb. 1997)	Nine times in 1989–96 period	Once (not for monetary policy purposes)

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Appendix Table 2 (cont.)

	Thailand	Brazil	Chile	Colombia	Mexico[1]	Peru
Definition	Total liabilities[1]	Demand, time and savings deposits[1]	Demand and time deposits[1]	[1]		Demand, time and savings deposits[1]
Use for settlements	Yes	Yes			Yes	
Eligible assets	2% banks accounts; 2.5% max. in vault cash and balance in eligible securities	Deposits at central bank and vault cash (up to 15%)	Vault cash and bank deposits in central bank	Deposits at central bank and vault cash	Deposits at central bank	Vault cash and banks deposits in central bank
Marginal requirements	No	Yes	Yes, in foreign currency	Yes	No	Yes, in foreign currency
Averaging	Yes	Yes[2]	Yes	Yes	Yes (subject to daily max. and min.)	Yes
Carry-over	No	Yes; only surplus positions	No	No	No	No
Type	Lagged	Lagged	Contem-poraneous	Semi-lagged	Contem-poraneous	Contem-poraneous
Maintenance period (end-day)	2 weeks	One week	One month	14 days	4 weeks	One month
Calculation period (end-day)	7th and 22nd	[3]	One month	14 days		
Lag	2 weeks	[4]	No	2 days	No	No
Remuneration	No	Yes[5]	No	No	No	Yes[2]

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Appendix Table 2 (cont.)

	Thailand	Brazil	Chile	Colombia	Mexico[1]	Peru
Penalties	Yes	TBC+18% p.a+ penalties	1.5 times average market rate	1% over the required for each day	Twice market rate	1.5 times the average active rate
Range of ratios	6%	15–75%	3.6–9%	5–21%		7%[3]
Last change	Sept. 1997		Beginning 1980			April 1997
Frequency of changes since 1990 . .	Last change was the first in 18 years	Very frequently	None	Very frequently; almost monthly	Current system adopted in Sept. 1992	Frequent changes before 1992; since then only one change

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Appendix Table 2 (cont.)

	Israel	Poland[1]	Russia	Saudi Arabia	South Africa[1]
Definition	Deposits with banks[1]	Demand, time and savings deposits[2]	All types of deposit[1]	Demand, time and savings deposits[1]	Total net liabilities[2]
Use for settlements		Yes	No	No	No
Eligible assets	Cash and banks deposits	Deposits and vault cash (up to 10%)[3]	Vault cash is allowed with restrictions	Only deposits at the central bank	Deposits at the central bank and vault cash
Marginal requirements	No		No	No	Temporary and exceptionally used in the past
Averaging	Yes with limits[2]	Yes[4]	No	No	Yes[3]
Carry-over	No	No		No	No
Type	Contemporaneous	Lagged	Lagged	Lagged	Lagged
Maintenance period (end-day)	One month	Month	Month	One month	One month
Calculation period (end-day)	Month	Month: three computing days: 10, 20 and last day	Month	One day Last day of the month	One month
Lag	None	One month	Month	2 weeks	15 business days
Remuneration	No	No[5]	No	No	No[4]
Penalties	Yes[3]	Yes[6]	Yes[2]	Yes	No
Range of ratios	0–6%	5–20%[7]	8–11%	2–7%	2%[4]
Last change			Feb. 1998	The ratios have remained unchanged since February 1980	
Frequency of changes since 1990	The average level in 1990 was 48%, compared to current average level of 4%	10 changes in 1990–96	Very frequently		5 adjustments in the 1990–96 period

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Notes: **India**: [1] Small deviations: 25% of interest on the defaulted amount is kept by RBI. For larger deviations, the RBI charges the Bank rate plus 3%. **Indonesia**: [1] Penalties: 0.1% of the daily shortage for rupiah and 0.04% for foreign currency. [4] 1% of the amount of the average reserve deficiency. [2] Since October 1997, 5% for rupiah and 3% for foreign currency deposits. **Korea**: [1] At the end of each day of the two-week maintenance period, the Minimum Cash Balance must not be less than 3%. **Brazil**: [1] Reserve requirements are applied to many balance sheet items. The most important are demand, time and savings deposits. The corresponding ratios of these three items are 75%, 20% and 15%, respectively. The answers provided in the table correspond to these three items. Within time and savings deposits, higher rates apply to short-term deposits. [2] In the case of demand deposits, averaging is subject to daily minimum of 40% of required reserves. [3] Friday for demand deposits; variable day for time and savings deposits. [4] Demand deposits: 6 working days; time deposits: one week; savings deposits: 9 days. [5] Demand deposits are not remunerated; time deposits: discount TBC rate (close to market rate); savings deposits: close to funding rate. **Chile**: [1] The reserve ratio is 9% for demand deposits and 3.6% for time deposits. The reserve requirement ratio on capital inflows is 30% for one year. Reserve requirements on the "reserva técnica" is 100%, is applied to short-term deposits in excess of 2.5 times the bank's capital and is remunerated on the basis of the Unidad de Fomento. **Colombia**: [1] Chequing, saving and CD accounts. Higher rates apply to short-term deposits. **Mexico**: [1] The answers provided correspond to the zero-average reserve requirement in operation. **Peru**: [1] Current, savings and time deposits; negotiable CDs, certain bonds. Higher rates for foreign currency deposits. [2] Only required reserves in foreign currency at LIBOR-1 3/8. [3] Domestic and foreign currency 7%; marginal requirement for foreign currency at 45%. **Thailand**: [1] The statutory reserve requirement ratio is 6% for domestic currency denominated deposits, and 7% for foreign currency ones. **Israel**: [1] Deposits in domestic and foreign currencies. Lower ratios apply for long-term deposits. [2] Based on a daily average during the month, but the average weekly deficit is not allowed to go beyond 40% in shekels and 15% in foreign currency. [3] Interest rate on loans to cover the reserve deficit is 48%. **Poland**: [1] New system of reserve requirements was established on 1st January 1998. The answers presented here correspond to the old system with references to the new one in those cases that were provided by the NBP. [2] The ratios are: 20% for zloty demand deposits; 11% for zloty time deposits and 5% for all foreign currency deposits. [3] From January 1998. [4] Averaging was introduced in August 1994. [5] Remuneration was eliminated in January 1998. [6] Two times the lombard rate. [7] Currently, the Law establishes a maximum of 30% reserve requirement ratio. The new Act sets a maximum limit of 30% on demand deposits and 20% on time deposits. **Russia**: [1] A lower rate applies to deposits of households at the Sberbank. [2] Size of penalty depends on overdue debt duration. Penalty rate cannot exceed two refinancing rates. **Saudi Arabia**: [1] The ratios are 7% for demand deposits and 2% for time and saving deposits. The reason for differential rates is the volatility in demand deposits and to encourage banks to solicit more of time and savings deposits. **South Africa**: [1] South Africa introduced new operating procedures in March 1998. Many characteristics of the reserve requirement changed. [2] Total liabilities adjusted for capital and reserves, less deposits pledged as securities for loans granted, less amounts owing by banks and mutual banks and less 50% of remittances in transit. [3] Averaging was not possible prior to the introduction of the new operating procedures. [4] Except for a supplementary reserve requirement of 1% of short-term liabilities of banks on which interest was paid.

Monetary policy operating procedures in Brazil

Central Bank of Brazil

Overview

Monetary policy-making has undergone major changes in response to recent key developments in the Brazilian economy.[1] The high inflation of the 1980s led to various unsuccessful stabilisation attempts, mostly through government intervention and price freezes. Following the normalisation of financial relations with the international community and in step with the trade and financial liberalisation movement of the early 1990s, the Real Plan (*Plano Real*) brought about a sharp and continuous reduction in inflation, from an annual rate of over 5,000% in June 1994 to under 4% in mid-1998. Both pronounced gains in real income and the subsequent recovery in economic activity have been associated with the abolition of the inflationary tax and the reduction in the degree of uncertainty faced by economic agents.

The monetary policy of the Real Plan is marked by the high priority placed on initially accomplishing and thereafter maintaining price stability. In July 1994, quarterly targets for the monetary aggregates were introduced aimed at creating confidence that there would be no inflationary financing of the government deficit. In order to prevent the upturn in private spending (stemming from pent-up demand) from adversely affecting prices, credit expansion was initially constrained by the imposition of a 100% marginal reserve requirement. Subsequently, restraints were placed on various forms and maturities of credit operations. The swift growth of narrow monetary aggregates at the outset of the Real Plan was mainly determined by the large increase in the transactions component of the demand for money, which in turn

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[1] Most of this paper was prepared prior to the period of financial turmoil which followed in the wake of the Russian financial crisis in mid-August 1998 and which necessitated a number of adjustments in monetary policy operating procedures.

was caused by the sharp decline in the opportunity cost of holding cash balances in a low-inflation environment.

Monetary policy was given increased flexibility by the adoption of a floating exchange rate regime in July 1994, replacing the decade-long regime of fixing the real exchange rate. As a result, volatility of international reserves was reduced and its impact on the monetary base smoothed out. The floating exchange rate regime was altered in the aftermath of the Mexican crisis in March 1995, when a band was introduced as a means to reduce exchange rate volatility. International reserve accumulation triggered by large subsequent foreign capital inflows, however, exerted a significant impact on monetary growth.

Short-term interest rates, the monetary policy operating target chosen by the Central Bank of Brazil, remained high throughout the second half of 1994 and most of 1995. Only from late 1995, following the phasing-out of credit controls, did interest rates continuously trend down until 30th October 1997, when the Bank decided to raise the basic rates as a first line of defence against the spreading crisis in the Asian financial markets. As pressures eased, the Bank was able to progressively reduce its interest rates until the Russian crisis of mid-August 1998 again precipitated a period of financial turmoil and rising interest rates.

Major changes have taken place in the operation of monetary policy. Active reliance on open market interventions was replaced by greater use of standing facilities as the primary policy tool of the Bank to steer interest rates. This move was made effective by the introduction of an interest rate corridor in 1996, bounded by the two basic interest rates set by Bank's Monetary Policy Committee (COPOM).

Monetary policy operational issues

The Bank has relied on monetary programming to establish intermediate targets and to communicate its intentions to the market. It publishes quarterly targets (within an acceptable margin of error) for the monetary base, for the amplified monetary base, which includes federal securities in the market and reserve requirements at the central bank, for M1 and for M4, the broadest monetary aggregate concept. Targets for these aggregates are chosen so as to supply the market and economic agents with additional information on the Bank's intentions with regard

to the desired interest rate path. The monetary programming exercise is carried out by the Research Department (DEPEC) and, following its approval by the National Monetary Council (CMN), is submitted to Congress for evaluation.

The operational target for monetary policy chosen by the Bank is the effective monthly interest rate on federal securities transactions (SELIC rate), which is supposed to stay within a corridor defined by the two rates set by the Monetary Policy Committee: the TBC rate (lower bound) and the TBAN rate (upper bound). Since January 1998, official interest rates have been expressed on an annual basis. The change was made to induce a lengthening of the maturity of federal securities and credit operations of the banking system.

The TBC rate is the main determinant of the cost of funding of the banking system. It therefore serves as a basis for other interest rates. The overnight (one-day only) segment of the money market is the most liquid and is most influenced by the Bank. The overnight rate is, ceteris paribus, the rate used by private participants as the benchmark for pricing the short-term end of the yield curve.

The monetary policy operating procedures adopted in 1996 have aimed at broadening financial institutions' access to the discount window, thus reducing the need for Bank intervention in the interbank market. The open market system is composed of 25 primary dealers, of which six are major commercial banks and five medium-sized ones, and 14 brokers. This organisation does not constrain the intervention activities of the Bank in the open market. Financial institutions may operate in the interbank market. However, banks and other institutions which do not hold bank reserves should operate through a bank as a custodian institution. Bank reserves are settled with federal securities on the same day as the transaction; the feasibility of interbank operations depends solely on the size and creditworthiness of participating institutions.

As of October 1997, the stock of demand deposits at commercial banks was around R$ 25 billion, and bank reserves summed up to R$ 10 billion. The size of the money market – understood as the sum of free federal securities held by financial institutions and easily convertible into bank reserves – was R$ 47 billion. The most important instruments are bills and notes issued by the Treasury or the Central Bank, interbank deposits and other securities. Daily turnover in the federal securities-based settlement system (Sistema Especial de Liquidação e de Custódia

– SELIC) was around R$ 100 billion. The high reserve requirement ratio applied to demand deposits (currently 75% of net demand deposits) has tended to inhibit activity in the interbank market somewhat.

Residual role of direct measures

There are no credit controls in place other than specific restrictions imposed on: (i) the amount of credit concessions to state companies (CMN Res. 2444, of 19th November 1997), and (ii) interest rates charged by the banks on loans to the agricultural sector (CMN Res. 2398, of 25th June 1997), currently a variable long-term interest rate based on yields of long-term government bonds (TJLP – Taxa de Juros de Longo Prazo), plus a fixed spread of 9% per year for Treasury funds, as well as fixed interest rates for controlled resources that banks are obliged to put aside for agricultural financing.

Although the Bank has a constitutional right to impose controls on credit operations, such controls are now much less employed than in the past. Limits have been placed on the financing of credit card and term purchases. Apart from the credits to the agricultural sector, interest rates on credit operations are freely determined by the financial institutions.

Credit controls typically have been used in Brazil as an instrument to alleviate price pressures triggered by a surge in household consumption. In 1995, for example, credit controls were imposed in order to offset the wealth effect associated with the abolition of the inflationary tax (following the introduction of the Real), borne especially by poorer households, which threatened price stability and might have put pressure on the current account. Moral suasion is not used to influence credit expansion.

Impact of State savings banks and the recycling of public sector bank deposits

Interest rates on time deposits and other liabilities of State banks, commercial or multiple banks are not influenced by the monetary authorities. Brazilian State banks are currently undergoing a process of modernisation, removal of political influence and submission to the

market discipline imposed by global institutions. A large number of State banks are expected to be privatised, transformed into development agencies, or liquidated according to the terms of the State bank restructuring programme (PROES).

At the federal government level, large transfers in the deposits of the Treasury at the Bank are rare, since most of the Treasury's deposits are scheduled in advance, making account flows more predictable. Nonetheless, whenever large transfers are made, they are notified to the Bank in advance.

State government and social security deposits are held by government-controlled banks (official financial institutions). Deposit flows of state governments and entities are independently managed and do not exhibit large fluctuations in the aggregate. The planning of monetary policy is thus not affected by such flows. Finally, excess cash of federal government-controlled companies is invested in federal government securities through a special segment of the open market, known as "extra-mercado" and operated by Banco do Brasil, rather than through private financial institutions.

Demand for bank reserves

The binding variable largely determining the demand for central bank reserves is the high reserve requirement ratio (75% of net demand deposits). Though to a lesser extent, the demand for central bank reserves is also determined by the evolution of the intra-period overnight rate. Settlement balances represent around 40% of the reserve requirements.

In Brazil, banks target small settlement balances whose amounts appear to be highly insensitive to movements in the overnight interest rate. The amounts are largely dictated by the Bank's policy towards the provision of end-of-day marginal financing (given the terms and conditions of central bank assistance). Until now, technical and institutional characteristics of payment and settlement arrangements have not been very crucial. The Bank has tried to ensure that sufficient funds are available in the system so that participants do not need to turn to it for assistance. If necessary, however, banks can have recourse to end-of-day assistance which is granted at posted rates. It is possible (although this

is not likely) to apply for this type of assistance through discretionary open market operations at a penalty rate.

Excess reserves are not remunerated in Brazil.[2] Banks have to maintain a reserve account with the Bank (banks are not permitted to have an account with other banks). They are therefore required to settle in the books of the Bank (the settlement agent).

The Bank closely monitors the financial position of the main institutions throughout the day. If, even after resorting to the discount (TBC) window or the TBAN window, an institution still encounters difficulties in financing its positions, the Bank may contact the open market dealers and try to find a lender for the institution in difficulty. Only after this fails may the central bank provide direct assistance to the institution through a repo operation, provided the proper guarantees are offered. It could be argued that the wide and relatively inexpensive discount window (in normal circumstances priced below interbank interest rates) promotes banks' recourse to central bank credit, away from the interbank market. This applies especially to institutions with large demand deposits and an ample stock of federal securities. Indeed, recourse to the TBC assistance line by major commercial banks happens almost every day and in considerable amounts. One major exception was the period between early September and mid-December 1998 when financial turmoil compelled the Bank to close its cheaper TBC window and force the banks to the more expensive TBAN window for liquidity assistance.

Supply of bank reserves

Changes in operating procedures in 1996 have tended to make the Bank's standing facilities the main monetary policy instruments in Brazil. Prior to the middle of 1996, recourse to the Bank's rediscount window was tantamount to being almost insolvent for a financial institution, resulting in difficulties in financing its everyday position in the interbank market. This situation was modified by Resolution 2308 (June 1996) of

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[2] The Bank created a remunerated deposit facility designed to hold the excess reserves of the banking system on 2nd December 1998. Outstanding balances are remunerated at the TBC rate minus 0.25%. Since the introduction of this deposit facility, in particular following the closure of the TBC facility on 19th January 1999, average balances in these deposit accounts have remained low.

the National Monetary Council. The revised discount window rules greatly widened the access and eased the terms on which an institution could obtain central bank credit via the discount window. Greater reliance on standing facilities as a major instrument of monetary policy was made possible by the relatively stable internal and external environment at that time.

The volume of central bank assistance commercial banks can obtain from the TBC discount facility – provided they have federal securities to use as collateral for the credit taken – is related to the amount of bank reserves held at the Bank.[3] Noteworthy is that the TBC rate, even though it theoretically represents the floor of the interest rate corridor, is not a deposit rate. Given that potential assistance through the discount window is similar in magnitude to the total amount of bank reserves, potential liquidity problems in the system are minimised.

The Bank currently manages day-to-day bank liquidity by guiding primary central bank debt auctions so as to maintain the open market systematically in an oversold position. Financial institutions are thus forced to access the standing facilities. Use of repo operations has been progressively reduced, being limited to special or emergency situations. At the end of the day, however, the open market desk can offer through the primary dealers and at a wide interest rate spread either deposits at or loans from the central bank. Institutions would accept these facilities only when conditions made it absolutely necessary. Forex swaps are not used in Brazil.

An important consideration with regard to the interest rate corridor, set every five to six weeks by the Monetary Policy Committee, is to signal the trend of the main operating target of the Bank. Another objective of the rediscount facilities has been to stimulate interbank lending from banks holding sizable stocks of federal securities (that could be used as collateral for central bank credit) to those having small portfolios of rediscountable securities. In order to support the development of the interbank market, the discount window as a standing facility was therefore designed to provide a wide availability of funds at a lower cost than the overnight rate. This liquidity management mechanism coupled with adjustments made by the Monetary Policy

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[3] Up until mid-1998, the volume of financial assistance was close to the amount of bank reserves. When financial turmoil affected the economy in late 1998, access to central bank facilities was significantly reduced.

Committee in the basic rates communicates the main intentions of the monetary authorities. However, market participants know that alternative instruments such as repo operations may always be used whenever required.

Central bank debt auctions are conducted each Thursday. The main purpose of the auction is to fine-tune the supply of bank liquidity via the discount window and also provide the market with additional signalling with regard to the desired level of short-term interest rates. Debt auctions are basically of three types: nominal bonds, bonds and notes indexed to the SELIC-rate and dollar-indexed notes.

The standard maturity of the auctioned nominal debt increased from one month in 1994–95 to 6.5 months in early 1998. Financial turbulence in late 1997 and 1998, however, forced a reduction of the maturities. Dollar-indexed bonds usually have a 12 to 36-month maturity and carry an annual coupon of 6%, payable in two half-yearly tranches.

Auction procedures allow each institution to submit five different bids with varying interest rates and volumes. No institution may individually buy more than 10% of the amount offered at an auction of nominal bonds. The Bank ranks the volumes bid in increasing interest rate (decreasing price) order and each institution pays the price it has bid (discriminatory price auction). The Bank reserves the right not to allocate the entire amount offered and takes every precaution to identify instances of non-competitive practices during the auctions, paying particular attention to variables such as the dispersion of the bids, the demand/offer ratio, etc. Following each auction, maximum and average prices (with the associated minimum and average interest rates) as well as total demand are disclosed to the market.

The Bank also conducts the auctions of Treasury paper, which normally take place on Tuesdays. The conditions and procedures are very much the same as for the central bank debt auctions, except that a single institution may purchase the entire amount offered as long as its bid is at a rate compatible with this situation. In addition to dollar-denominated debt and nominal debt, the Treasury also auctions debt indexed to the interest rate offered on bank certificates of deposits and to the SELIC-rate.[4]

[4] Financial instability in the second half of 1998 led to the creation of additional central bank and Treasury securities indexed to the exchange rate, while the issuance of securities indexed to the overnight rate, which had been dormant in preceding years, was resumed. Moreover, new securities were issued, the yield of which was partly pre-set and partly variable.

Central bank open market operations

Central bank open market operations in the secondary market (repos or outright operations) have been largely discontinued since the introduction of the interest rate corridor in mid-1996. As already stated, these operations take place only in conditions of excess liquidity or in emergency situations. Both central bank and Treasury securities may be the underlying instrument in such operations.

One example of such operations related to the sale of a major Brazilian commercial bank in early 1997 which involved a substantial inflow of foreign exchange. A repo operation was necessary to sterilise the surge in bank reserves. Moreover, as already described, the crisis in several East Asian countries adversely affected the Brazilian stock and money markets. Two major outright operations of longer-term federal securities were conducted and overnight repo operations were resumed by the open market desk to provide liquidity to the system and signal the new level of the basic interest rates. In the wake of the Russian crisis repo operations assumed again the importance they had had in the past as a major tool of liquidity management.

Transparency and signalling

Monetary policy-making has been geared towards more transparency. Various actions have been directed at making the policy stance more effective, such as the setting of basic rates and the Monetary Policy Committee procedures. However, the Bank avoids imposing policy-making rigidities so as to ensure that the necessary degree of flexibility in the process of liquidity management and interest rate steering is maintained.

Signalling is done mainly by the Monetary Policy Committee through the setting of the basic rates of the Bank. Additional signalling information is imbedded in the price and maturity of central bank debt auctions, as well as in the daily management of the price at which the Bank accepts its own and Treasury bonds in the conduct of repos and as collateral in rediscount operations. The careful handling of the latter signal has proved to be especially important in moments of crisis.

Monetary policy operating procedures in Colombia

José Darío Uribe[*]

Introduction

The basic long-term target of Colombia's monetary policy is price stability. In an attempt to achieve this primary goal, the central bank uses the monetary base as an intermediate target and keeps the exchange rate within a band defined in terms of a single currency – the dollar. The main policy instrument is open market operations – in the past reserve requirements have been used – with the overnight interbank rate acting as its main operational variable.

Within this framework, the Banco de la República (BR) tries to fulfil the requirements of the Constitution, which are "to maintain the purchasing power" of the domestic currency and to preserve the stability of the financial system. The BR has capital, technical and administrative autonomy and makes use of a variety of policy instruments – open market transactions, a discount window and reserve requirments, among others. The Board of Directors of the BR, with seven members including the Governor of the Bank and the Minister of Finance, is the monetary, credit and exchange rate authority of the country.

This paper presents a short summary of the monetary policy implementation procedures that were adopted in Colombia during the years 1996–97. Section 2 describes briefly the type of considerations involved in defining the quantitative inflation target and the intermediate target. Section 3 describes current operational procedures and instruments, while Section 4 concludes.

1. Strategic aspects of monetary policy

(i) Final target

In Colombia, according to Law No. 31 of 1992, the Board of Directors of the BR must announce, each year, a quantitative inflation target lower than the observed inflation rate of the immediately preceding year. The target is a point target (not a range) with a time horizon of one year and is defined in terms of the overall CPI. Once established, it is not revised.

In defining this target, the BR staff carries out four types of technical task:
- detailed assessment of the inflationary pressures existing in the short and medium term;
- inflation projections using econometric models;
- inflation projections using an inflation model with endogenous credibility; and
- financial programming in the International Monetary Fund (IMF) tradition.

The evaluation of inflationary pressures is based, inter alia, on an analysis of the recent evolution of consumer and producer prices, the behaviour of different core inflation indicators, the trends of monetary aggregates and their deviation from their target or guidelines, an evaluation of productive activity in relation to different estimates of potential GDP, and the results of surveys of inflation expectations and of recent and expected behaviour of wages/salaries and the nominal exchange rate. Such evaluation of inflationary pressures is complemented with: (i) inflation forecasts derived from time series methodology (ARIMA, VAR); (ii) structural models with the stock of money, the nominal exchange rate, wages/salaries and the product gap among their explanatory variables; (iii) a simulation model in which the degree of credibility of the inflation target is endogenous; and (iv) an assessment of the impact of anticipated supply shocks.

Expected inflation is also established on the basis of an IMF-style financial programming exercise. The estimate of gross domestic product (GDP) growth implicit in the national budget and in the preliminary inflation target permits an initial estimate of the growth in nominal spending which has to be financed with the creation of liquidity. This figure, together with forecasts of the capital account in the balance of

payments and the external and internal credit requirements of the Government, allows the assessment of: (i) the coherence of financial flows among the different sectors of the economy; and (ii) the price, exchange rate and interest rate effects of monetary and fiscal policies implicit in the exercise.

If the results show a lack of coherence between monetary and fiscal policy objectives, either spending adjustment alternatives are analysed or the exercise is carried out again but with different assumptions about inflation, product growth, the exchange rate and interest rates. The final version of the financial programming exercise – completed by the technical staff of the BR and the Ministry of Finance – and its conclusions are submitted for study and approval by the Bank's Board of Directors. The Board then decides and announces the quantitative inflation target, expected GDP growth and the parameters of the exchange rate band.

The financial programming exercise is also a fundamental instrument in co-ordinating the BR's basic functions with general economic policy, in the spirit of the provisions of the Constitution and Law No. 31 of 1992.[1]

(ii) Intermediate target(s)

The monetary base is the intermediate target of monetary policy. In the past, M1, broad money (M3) and inflation forecasts have been used for the same purpose. The rationale for using the quantity of money as an intermediate target lies in its close relationship with inflation in the long run.

The monetary base target is formulated in terms of a corridor, with limits of plus and minus 3%. The first step in the estimation of this band is a calculation of the expected growth in broad money (M3). To estimate this growth, the GDP projection, inflation rate target and the projected change in velocity are taken into account. Once the expected annual growth of M3 has been defined, several time series models are used to forecast each of the components of broad money. The results are then

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[1] To ensure co-ordination between the basic functions of the BR and general economic policy, the Constitution and the Law provide for the participation of the Ministry of Finance on the Board of Directors (with voting rights), the possibility for the Board of Directors to issue an opinion on the amount of external and internal credit resources included in the national budget, and an obligation of concerted management of the exchange rate. In practice, this co-ordination is carried out mainly via the participation of the Minister of Finance on the Board of Directors and through the financial programming exercise.

adjusted (re-scaled) to ensure consistency. Subsequently, these indepen-
dent exercises are used to determine, given reserve requirements, the
expected demand for reserves, which, together with a projection of the
currency component, provide base target levels.

The monetary base corridor is approved and announced publicly by
the Board of Directors of the BR. It is assumed to remain valid for the
entire year. Changes in the corridor prior to the year-end are presumed
to be motivated either by substantial changes in the macroeconomic
indicators underlying the monetary programme or by very severe
disturbances in the financial markets. In the past, the BR has opted to
formally redefine the target and announce a new one (e.g. in May 1997)
or to communicate its willingness to tolerate a degree of departure from
the original target.

In addition to the monetary base commitment, at the end of each
year the Board defines an exchange rate band applying for the subse-
quent year. As stated in the Introduction, the band is defined in terms of
a single currency – the US dollar – reflecting to a large extent the large
share of the United States and other countries of the western
hemisphere in the total volume of Colombia's exports and imports. Since
it was implemented (January 1994), the limits of the band have been kept
at plus and minus 7%. This breadth is considered to serve two

Graph 1
High powered money corridor (1996–97)
Weekly observations (in billions of Col. $)
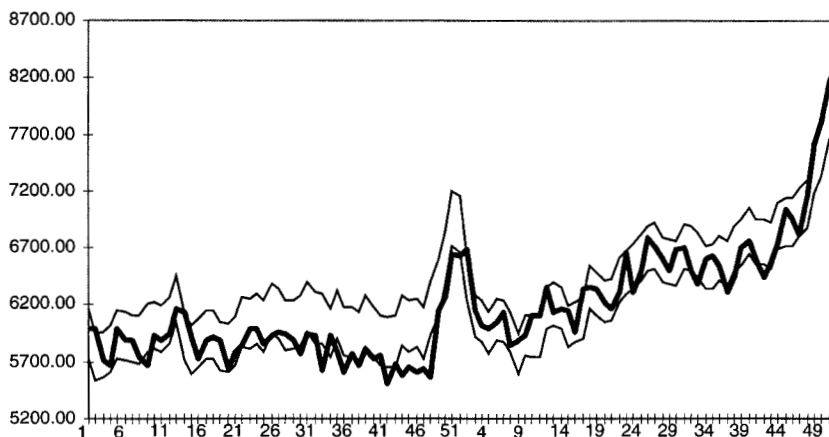
purposes. First, it provides necessary flexibility in nominal exchange rate determination for control of monetary growth. Secondly, it largely eliminates the risk of having a misaligned real exchange rate vis-à-vis the value of the fundamental determining factors, particularly public spending and external capital flows.

The central parity is readjusted by a value that approximates the difference between the quantitative domestic inflation target and inflation forecasts in Colombia's main trading partners. During its first year of operation (1994), the devaluation of the explicit band was 11%. This figure, only a few points lower than the expected difference between domestic and foreign inflation, was supported by the results of several technical studies which suggested that the chosen value for the initial central rate of the band (i.e. the market rate of the previous day) was indeed misaligned with fundamentals (undervalued). During 1995 and 1996, the chosen devaluation rate for the band was 13.5%. This figure is consistent with the aforementioned formula. In 1997 and 1998 rates of 15% and 13%, respectively, were established. The idea is to guarantee that, if the inflation target is achieved, the real exchange rate level observed at the end of 1996 can be maintained.

In general, the existence of a sliding band is due to two factors. First, Colombia's inflation rate has permanently been much higher than the weighted average of inflation rates in its major trading partners. Secondly, in an inflationary environment with a strong inertial component, a horizontal band would lead to significant and untenable rates of real appreciation.

In addition, the formula selected to determine the band's rate of devaluation uses the quantitative inflation target instead of past inflation data, in order to help reduce inflationary inertia. In operational terms, the limits of the band are announced only a few days in advance but, in practice, agents may readily calculate its path throughout the year on the basis of the announced target for the devaluation of the central parity.

(iii) Monitoring

The final and intermediate targets are monitored continuously. Every month, the BR's Department of Economic Research draws up an inflation report to be presented at the month's first meeting of the Board of Directors. The report includes a section describing the recent behaviour

Graph 2
Exchange rate target zone (February 1994 – January 1998)
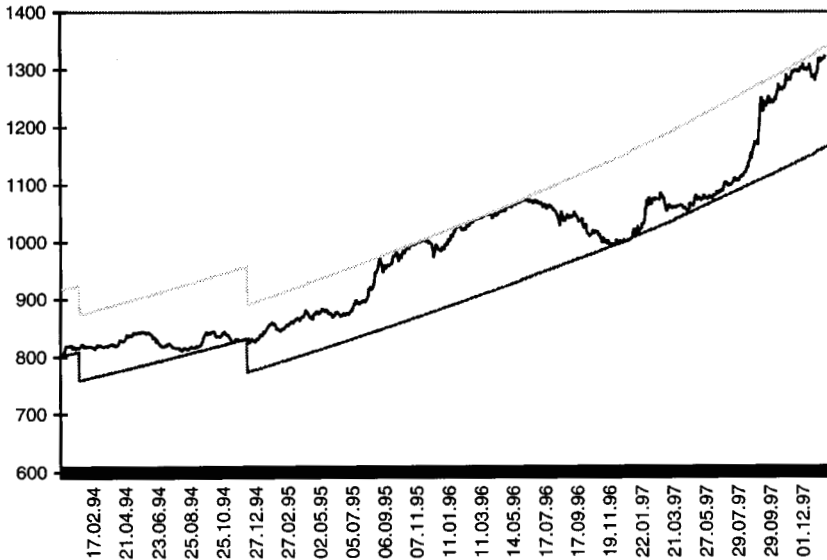
of prices, monetary and credit aggregates, real activity, expected inflation, the exchange rate and the results of re-estimates of inflation models. Similarly, the Economic Research and Monetary Operation Departments produce, once a week, two reports showing, inter alia, the most recent

Table 1
Central bank intervention in the forex market
Sales and purchases at the limits of the zone*

Year	Amount (US$ million)	Sales (number of days)	As a percen- tage of average MO	Amount (US$ million)	Purchases (number of days)	As a percen- tage of average MO
1994	185.2	8	3.4	–	–	–
1995	–	–	–	178.0	14	3.0
1996	1,560.8	21	27.6	333.4	17	5.9
1997	–	–	–	–	–	–

*These figures do not include intervention within the limits of the zone.

behaviour of monetary and credit aggregates, new data on Treasury transactions, the latest interest rate figures, open market transaction behaviour and monthly projections of monetary aggregates. These documents are presented at a weekly meeting at which the members of the Board of Directors, representatives of the Treasury and Public Credit Office and the technical staff of both the BR and the Ministry of Finance are present. The nature of any deviation in prices and monetary aggregates from their target is studied. This committee is not a decision-making entity; when decisions on short-term policy are needed, the Board has to formally delegate the relevant authority.

2. Operating procedures

(i) General considerations

In addition to monetary base targeting and exchange rate commitments, in 1995 the Board established an overnight interest rate band. In August 1997, the band's width was set at 700 basis points, ranging from its minimum level of a 20% effective rate to a ceiling of 27%. The main purpose of this corridor is to reduce the rate's short-run volatility and avoid fluctuations in the long-term rate that may not be consistent with movements in the monetary aggregate that is being targeted. Thus, the main level of the band is the *ex ante* rate considered to be consistent with the monetary base corridor. The bank commits itself to sell its own paper overnight at the lower limit of the interest rate band and to inject liquidity through repurchase operations with Treasury bills at its upper limits (again mostly with overnight maturity).

Macroeconomic theory recognises the difficulty of controlling monetary aggregates and interest and exchange rates simultaneously in an open economy exposed to flows of external capital. Hence, under such conditions, monetary and exchange rate policies are not independent (even in the short term). In consequence, fixing one variable requires coherent levels of equilibrium for the others. In this way, simultaneous control of the three variables can only be achieved if their targets are mutually consistent. This conclusion may be extended to include a case in which the monetary authority sets targets on ranges – not points – of the variables. Here, the simultaneous presence of an exchange band and a monetary band is not internally inconsistent in the

presence of mobility of capital, as long as their parameters (breadth and level) respect the existing equilibrium ratios among the variables.

To illustrate the above point, we may consider a small, open economy with a crawling band or target zone system in which uncovered interest rate parity holds. Starting from a point of equilibrium in money supply and interest and exchange rates, the presence of a *credible* band for the latter immediately determines the existence of an interest rate band. Such band is defined by the interest rate's uncovered parity condition and by the ceiling and floor of the exchange rate band:

$$i^* + \hat{e}_{min} \leq i \leq i^* + \hat{e}_{max}$$

where *i* is the domestic interest rate, i^* is the external interest rate and $\hat{e}_{min}$ and $\hat{e}_{max}$ are, respectively, the minimum and maximum devaluation permitted by the exchange rate band, on the basis of the initial exchange rate.

In turn, given the interest elasticity of the demand for money, the interest rate band thus defined imposes a restriction on the monetary band. This happens because capital flows adjust the money supply endogenously to levels compatible with the limits of the exchange rate band when the domestic interest rate exceeds the limits imposed by the exchange rate band. The less elastic the demand for money, the narrower the monetary band consistent with the interest rate band (fewer capital inflows and outflows are required to take the domestic interest rate to levels consistent with the exchange rate band).

This means that the monetary, exchange rate and interest rate bands condition each other. Consequently, it is feasible to set targets for them, provided that the relationship is maintained. In the event of conflicts between these targets, there is a clear-cut system of hierarchy with regard to the exit clauses of the system. The first target to be abandoned is that of the interbank interest rate. With respect to the monetary base and exchange rate corridors, the decision is made taking into account the external conditions facing the economy.

During 1997, such conflicts did not arise. As seen in Graph 3, the exchange rate and the monetary base stayed consistently inside their target zones. On the other hand, the interest rate intervention band was lowered three times, since the Board of Directors considered that the inflation rate was on target and the economy was performing well below potential.

Graph 3
Monetary base corridor
January–December 1997 (20-day moving average)

US$ billions (y-axis: 5,300 / 5,800 / 6,300 / 6,800 / 7,300 / 7,800)

x-axis: 02.01.97 31.01.97 28.02.97 02.04.97 30.04.97 30.05.97 02.07.97 30.07.97 29.08.97 26.09.97 27.10.97 26.11.97 29.12.97
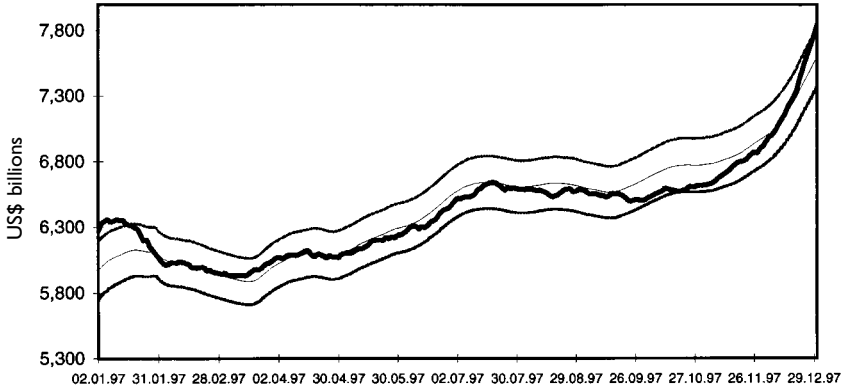
Nominal exchange rate and the exchange rate band
January–December 1997

Pesosper dollar (y-axis: 920 / 970 / 1,020 / 1,070 / 1,120 / 1,170 / 1,220 / 1,270 / 1,320 / 1,370)

x-axis: 02.01.97 31.01.97 28.02.97 02.04.97 30.04.97 30.05.97 02.07.97 30.07.97 29.08.97 26.09.97 27.10.97 26.11.97 29.12.97

90
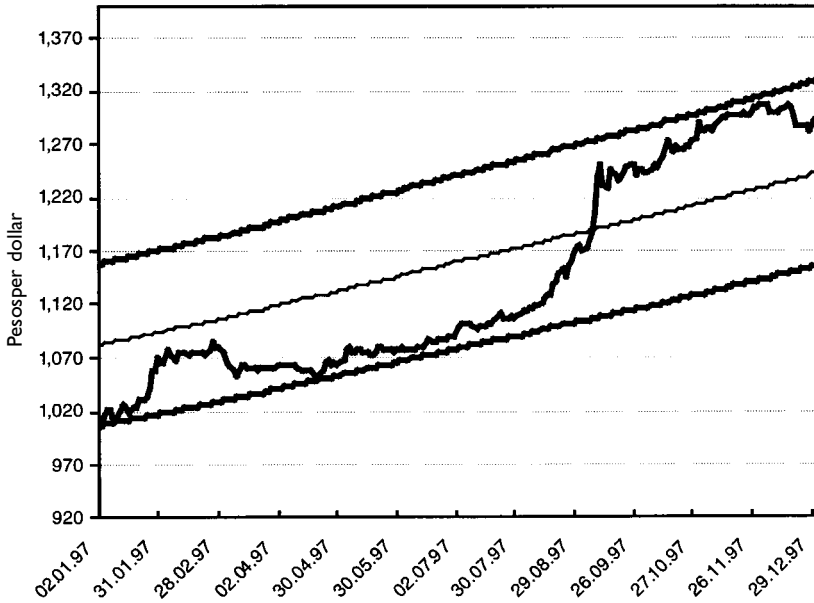
Graph 3 (cont.)
Interbank lending interest rate* and intervention limits in 1997
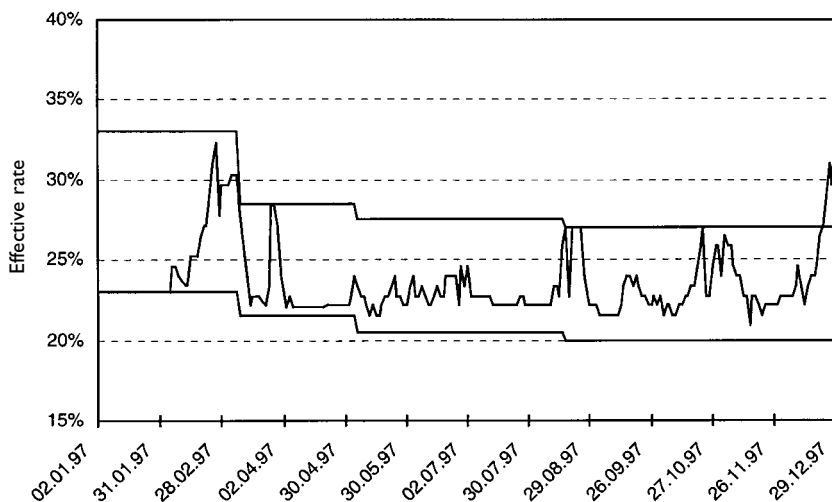
* Corresponds to the overnight rate.

(ii) Monetary policy instruments

Open market operations and reserve requirements have been the main monetary policy instruments used in recent years in Colombia. At present, open market operations (OMOs) are used for control and management of the monetary base. Credit quotas in favour of private agents and lending to the Government are prohibited by the Constitution. However, an exception to the latter prohibition is made in the case of open market operations or when there is unanimous approval by the Board of Directors of the Bank.

The Bank is currently carrying out open market operations with its own securities. The maturity of these instruments varies between one and 90 days and sale is by auction. The main agents participating in this market are banks, finance corporations, savings and loan corporations, commercial finance companies, trust companies, pension funds and stock brokers. By law, after 1999 the Bank will have to carry out these transactions with government paper negotiated on the secondary market.

The Bank also engages in repurchase agreements on its own securities. These transactions are used as a mechanism to inject liquidity into the system on a short-term basis (between one and thirty days). The Bank holds three auctions per day through its own electronic system (SEBRA). The first covers long-term transactions. Once this auction is closed, a second, geared towards control of the short-term rate (one-day contraction transactions and one to seven-day expansion transactions) is held. The third auction is identical to the second.

The Bank's Board of Directors also sets the level of reserve requirements. These depend on the maturity of deposits (the shorter the maturity, the higher the requirements) and are applicable to demand deposits, savings accounts, time deposits and bonds. Reserves are not remunerated and the accounting period lasts two weeks, with a two-day lag between the observed and the required reserve. The fine for failure to comply is 3.5% over the total of the business days of the respective month.

Reserve requirements were used as an active monetary policy instrument until 1993. Since then, reserve requirements have tended to decrease, reducing dispersion among liabilities, and their use as a monetary instrument has declined. Reserve levels now average 8.31%, 7.42 percentage points lower than three years ago. Reserve requirements are understood to be a parameter intended to hedge against bank runs.

In addition, the Bank has an open Transitory Liquidity Support (TLS) mechanism for credit institutions that suffer a sudden drop in their deposits. The TLS mechanism is made up of two facilities, known as an ordinary and a special procedure. In the ordinary procedure the Bank may lend resources to fully solvent entities to cover drops of up to 10% of the maximum level of their deposits shown in the 15 calendar days prior to the request. The mechanism employed is that of discounting or rediscounting quality A assets (portfolio or securities), provided that, if the entity holds central bank securities, these will be the first to be rediscounted. This facility is granted for a maximum 30-day period. Any increase in the amount drawn is conditional on further drops in deposits, provided that it does not exceed the aforementioned 10%. While using these resources the entity cannot increase the amount of its investment and/or lending operations. Banks may make use of the procedure for up to 90 calendar days each year but there must be at least 15 calendar days between any two instances of recourse.

Table 2

Maturity structure of open market operations (1994–97)

Year	Amount ($ millions)	Number of weeks	Distribution by maturity (days)								
			1	7	15	30	30–45	90	180	360
1994	7,797,725	52	–	56.68%	25.63%	–	10.85%	2.98%	0.95%	2.91%
1995	13,329,501	48	0.20%	0.29%	0.11%	–	0.32%	0.06%	0.01%	0.01%
1996	32,060,663	45	0.82%	0.07%	0.06%	0.03%	–	0.02%	–	–
1997	113,432,298	52	92.87%	–	–	1.58%	–	5.56%	–	–

Table 3
Established required reserves for financial institutions

Liabilities	Percentage prevailing 18 May 1994	Percentage prevailing December 1997	
	Stocks	Stocks	Marginal
I. Demand deposits	41	21	21
II. Time deposits			
Less than 6 months	3	5	7
Between 6 and 12 months . .	2	5	7
Between 12 and 18 months .	1	5	7
18 months or more	1	5	0
III. Savings accounts	10	10	10
IV. Bonds	..	7	0

The special TLS procedure is aimed at two types of entity: (i) those suffering drops in excess of those established under the ordinary procedure; and (ii) those that, due to certain solvency problems, are participating in a capital adjustment programme with the Super-intendency of Banks. Specifically, the Bank will provide, also through discount or rediscount, resources for up to 180 calendar days, and up to 15% of deposits, under more restrictive conditions of capital sustainability (e.g. entities must show themselves capable of returning the resources and maintaining positive operating margins). The cost of resources and the restriction on investment and lending operations are the same as the procedure described above. However, access to this special support procedure is conditional on the entity not having used it during the last 12 months.

The use of TLS during 1995-97 was very infrequent. In this period, liquidity was provided through the ordinary procedure on three occasions and involving sums that did not exceed US$ 2.5 million. The special procedure was not used during that period.

(iii) The specific procedure

The Open Market Operations Committee monitors the economy's liquidity on a weekly basis and calculates OMO requirements to place

the monetary base at the corridor's midpoint. For this purpose, it forecasts demand for currency, bank reserves and any sources of monetary expansion. Demand for currency is forecast with an ARIMA model. Demand for bank reserves is estimated by taking into account obligatory reserve requirements of intermediaries, on the basis of an estimate of liabilities subject to such reserves. On the other hand, monetary base supply is calculated by projecting, separately, the main sources of monetary expansion or contraction. The Treasury reports its weekly flow of income and expenditure in local currency and the impact of these movements on its accounts at the BR. On the basis of forecasts of international reserves, the monetary impact of the Bank's possible intervention on the exchange market is estimated. The autonomous factors affecting the supply of liquidity are depicted in the following table.

The weekly behaviour of the interbank interest rate is predicted on the basis of estimates of liquidity supply and demand, and OMO requirements are determined in order to place the monetary base at the midpoint of the corridor. If monetary base supply exceeds demand, the Bank expects the interbank interest rate to fall and absorbs excess liquidity with short-term OMOs. If demand for high-powered money exceeds its supply, the Bank may provide liquidity through repo operations once the interbank interest rate reaches the upper limit of the overnight interest rate band.

Table 4
Autonomous factors affecting liquidity, 1993–97
In billions of pesos

	Average*	Standard deviation*
Bank reserves	38.0	170.2
Autonomous liquidity position		
Net foreign assets	120.9	261.3
Net foreign lending to government . . .	−4.7	166.6
Other net assets	22.3	89.5
Currency	44.9	234.7
Other net liabilities	55.7	321.6

* Of monthly changes.

Thus, intervention by the bank on the interbank market takes place only at the limits of the interest rate band. Therefore, whenever the monetary base exceeds its band for a pre-established period of time, the Bank modifies the interbank interest rate band. Hence, during some weeks, liquidity projections may suggest that the monetary base will exceed the band and that OMO requirements to bring it back within the band cannot be met at the present interest rates. If this is a short-lived episode, the base will move back inside the corridor in a few weeks. If the monetary base repeatedly breaches its upper or lower limits for several weeks due to liquidity excesses or shortages, the Board of Directors will increase or decrease the intervention interest rate until such deviations are corrected.

On the other hand, there are two types of central bank intervention in the forex market. One of them is carried out when the exchange rate is inside the target zone and is aimed only at reducing this variable's volatility. To this end, the Bank retains the right to intervene in the exchange market and has carried out exceptional and direct operations with the public sector. The second kind of intervention arises when the nominal exchange rate reaches either of the corridor's limits. This type of intervention was seen in December 1994 when the exchange rate reached the explicit corridor's floor, thus having to be realigned. It was also used in the second half of 1995 and the first half of 1996 when, due to pressures arising from adverse political developments, the exchange rate reached the weak end of its crawling band. In December 1996, however, the Bank carried out a large-scale intervention to defend the band's stronger limit, in the presence of a massive capital inflow associated, in large part, with public sector operations. In the last few months, however, the nominal exchange rate has fluctuated close to the weak end of the target zone, with moderate intervention by the central bank.

Direct restrictions on indebtedness in foreign currency exist in Colombia. A control system for foreign currency indebtedness based on price incentives has been in place since September 1993. Under this scheme, loans with a term shorter than a pre-established minimum entail the constitution of a deposit, in dollars, at the central bank for a certain period of time. These deposits are called "Titulos por Financiaciones" and may be redeemed before expiry, subject to a discount table. In this way, the incentives for foreign indebtedness depend on the opportunity

cost of the deposits and on the domestic/foreign interest rate differential. On the other hand, the maintenance cost of the deposit depends on the percentage of the deposit and on the ratio between the term of the loan and the deposit. Since May 1997, these deposits have been denominated in Colombian pesos, except for export financing.

The financial sector has been forced to maintain a minimum net asset position in foreign currency. This minimum amount has fluctuated widely, from 30% of all foreign currency liabilities in October 1991 to 45% in March 1992 and 0% in November 1995. Nowadays net foreign currency asset position for the financial sector must neither exceed 20% of all technical capital nor be negative.

(iv) Transparency and signals

The response of the financial markets to expectations has grown in Colombia in the past few years. With the purpose of guiding the market's expectations, the BR publishes, each year, the quantitative inflation goal, the weekly corridors for high-powered money, M1 and M3, and the parameters of the exchange rate crawling band. The Bank makes weekly results of monetary aggregates and international reserves available to the general public with a two-week lag. On the other hand, agents have daily information on the exchange rate and the rates that define its bounds.

Every month, after analysing price behaviour, the Board of Directors, or one of its members, comments on the observed results. The convenience of releasing a monthly inflation report, similar to those compiled by a number of central banks that have adopted a final target as monetary strategy, is currently under evaluation. Moreover, twice a year the Board presents to Congress a report in which the recent evolution of economic policy and the economy as a whole is assessed. On several occasions, members of the Board participate in academic events and present their personal view regarding the economy's behaviour and its outlook.

The measures adopted by the Board of Directors are made public through resolutions, reports and press conferences. The modifications in the central bank's intervention interest rates in the money market are announced through reports and the net results of the OMOs are published weekly. In contrast, the extent of the Bank's intervention in the

exchange rate market is not made public, although an approximate estimate may be obtained through the weekly exchange rate statistics released by the Bank.

3. Concluding remarks

This paper has presented the framework for monetary policy formulation and implementation in Colombia during 1996-97. Monetary and exchange rate policies are conducted in an institutional set-up characterised by a large degree of formal central bank independence, an exchange rate band regime and an increasing use of market-oriented policy instruments.

    The main task ahead is to convince the Government and the general public that price stability is a necessary condition for sustainable economic growth. The Bank is committed to developing a better perception of the Bank's actions and to improving the understanding of the benefits of lower inflation. The Board and the Bank's technical staff are also assessing the current monetary policy operating procedures.

Monetary policy operating procedures in India

Y. V. Reddy

1. Monetary policy objectives

The preamble to the Reserve Bank of India Act sets out the objectives of the Bank as "to regulate the issue of Bank notes and the keeping of reserves with a view to securing monetary stability in India and generally to operate the currency and credit system of the country to its advantage". Although there has not been any explicit legislation for price stability, as has been the current trend in many countries, the objectives of monetary policy in India have evolved as those of maintaining price stability and ensuring an adequate flow of credit to the productive sectors of the economy. These twin objectives are clearly spelt out from time to time in monetary and credit policy announcements by the Reserve Bank. The objective of price stability has, however, gained further importance following the opening-up of the economy and the deregulation of financial markets in India in recent times.[1]

The growing recognition that price stability ought to be the core objective of monetary policy is reflected in the Reserve Bank's Annual Report for 1996/97: "in the case of India, both output expansion and price stability are important objectives but depending on the specific circumstances of the year, emphasis is placed on either of the two. Increasingly, it is being recognised that central banks would have to target price stability since real growth itself would be in jeopardy if inflation rates go beyond the margin of tolerance".

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[1] It may be noted in this context that a number of measures have been taken in recent years to remove various restrictions on international current account transactions and ease capital account transactions, culminating in India accepting Article VIII status under the Articles of Agreement of the International Monetary Fund (IMF) in August 1994.

2. Institutional background

As regards the conduct of monetary policy, the choice of targets, instruments and operating procedures was circumscribed to a large extent by the nature of the financial markets and the institutional arrangements. In this context, the period prior to 1992 can be termed as the pre-reform period, with the post-reform period emerging thereafter. Although the reform of the financial sector was initiated in the mid-1980s, the process was hastened following the economic crisis in the summer of 1991. The foundation for the reform of the monetary and financial system was laid by the Committee to Review the Working of the Monetary System (Chakravarty Committee, 1985) and the Working Group on the Money Market (Vaghul Group, 1987).

(i) Pre-reform period

In the pre-reform era, the financial market in India was highly segmented and regulated. The money market lacked depth, with only the overnight interbank market in place. The interest rates in the government securities market and the credit market were tightly regulated. The dispensation of credit to the Government took place via a statutory liquidity ratio (SLR) process whereby the commercial banks were made to set aside substantial portions of their liabilities for investment in government securities at below market interest rates. Furthermore, credit to the commercial sector was regulated, with prescriptions of multiple lending rates and a prevalence of directed credit at highly subsidised interest rates. However, the institutional arrangement for financing the government deficit is of particular significance for an understanding of the conduct of monetary policy. The provision for extending short-term credit (not exceeding three months) to the Central government slipped into a practice of rolling over this facility, resulting in automatic monetisation of the Government's deficit. The situation was aggravated further during the 1980s as the Government's fiscal balance rapidly deteriorated. The process of creating 91-day ad hoc Treasury bills and subsequently funding them into non-marketable special securities at a very low interest rate emerged as the principal source of monetary expansion. In addition, the Reserve Bank had to subscribe to the government dated securities which were not taken up by the

market. As a result, net Reserve Bank credit to the Central government, which constituted about three-quarters of the monetary base (reserve money) during the 1970s, rose to over 92% during the 1980s. It was only in the 1990s that the trend was reversed following economic reforms (Table 1).

In such an environment, monetary policy had to address itself to the task of neutralising the inflationary impact of the growing deficit. The Reserve Bank had to resort to direct instruments of monetary control, in particular the cash reserve ratio. This ratio was used to neutralise the financial impact of the Government's budgetary operations rather than as an independent monetary instrument.

(ii) Post-reform period

The financial sector reforms initiated following the recommendations of the Narasimham Committee (1991), in conjunction with the recommen-dations of the Chakravarty Committee and the Vaghul Working Group, produced far-reaching changes in the financial sector which had an important bearing on the conduct of monetary policy.

The Chakravarty Committee had advocated regulation of the money supply in line with the evolving price/output situation. As regards the means of achieving the desired monetary expansion, the Committee had recommended control of the monetary base (reserve money). However,

Table 1
Composition of monetary base
In percentages

Items	Averages of end-March figures			End of March			
	1971–80	1981–90	1991–94	1995	1996	1997	1998
Ratio of reserve money: Credit to the central government	76.8	92.3	87.1	58.4	61.1	60.3	59.1
Net foreign exchange assets	19.7	10.7	21.4	44.1	38.1	47.4	51.2
Other assets*	3.5	–3.0	–8.5	–2.6	0.8	–7.8	–10.3

* Includes refinance to banks, credit to financial institutions net of items of non-monetary nature such as capital and reserves, and revaluation accounts for foreign exchange assets.

as the practice of automatic monetisation of the Government's fiscal deficit impinged on the effective control of the monetary base, there was an imperative need for a change in the institutional arrangement. A momentous step in this direction was the historic agreement of 1994–95 between the Government of India and the Reserve Bank, eventually culminating in the elimination of the issuance of ad hoc Treasury bills with effect from 1st April 1997.[2]

With the initiation of financial sector reforms, the emphasis was placed on the development and deepening of money, government securities and forex markets, and an effort was made to move away from the use of direct instruments of monetary control to indirect measures such as open market operations and market-related interest rates.

In order to improve short-term liquidity and encourage its efficient management, interbank participation certificates, certificates of deposit (CDs) and commercial paper (CP) were introduced. The Discount and Finance House of India (DFHI) was set up to promote a secondary market in a range of money market instruments. Treasury bills of varying maturities (14-, 91- and 364-day) were introduced. More importantly, interest rates on money market instruments were left to be determined by the market.

The process was well supported by reforms in the government securities market. Concomitant with sharp fiscal adjustment by the Central government, the interest rates on government paper were made market-related and the maturity periods reduced substantially to a maximum of ten years.[3] Other fundamental reforms in the government securities market include setting up a system of primary dealers (PDs) for dealing in government securities, introducing a delivery-versus-payment (DVP) system in respect of government securities settlement,

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[2] Since 1st April 1997, the RBI has provided temporary accommodation to the Central government to take care of its mismatches in receipts and expenditures through a scheme of ways and means advances. This scheme, which operates within ways and means limits provided for different periods of the financial year, replaced the open-ended access to the facility prevalent earlier. In addition, an "overdraft" facility was set up available for a transition period of two years to allow for the introduction and improvement of cash and debt management operations within the Central government. Overdrafts will not be permissible after 31st March 1999.

[3] It may be noted in this connection that, since April 1992, the entire central government borrowing programme in dated securities has been conducted through auctions. During 1998–99, the Reserve Bank issued two central government securities of 15-year and 20-year maturity.

adopting new techniques for flotation, introducing new instruments such as zero coupon bonds, partly paid stock and capital-indexed bonds, conducting auctions to impart greater transparency in operations, allowing repos in government dated securities and Treasury bills of all maturities and issuing guidelines for setting up satellite dealers (SDs). All these measures have brought about significant changes in that a new treasury culture has been developed amongst banks and institutions so that the demand for government paper is no longer governed solely by statutory liquidity ratio (SLR) requirements but by considerations concerning the effective management of liquidity.

In consonance with the medium-term objectives of financial sector reform, the SLR was brought down from its peak level of 38.5% in April 1992 to 25% of net demand and time liabilities (NDTL) in October 1997. Moreover, there were sharp cuts in the cash reserve ratio (CRR), progressively to 10% in January 1997 from 15% in 1991.[4] The Reserve Bank's refinance facility was also rationalised while lowering the CRR – the sector-specific refinance facilities were de-emphasised and simultaneously a general refinance window was opened in April 1997.

Open market operations (OMOs) have gained considerable momentum as the Reserve Bank now responds more flexibly to market yields when drawing up its price list. It also conducts repo and reverse repo transactions in order to ensure a reasonable corridor for money market rates of interest.

The interest rate structure was rationalised. Banks are now free to determine their domestic term deposit rates and prime lending rates (PLRs), except for certain categories of export credit and small loans below Rs 0.2 million. In addition, all money market rates are also free. The most significant development in this area has, however, been the reactivation of the bank rate by linking it to all other rates including the Reserve Bank's refinance rate.

India switched over to a market-determined exchange rate system in March 1993 and current account convertibility was instituted in August 1994. Since then, a number of steps have been taken to integrate the Indian forex market with the global financial system by allowing authorised dealers (ADs) more freedom to manage their foreign

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[4] In May 1991, an incremental CRR of 10% was imposed. This was subsequently withdrawn. In August 1998, the CRR was raised to 11%.

currency assets and liberalising inward capital flows. Furthermore, with a view to moving progressively towards capital account convertibility a committee was set up and its recommendations are under consideration by the Government of India and the Reserve Bank.

3. Intermediate targets

In view of the fairly stable demand function for money, broad money (M3) has been treated as an intermediate target in the conduct of monetary policy. The Reserve Bank sets indicative broad money expansion targets in line with the expected rate of growth of GDP and a tolerable level of inflation. On the basis of the targeted level of broad money expansion, the desired level of reserve money expansion is ascertained. The order of the reserve money expansion, however, has to be consistent with the likely fiscal and external payments position. With the recent change in the institutional arrangement resulting in the phasing-out of the automatic financing of the Government's deficit, the Reserve Bank has some manoeuvrability with regard to the expansion of reserve money. The targeted M3 expansion is publicly announced through the Governor's statement on monetary and credit policy. However, a number of other indicators such as movement in interest rates, exchange rate and availability of credit to productive sectors of the economy are also considered when formulating monetary policy.

4. Operating procedures and instruments

The reform of the monetary and financial sector has enabled the Reserve Bank to expand the array of instruments at its command. The operational target of monetary policy continues to be banks' reserves, which are controlled by changes in reserve requirements effected mainly through the cash reserve ratio (CRR). However, the Reserve Bank is attempting to reduce the emphasis on the use of the CRR as an instrument of monetary control. The CRR has been progressively brought down and the liquidity management in the system is carried out through open market operations in the form of (i) outright purchases/sales of government securities and (ii) repo and reverse repo operations.

In the face of unidirectional movements in the CRR,[5] except on occasions of exchange rate volatility or necessitated by the need to sterilise capital inflows, the excess liquidity in the system was mopped up by outright sales of government securities by the Reserve Bank. Although the net demand and time liabilities (liabilities subject to reserve requirements) of the commercial banks expanded from Rs 3,602 billion in August 1994 to Rs 5,201 billion in January 1997, their deposit balances with the Reserve Bank declined from Rs 504 billion to Rs 446 billion during the same period. This would imply, that between August 1994 and January 1997, the incremental liabilities of the commercial banks were not only free from reserves but there was a release of reserves to the tune of Rs 58 billion. The liquidity pressure thus generated was to be contained by resorting to open market operations. The cumulative net outright sales of government securities during the four-year period between 1993/94 and 1996/97 amounted to Rs 216 billion. The market demand for government securities was so strong, partly aided by cuts in the CRR, that the Reserve Bank was able to offload most of its stock of marketable securities accumulated in the past. However, the reduction of marketable securities in the Reserve Bank's portfolio did not hinder the subsequent conduct of open market operations as non-marketable special securities worth Rs 200 billion were converted into marketable lots during 1997/98. Over the reform period, the market absorption of government securities was rendered possible by reforms in the government securities markets, which ensured market-related rates of interest and thus helped the development of a secondary market.

Short-term liquidity management was undertaken by repos on a regular basis. Usually, the Reserve Bank engages in repos for a maturity of up to 14 days, which is the cycle for reserve requirements. Recently, the Reserve Bank has been performing three to four-day repos to absorb very short-term liquidity and even out money market rates. During 1993/94, repo auctions were conducted on as many as 36 occasions in the interest rate range of 5–11½%. Although the frequency of repo auctions was reduced in the subsequent two years on account of tight liquidity conditions,[6] during 1997/98, repos were carried out on as many as 176 occasions (Table 2). The repo operations have become a firm

[5] The CRR was gradually reduced from 15% in August 1994 to 10% in January 1997.
[6] Repo transactions were temporarily discontinued between February 1995 and October 1996.

Table 2
Repo auctions

	No. of times	Repo amounts (Rs billion)		Cut-off repo rates (in %)		DFHI's average fortnightly call-money lending rates (in %)		
		Low	High	Low	High	Low	Median	High
1993/94	36	0.35	108	5.00	11.50	4.1	5.3	10.0
1994/95	23	0	11	5.40	7.00	3.6	11.6	27.2*
1995/96	0	–	–	–	–	9.2	13.9	31.9*
1996/97	24	3.0	42	4.00	5.48	3.2	7.8	10.2
1997/98	176	0	64	2.40	9.00	0.5	6.2	50.0*

* Reflects the phase of exchange rate volatility when the call rates were allowed to rise as a matter of policy.

fixture, with the Reserve Bank offering daily fixed rate repos for a maturity of three to four days since November 1997.

The repo rates and the amounts tendered in the repo auctions, apart from reflecting liquidity conditions, provide a floor for the overnight call-money rates. In the event of tight liquidity conditions, the Reserve Bank provides liquidity support to primary dealers in the form of a reverse repo facility in government dated securities. The conduct of such reverse repos enables the Reserve Bank to indirectly intervene in the market, alleviating undue pressure on overnight call-money rates. In addition to the repo rates, in April 1997 the Reserve Bank also reactivated the bank rate, which is now used as a signalling rate to reflect the stance of monetary policy. The interest rates on all accommodations from the Reserve Bank, including refinance, are linked to the bank rate. The use of the bank rate as an active instrument of policy can be gauged from the fact that it was changed on as many as five occasions during 1997/98, the most often so far in any financial year.

The refinance window of the Reserve Bank provides an additional source of reserves. The Reserve Bank currently provides two types of refinance facility to banks – export credit refinance and general refinance.[7] While the former facility is formula-based and extended to

[7] In addition, since September 1998 a special liquidity support facility has been put in place by way of refinance to banks which have invested in government securities out of rupee proceeds from "Resurgent India Bonds" (RIBs) issued in August 1998 to mobilise foreign currency deposits from non-resident Indians.

banks against their outstanding export credit eligible for refinance, the latter facility is provided to tide banks over their temporary liquidity shortages. Banks are eligible for export credit refinance to the extent of 100% of the increase in outstanding export credit eligible for refinance over the level of such credit in mid-February 1996, and the rate of interest on the facility is equal to the bank rate.[8] The Reserve Bank provides a general refinance facility to banks which is equal to 0.25% of each bank's fortnightly average outstanding aggregate deposits in 1996/97. This refinance is provided for two blocks of four weeks each. The rate on this refinance for the first block of four weeks is the bank rate, and for the next four weeks it is the bank rate plus 1 percentage point.

Although there is no formal corridor for interest rates, the bank rate provides an upper bound to the overnight interest rates, thereby creating an informal corridor for interest rate determination. Moreover, the spread between repo rates and the bank rate has narrowed considerably, which would imply that short-term interest rates could fluctuate in a narrow band, thereby minimising interest rate volatility. However, short-term interest rates are allowed to rise in periods of exchange rate volatility. For example, in the second half of 1995/96, the foreign exchange market experienced considerable volatility, requiring the Reserve Bank to actively intervene in the market. A panic demand for cover by importers and cancellations of forward contracts by exporters created persistent mismatches of supply and demand in both the spot and forward segments of the market. Forward premia rose sharply in October 1995, far out of alignment with interest rate differentials. The prohibitive cost of foreign exchange cover prevented banks from mobilising foreign currency assets and employing them to fund domestic assets. The exchange market intervention (net sales) by the Reserve Bank in the spot market led to a withdrawal of liquidity, causing a sharp increase in call rates given the buoyant demand for credit. Intervention, in turn, was supported by measures such as the imposition of an interest surcharge on import finance and the tightening of concessionality in export credit for a longer period. As the exchange rate stabilised, money market support was provided by the Reserve

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[8] As a temporary measure for the period August 1998-March 1999, the rate has been fixed at 200 basis points lower than the bank rate.

Bank, mainly through reverse repos conducted with primary dealers and an easing of the reserve requirements. As a result, call-money rates moved downwards to more realistic levels.

In the backwash of the Asian currency turmoil, the foreign exchange market in India once again came under severe pressure during the second half of 1997/98, obliging the Reserve Bank to undertake strong monetary policy measures in January 1998, leading to a withdrawal of liquidity and a temporary sharp increase in short-term interest rates. Once orderly conditions were restored in the foreign exchange market, the overnight interest rates reverted to the corridor provided by the repo rates and the bank rate (Chart 1).

Although there has been no explicit interest rate target, in recent years a great reliance has been placed on interest rates and exchange rates in the day-to-day conduct of monetary policy. The movements in the interest rates and exchange rate also increasingly reflect the integration of the money market and the foreign exchange market on the one hand, and various money market segments on the other hand. The interest rates on major money market instruments (91- and 364-day Treasury bills, CP and CDs) in the recent period show a cointegrating

Chart 1
Interest rate corridor
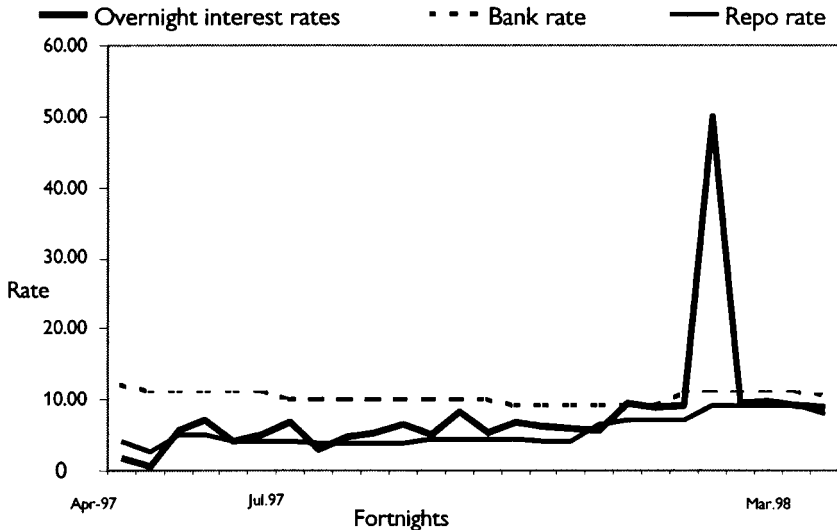
movement with a very high speed of adjustment, reflecting a convergence of money market rates which augurs well for the prospective targeting of interest rates in the conduct of monetary policy.

The use of monetary instruments in India has undergone a shift from direct to indirect instruments. The process has been facilitated by reforms in the monetary and financial system. The increasing openness of the economy and a market-determined exchange rate mean that the focus of policy should increasingly be to ensure an orderly movement in exchange and interest rates. There is growing evidence of a strengthening of the interest rate channel of the monetary transmission mechanism, which would imply that interest rates could be used as effective targets of monetary policy. Although the Reserve Bank has been relying on broad money targets as a guide for conducting monetary policy, the focus of short-term monetary management in recent times has thus been on interest rates and the exchange rate. In the light of the emerging dynamics, the monetary and credit policy announcements for the year 1998-99 have emphasised a multi-indicator approach, with movements not only in the money supply but also in a host of economic variables being tracked for policy purposes.

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A decade of monetary reform in Israel (1987–97): evolving operating procedures

David Klein

1. In the beginning[1]

When I took office in September 1987 as Senior Director, Monetary Operations and Exchange Control at the Israeli central bank, I enquired about the, to my mind, strange title of my new post: Exchange Control. I was told, there's not much to do there. You remember the utter failure of the attempt to liberalise the capital account ten years ago, in 1977? What is more, don't forget that a fixed exchange rate is our nominal anchor for stabilising prices. For that you need foreign currency reserves. You know our people: the day we liberalise the capital account we won't have even one dollar in the coffers.

What about the Monetary Operations part, I asked? Well, I was told, since a fixed exchange rate is our main policy instrument, interest rates should assist in stabilising the exchange rate to stabilise prices. But, I wondered, if the capital account is under control, and capital flows are forbidden, what can interest rates do to affect the exchange rate? Aha, they said, when it really matters, exchange controls are not terribly effective. Furthermore, we still have an annual inflation rate of 15–20%, and the public doesn't trust the fixed exchange rate regime too much; as a result, from time to time we undergo a wave of speculative attacks against the domestic currency, forcing us to devalue. We have to keep interest rates high. That much I admittedly knew – the short-term real interest rate was indeed high, at around 25%.

If this is the case, I kept wondering, how come the economy is not collapsing? Well, I was told, not everybody is paying a real rate of 25%. Is that so, I said. Yes, I was told, and the trick is directed credit. Exporters,

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[1] The dialogue referred to in this section is, in fact, a summary, from the viewpoint of a policy-maker, of several internal discussions held mainly over the period 1988–91.

importers, industrialists, agriculturists, local authorities, home-buyers, long-term real investors – they all enjoy special credit facilities, carrying below-market rates, arranged by the Treasury and by us at the central bank. Look at the balance sheets of commercial banks: most of them are composed of special government programmes, insulating borrowers from the influence of current interest rate policy.

But – I was still trying to understand the conceptual framework – if from time to time we have a speculative assault against the domestic currency and, despite the high interest rates, we have to bow before market pressures and devalue, in what sense is the exchange rate a nominal anchor, and how are we going to get rid of our double-digit inflation? Oh, that, I was told, is simple: what is needed is a well-rounded economic policy package. Remember how we reduced inflation from 445% in 1984 to 20% in 1986? We combined fiscal, monetary and incomes policies, stabilised the exchange rate and exercised price control. We should employ a similar programme once again to reduce inflation from 20% to 2%. To do that we need an opportunity, and in the meantime we sit tight and wait.

I wanted to ask: how do we recognise an opportunity when we see one, so that we can seize it? I also wanted to enquire how we seize an opportunity once we identify one. But at that point I thought that the general nature of the overall approach was already clear to me, so I decided to leave it. I did not expect, anyway, to get an operationally meaningful answer.

2. Developing a consistent strategy

Shattering this conceptual and practical edifice turned out to be a long-term project. Hyperinflation in the first half of the 1980s was a traumatic experience which helped form a relatively broad consensus around an IMF-type recovery programme in 1985, strongly supported by the US Government. No such consensus could be marshalled when, in the second half of the 1980s, the pace of inflation was "stabilised" at an annual average of "only" 18%. Was the sit-and-wait strategy to attain price stability the only one under the circumstances?

In principle, there was an alternative to the "package" approach. A well-synchronised programme is necessary when, facing an imminent

crisis, you make a quantum jump down from hyper- to moderate inflation. But normally a government has macroeconomic targets, and instruments are used to attain them. The use of one instrument should not depend, on a daily basis, on the use of other ones – as long as there is a coherent macro strategy. In such a framework monetary policy should aim, mainly if not exclusively, at other attaining price stability, while fiscal policy should take care to create other conditions for durable growth. But, one could ask back in 1987, how can one conduct an active monetary policy when government involvement in financial affairs is so wide and deep? The symptoms were there for everybody to see:

- the cost to domestic residents of borrowing foreign currency in the domestic market was more than *twice* the cost of borrowing abroad;
- the real cost of short-term domestic-currency borrowing was more than *three* times the cost of long-term borrowing in domestic currency; and
- the rate paid by short-term domestic-currency borrowers was almost *four* times the rate paid to domestic currency depositors.

It was obvious that these gaps were sustainable only through a massive administrative intervention in the financial markets by the authorities. That gave us a starting-point. We realised that we could not offer, yet, a viable monetary policy to replace the exchange rate as the nominal anchor. But we could claim, in the name of efficient resource allocation, that such high interest rate differentials were distortive and should therefore be minimised. The name of the new game was deregulation. Thus, towards the end of 1987, we had the beginnings of an agenda.

It is not our purpose here to elaborate on our deregulation policy.[2] Strong and often vehement objections were raised time and again, by the staff of the central bank and the Treasury, to each and every one of the steps taken. Nevertheless, we were able, in the last decade, to free a good deal of the money and capital markets from government intervention, and that includes meaningful progress in capital account liberalisation. This policy, coupled with making the exchange rate regime continuously more flexible, opened the way for an independent monetary policy in the 1990s.

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[2] The main details are presented in Klein, David (1994): "Financial deregulation in Israel: policy and results". In Baliño, T. J. and C. Cottarelli (eds): *Frameworks for monetary stability*. Washington D.C.: International Monetary Fund.

However, to be able to exercise it, we had to pay attention to one additional element: creating the appropriate tools. For the conduct of monetary policy it is a necessary, but not a sufficient, condition to have normally functioning financial markets. For that purpose one also needs market-based instruments. In 1987 we had practically none, and we knew it when we started our deregulation policy. We knew that it was not enough to clear the landscape; we also had to construct new modes of travelling through it.

3. Instruments of monetary policy

(i) Setting up the infrastructure for market-based instruments

In approaching the design of policy instruments, we decided to learn, as far as possible, from the experience of others. We thought that it was enough of a challenge to adapt the new tools as required to our specific circumstances, and we did not feel any urge to invent instruments that had not been tested elsewhere.

By the end of 1987 we had taken care of four essential items:

First, we established a fixed maintenance period for meeting, on a monthly average, the reserve requirements, which were the main policy instrument at the time. To be sure, there had been a maintenance period before, but it was shorter, its starting-point was not constant and, therefore, not identical for all the banks, and it was possible for certain periods to escape being covered by any given maintenance period. It was, indeed, a bizarre and confusing arrangement. In addition, the cost of not meeting the requirements was not clear-cut, and we straightened out that aspect too.

Secondly, we changed the discount window arrangement. Instead of having, as previously, one window on which every bank could draw unlimited amounts at a given interest rate, we established a ladder of windows, each one carrying a higher interest rate, and a quota in each window, for each bank, depending on its size.

Thirdly, we instituted a repo-like instrument, namely a loan to commercial banks for one week, collateralised by bank deposits held with the central bank. The interest rate and the allocation of the offered quantity among the banks were determined in an American-style auction,

where each bank paid the rate bid by it in the auction. For us it was a wholly new instrument and, in the course of time, the interest rate determined at these auctions became the key short-term interest rate in the economy, with various bank rates closely linked to it.

Fourthly, we reversed a policy of the central bank that had severely restricted an interbank trade in liquid assets. To promote an active market we offered the banking system our clearing services and, as a by-product, we came to know on a daily basis who was selling to whom, how much and at which interest rate. It turned out to be a very thriving market and a highly efficient channel for transmitting policy-induced changes in short-term interest rates.

(ii) Further adjustments

In addition to these four basic elements that created the infra-structure for linking the short-term money market to our monetary policy, we acted to shift the emphasis in our instrument portfolio towards greater flexibility. In this connection there were two items on our long-term agenda: reducing the exorbitant reserve requirements, and developing our ability to operate in the capital market.

Reducing reserve requirements

Towards the end of 1987, average reserve requirements on commercial banks' deposits amounted to 63%, either held in the form of deposits with the central bank, most of which were remunerated at below-market rates or invested in government bonds. The requisite percentage depended mainly on the nature of the deposit (foreign currency, index-linked or non-linked) and not on its time to maturity.

Following the practice in most other countries, and for the same reasons, we decided to cut reserve requirements to what we labelled "business" level, that is, the level at which banks will want to hold reserves even if there is no formal obligation to do so. Furthermore, we wanted the new requirements to be only in the form of deposits with the central bank and only in non-linked domestic currency. Ten years after we started, the job is almost completed. The average requirements in 1997 are 3%, all of which is held with the central bank, and only the part held against foreign currency deposits of foreign residents still in foreign currency.

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The gradual reduction of reserve requirements also led to another change. Bank deposits with the central bank were the collateral for the loans extended to the banks in the framework of repos. As those deposits dwindled, we moved over to accepting government bonds as collateral.

Open market operations

Developing instruments that would transmit the message of monetary policy through the capital market proved to be particularly difficult. The capital market itself was still in the early stages of development and the Treasury monopolised whatever was there to finance the budget deficit and recycle the large government debt. Any activity on the part of the central bank in this market was perceived as "competition" and thus could not be allowed.

Nevertheless, in this desert grew a small tree, although it was nothing much to write home about at first. In 1984, when everybody was looking for ways to deal with hyperinflation, the Treasury agreed to enact a special law creating a new monetary instrument. Under this law the Treasury could issue a short-term note (Treasury bill, as it is called in other countries) the maturity of which would be up to one year. This note, so the law stated, would serve only monetary policy needs and not the financing of the budget deficit. However, to make sure that the central bank would not turn it into a major instrument, the law put a nominal ceiling on the quantity that could be issued, and added that any increase in that ceiling would need the approval of the Minister of Finance and Parliament.

Over the years we were able to improve the lot of this instrument, the only one available to us in the capital market. Today the ceiling is updated automatically, twice a year, according to the change in the means of payment or the change in consumer prices, whichever is higher. However, it is still not a major instrument and it will not be until we have a free hand in determining the quantities. Nevertheless, there is a reasonable daily trading in this instrument, and its yield serves as a benchmark for pricing another, longer-term, variable rate, non-indexed government bond. Furthermore, the short-term note serves as the underlying asset for another instrument that we at the central bank have developed – one that enables trading in interest rate futures.

Other than that, we are not operating in the capital market as part of our monetary policy. Taking into account the growing importance of non-banking intermediation in Israel, open market operations as an instrument of monetary policy should assume more importance.

Updating the use of repos

This brief survey of our instruments would not be complete if we did not cover more recent developments in our use of repos.

Towards the end of 1990 we added a daily auction to the weekly one which we launched in 1987. Both served us well for five years, until, in the mid-1990s, we started to experience a period of capital inflows. Owing to the constraints of the exchange rate band, we had to buy foreign currency and sterilise the resultant increase in the money supply. The sterilisation reduced our loans to commercial banks almost to zero and prompted us to use reverse repos, i.e. we began accepting deposits from the banks, rather than extending loans to them through the same auction system.

4. The situation in the late 1990s

Most, if not all, policy-makers in Israel, nowadays accept that precisely synchronised, all-embracing, multifaceted economic programmes that clearly distinguish, on a given day, between the past and the future, are suitable only for crisis management. Regular economic policy should be based on some division of labour among government institutions, operating within a coherent framework to attain known targets.

Much has been done over the last decade to put in place the infrastructure required for such a modus operandi. Concentrating on monetary policy, the following items are noteworthy:

- the setting of annual monetary targets aimed at price stability in the long term was introduced in 1992;
- understanding of the channels through which the short-term interest rate, our operating target, affects inflation, our final target, is increasing.[3] As a result, we regularly follow a set of indicators as the basis for the daily, weekly and monthly meetings at which we discuss the need, if any, to adjust policy;

- in the meantime the central bank continues to co-operate with the Ministry of Finance to complete the deregulation of financial markets and the liberalisation of the capital account. The near-term agenda includes reforming pensions, changing the nature of exchange control to permit any foreign currency transaction unless explicitly forbidden, and further examining and adapting our exchange rate regime.

The main task ahead of us is, still, to convince the Government and the public that price stability is conducive to durable growth. Otherwise we will be required as before to take care also of unemployment, growth, balance-of-payments deficits, the well-being of the stock exchange and even the redistribution of income to reduce inequality. As long as this remains the case, the road to price stability is going to remain a rough and long one.

[3] The staff of the Monetary Department are engaged in quantifying, through econometric and other research methods, the relationships between policy instruments and the target. Some of the findings are reported in Klein, David (1998): "Transmission channels of monetary policy in Israel". In "The transmission of monetary policy in emerging market economies". *BIS Policy Papers*, No. 3, Basle: Bank for International Settlements.

Recent developments in monetary policy operating procedures: the Korean case

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Introduction

The process of financial liberalisation gained momentum from the beginning of the 1990s when the first step of a four-stage interest rate deregulation plan was put in place in 1991. The liberalisation of interest rates had been completed by July 1997 except for those on products having the characteristic of pure demand deposits. At the same time the opening of financial markets and the liberalisation of the foreign exchange market were further accelerated after Korea's admission to the OECD in late 1996. The currency crisis in late 1997 further boosted the pace of financial market opening and foreign exchange liberalisation. Actions taken in response included the opening of both the capital and money markets and the shift to a floating exchange rate system. All these measures have contributed towards a more efficient allocation of resources and have helped create a more competitive economic environment.

In addition, various reform measures were put in place in the financial markets in which the Bank of Korea's open market operations are carried out. Among them, measures taken to revamp the structure of the call market are particularly important. The Bank of Korea has done its utmost to improve the effectiveness of monetary operations: measures have been taken to enhance the effectiveness of monetary policy instruments, elaborate market-based operations and streamline the payment and settlement system. At the same time the Bank has used the overnight call rate as its operational target in addition to bank reserves in implementing its daily operations since December 1997.

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Details of recent changes in the financial environment are provided in Section 1. Section 2 explains the measures taken to improve the effectiveness of monetary policy. Section 3 describes the objectives and intermediate target of monetary policy, the operational target, monetary programming and details of the implementation of monetary operations including forecasting liquidity, the available policy instruments, and signalling and transparency. Finally, recent experiences of monetary operations and an empirical assessment of the performance of recent operations under a deregulated environment are provided in Section 4.

1. Recent changes in the financial environment

Many restrictions on financial markets and foreign exchange were relaxed or abolished in order to accelerate the globalisation and internationalisation of the Korean economy from the beginning of the 1990s. Most notably, the Government and the Bank of Korea announced a four-stage interest rate deregulation plan in 1991. Deregulation went into high gear as a result of the "Blueprint for Financial Liberalisation" and "Market Opening" in July 1993 and the "Foreign Exchange Reform Plan" in December 1994. Furthermore, Korean financial liberalisation has gathered pace since Korea's OECD admission in October 1996.

The currency crisis in late 1997 that erupted just after the completion of these "scheduled" changes necessitated more intensive deregulation and liberalisation. A wide range of economic policies was challenged once Korea came under IMF supervision; the Government changed microeconomic structures, including the organisation and functions of the Bank of Korea and macroeconomic policies.

(i) Implementing interest rate deregulation

In August 1991 a four-stage interest rate deregulation plan (Table 1) was established to promote the allocation of funds through the price mechanism and strengthen the competitiveness of the domestic financial industry.

The first stage of the plan was carried out in November 1991 with the deregulation of most short-term lending rates of banks and non-bank financial institutions. Rates on most money market instruments and time

deposits with maturities of at least three years were liberalised along with coupons on corporate bonds with maturities of at least two years.

The second round of deregulation in November 1993 freed up all lending rates of banks and non-bank financial institutions except for those on loans financed by the Government or by Bank of Korea rediscounts. Rates on time deposits with maturities of at least two years and coupons on all bonds including financial debentures were also liberalised.

The third stage of deregulation was partially effected in July 1994, phasing out regulations on maturities of short-term financial instruments such as certificates of deposit (CDs), repurchase agreements (repos) and commercial paper (CP). In addition, rates on some loans supported by the Bank's rediscounts and on deposits with maturities of at least one year were freed up in December 1994. In July 1995 rates on all loans supported by the Bank of Korea were deregulated and rates on time deposits with maturities of at least six months were freed up. Furthermore, all deposit rates except those on demand deposits were liberalised in November 1995.

In July 1997 interest rates on demand deposits were liberalised and restrictions on the maturities and minimum denomination of short-term money market instruments were lifted as the fourth stage of deregulation. At the same time commercial banks were permitted to issue financial debentures and introduce money market deposit accounts (MMDAs). Accordingly, all interest rates are now liberalised except for rates on products having the characteristic of pure demand deposits such as cheque, passbook and temporary accounts.

Until December 1997, there had been a legal ceiling on interest rates of 25%. However, the mounting downward pressure on the Korean won after the currency crisis in November 1997 made the legal ceiling a binding constraint for the scope of stabilisation in the foreign exchange market. At the end of 1997, the Government raised the ceiling to 40%, lifting it completely in January 1998.

(ii) Opening of financial markets and liberalisation of foreign exchange market

Capital market opening

The opening of the domestic stock market to foreigners in January 1992 marked a new phase of capital market liberalisation. The ceiling on

overall foreign investment in any listed company was initially set at 10% and then gradually raised, with by far the largest increase being implemented after the outbreak of the currency crisis in November 1997. The net effect was to bring the ceiling to its current level of 55% in January 1998.

It was not until July 1993 that the first consolidated timetable for capital market opening was prepared with the main features of the Blueprint on Capital Market Opening being announced. These included the replacement of the previous system by a notification system for foreigners' direct investments in Korea and for Korean companies' issuance of bonds in overseas markets. In addition, foreign investment in non-guaranteed corporate bonds issued by small and medium-sized enterprises (SMEs) was allowed.

In December 1994 the Government announced the Foreign Exchange Reform Plan incorporating the previous Blueprint: capital transactions were to be liberalised in three phases, bringing the level of liberalisation up to that in most industrialised countries by 1999. Procedures for inward direct investment were streamlined and restrictions on institutional investors' outward portfolio investment were greatly eased in 1994. International organisations were authorised to issue floating rate notes denominated in won in 1995. In addition, commercial loans to SMEs were allowed.

In preparing for OECD admission, the Government decided to accelerate liberalisation in 1996. Restrictions on outward direct investment were streamlined: under this revised system, outward direct investment projects are deemed automatically approved unless applicants are notified otherwise within 15 days of their application. Furthermore, financial loans extended by non-residents, which had been strictly regulated, were allowed for large companies participating in major infrastructure projects. The ceiling on outward investment was abolished and the scope of foreign securities in which institutional investors may invest was widened to include short-term financial instruments such as CP.

In 1997 foreigners were allowed to purchase domestic beneficiary certificates for domestic stocks as well as public bonds. However, the desperate need for the country to build up foreign exchange reserves after the currency crisis gave increased momentum to domestic bond market opening. Purchases by foreigners of corporate, government and

Table 1
Deregulation of interest rates

	Lending rates	Deposit rates	Coupons
First stage (21.11.91)	– Bank overdrafts and discounts on commercial bills, excluding loans assisted by BOK rediscounts – Discounts on commercial paper and trade bills of investment and finance companies, etc. – Overdue loans	– Short-term large denomination deposit instruments such as CDs, trade bills, commercial paper and repos – Time deposits and trust products with maturities of at least three years	– Corporate bonds with maturities of at least two years
Second stage (01.11.93)	– All loans of banks and non-bank financial institutions, excluding those assisted by government funds or BOK rediscounts	– Time deposits with maturities of at least two years – Installment-type deposits with maturities of at least three years	– Corporate bonds with maturities of less than two years and all financial debentures – Monetary stabilisation bonds and all government and public bonds
Third stage (18.07.94)		– Minimum maturities of short-term marketable products shortened (from 91 days to 60 days) – Banks permitted to handle cover bills	
(01.12.94)	– Some loans assisted by BOK rediscounts such as discount of bills	– Time deposits with maturities of at least one year – Installment-type deposits with maturities of at least two years	
(24.07.95)	– All loans assisted by BOK rediscounts	– Time deposits with maturities of at least six months – Installment-type deposits with maturities of at least one year – Maturities of short-term marketable products shortened (from 60 days to 30 days)	
(20.11.95)		– Time deposits with maturities of at least one month – Installment-type deposits with maturities of at least six months	
Fourth stage (07.07.97)		– All deposits except pure demand deposits such as cheque, household cheque, passbook and temporary accounts	

public bonds, which had originally been scheduled for 1999, were liberalised in December 1997. The Government thereby abolished all restrictions on foreign investment in domestic bonds.

Furthermore, foreign investment in short-term money market instruments such as CP and CDs was permitted in February 1998. Commercial loans to large companies were also admitted. Moreover, friendly take-overs of Korean companies by foreign investors were allowed, although the acquisition of a majority or more than 15% of the equity of companies whose asset size is over 2 trillion won still needs approval. As a result, Korea has made great strides towards a completely open capital market system comparable to that of most industrialised countries.

Foreign exchange liberalisation

The introduction of a market-average foreign exchange rate system in 1990 was a crucial step in progress towards an advanced foreign exchange management system in Korea. Under this system, the daily basic exchange rate of the won against the US dollar, namely the market-average exchange rate, was determined by the weighted average of won/USdollar transactions conducted on the previous business day among foreign exchange banks. The daily fluctuation of the market-average exchange rate was widened from the initial 0.4% above or below the basic rate to 10% either way on 20th November 1997. The recent currency crisis spurred greater liberalisation: the daily fluctuation limit was eliminated with effect from 16th December 1997, effectively launching a floating exchange rate system.

In addition, to reduce foreign exchange risk and foster the development of the foreign exchange market, from the beginning of the 1990s the restrictions on banks' foreign exchange positions and underlying documentation requirements evidencing real demand for foreign exchange transactions were substantially relaxed.

In a related move in September 1992, the positive-list system for the management of foreign exchange was replaced by a negative-list system. Whereas under the old system all foreign exchange transactions had been prohibited in principle unless exempted by the authorities, the new system allowed all foreign exchange transactions unless specifically restricted. The foreign exchange concentration system was almost completely dismantled in February 1995.

Lowering entry barriers to the financial industry

As the liberalisation of financial markets progressed, entry barriers were gradually relaxed in consideration of competitive conditions in the markets. In banking, entry barriers were lowered at the end of the 1980s. Six new nationwide commercial banks entered the market between 1989 and 1992. As for foreign banks, 22 branches were established between 1990 and 1997. Foreign branches operating in Korea were progressively placed on an equal footing with domestic banks by lifting certain restrictions on their operations and reducing their privileges. In August 1998 there were 13 nationwide commercial banks, eight local banks and 52 foreign bank branches in Korea (Annex I).

The establishment of domestic and foreign securities companies, which had been prohibited since the 1960s, was again allowed in the 1990s. In 1991 under the Act Concerning Merger and Conversion of Financial Institutions, five investment and finance companies changed their business form to that of securities company and a new securities company started trading. As a result, there were 56 securities companies including 21 foreign securities company branches in August 1998. With the progressive broadening and deepening of the financial market, remaining entry barriers will be generally lifted.

(iii) Restructuring the financial sector

The exit of insolvent financial institutions was made easier in an attempt to strengthen the competitiveness of financial industries. In March 1997, to provide the institutional framework for the restructuring of the financial industry, the Act Concerning the Merger and Conversion of Financial Institutions was extensively revised and retitled the Act Concerning the Restructuring of Financial Institutions. The revision stipulated that, to encourage voluntary mergers between financial institutions, government measures of support for such mergers be announced in advance. It also simplified the merger process and shortened the period of time required for a merger. This Act is playing a key role in activating restructuring by merger, take-over, and purchase and assumption. Many institutions are involved in negotiations aimed at meeting Basle capital adequacy ratios and acquiring competitiveness.

The launch of the IMF programme in December 1997 provided an opportunity to reshape the microeconomic structure of the financial industry that had remained unchanged for a long time.

The independence of the central bank was strengthened by the revision of the Bank of Korea Act in December 1997 which entered into force in April 1998. The ultimate goal of monetary policy implemented by the Bank of Korea was clearly defined as price stabilisation. In the meantime the banking supervision duties of the Bank of Korea were restored to the Government. Financial supervision had been divided between many bodies including the Bank of Korea. It was consolidated with the establishment of the Financial Supervisory Commission (FSC) which covers all financial institutions.

In the face of severe financial turmoil in December 1997 the Government began to realise that panic might lead to bank runs and jeopardise the overall financial markets unless insolvent financial institutions were compelled to suspend trading or close down. From mid-December 1997 many financial institutions hit by reduced credibility started to display symptoms of insolvency in the face of huge withdrawals of deposits and difficulties in borrowing money in the call market. A sharp deterioration in the liquidity conditions of many merchant banks resulted in the compulsory suspension of trading of 14 of the 30 merchant banks in December 1997. Two securities companies and one investment and trust company were also ordered to suspend trading in the same month. In addition, the shareholders' equity of two troubled nationwide commercial banks was written down substantially and the Government recapitalised them by subscribing shares in January 1998.

The business licences of 16 merchant banks and four securities companies were revoked at the end of August 1998. Two investment and trust companies also suspended trading and their assets were acquired by the other investment and trust companies. In addition, of the 12 undercapitalised commercial banks, five suspended trading at the end of June 1998 and their business is being transferred to five commercial banks under purchase and assumption. The remaining seven under-capitalised banks were required to submit implementation plans to increase their Basle capital adequacy ratios, which will require the FSC's approval. In August 1998 two of them, both nationwide commercial banks, announced plans to merge. Banks whose implementation plans are

not approved will be subject to mandatory mergers or transfers of business under purchase and assumption, or required to exit under the Prompt Corrective Action procedures.

The need to allay deepening public anxiety over the soundness of the financial system led the Government to revise the Deposit Protection Act, bringing various types of financial instruments within the scope of guarantees by the Korea Deposit Insurance Corporation whose debentures were in turn fully backed by the Government. By this measure, the troubled financial system could escape its creeping paralysis.

The other problem undermining the stability of the financial industry was the unsustainable bad loans of financial institutions. The moral hazard endemic in the government-led development system had prompted domestic financial institutions to compete on asset scale rather than profitability. Economic recession further worsened the non-performing loan problem which, left the to the market mechanism, threatened the viability of the domestic financial industry as a whole.

In this context, the Government decided to swap the non-performing assets of financial institutions for government-guaranteed bonds. Bad loan resolution and deposit insurance contribute to stabilising financial markets and enhancing financial institutions' Basle capital adequacy ratios. However, they need a huge amount of money which has to be raised by issuing government-guaranteed bonds in the market. Government-backed bonds to the value of 64 trillion won are to be issued by the end of 1999 and money financed by the issuance of those bonds will be used to recapitalise financial institutions and repay depositors of closed and failed financial institutions.

2. Measures taken to improve the effectiveness of monetary policy

(i) Enhancing the effectiveness of monetary policy instruments

As the four-stage interest rate deregulation plan and other financial liberalisation schemes proceeded, the Bank of Korea did its utmost to expand and improve its monetary policy instruments. Measures taken to reform monetary policy instruments included the lowering of minimum reserve requirement ratios, a sharp reduction of the aggregate ceiling on

the Bank of Korea's discount window and the introduction of free competitive bidding for open market operations.

Lowering reserve requirement ratios

Until the early 1990s the Bank of Korea made frequent use of changes in reserve requirement ratios for managing domestic liquidity. In particular, they were actively used during the late 1980s when the Korean economy experienced a substantial current account surplus. In an effort to absorb the excess liquidity generated by the external sector, the average reserve ratio of 4.5% in 1986 was raised to 10.4% in 1990.

Although this measure was dictated by the pressure of circumstances, this episode suggested that frequent changes in reserve requirement ratios might bring about three main problems. First, because required reserves in Korea are non-remunerated, an increase in the ratios places banks at a competitive disadvantage in deposit-taking vis-à-vis non-bank financial institutions which are not subject to reserve requirements. Korean experience was that banks' share in deposit-taking continued to fall sharply, largely as result of the high reserve requirements imposed on them. More specifically, banks' share in total deposits fell from 48.8% in 1985 to 34.9% in 1990, and to 28.1% in 1997. Secondly, since reserve requirements are enforced on the basis of a strict regulatory framework, heavy reliance on changes in reserve requirement ratios for monetary control gives a central bank less scope for implementing market-oriented operations. This could in turn well delay the further development of financial markets. Finally, changes in reserve requirement ratios are probably not an effective tool in managing the liquidity of non-bank financial institutions. In particular, the effectiveness of changes in reserve requirements may well be more limited in managing liquidity where financial markets are more highly compartmentalised.

In view of these problems, the Bank of Korea no longer makes active use of changes in reserve requirements in managing domestic liquidity. The decisive break came with the sharp reduction of reserve requirement ratios undertaken in three steps between April 1996 and February 1997 (Table 2). The main purpose was to improve banks' profitability and competitiveness in deposit-taking vis-à-vis non-bank financial institutions which had not so far been subject to reserve requirements. The average reserve requirement ratio of 9.4% in March 1996 was lowered to 3.1% by February 1997. Along with these

measures, a 2.0% reserve requirement was introduced on deposit-taking through the sale of CDs upon the abolition of ceilings on their issuance in February 1997.

More recently the Monetary Board decided to raise the permissible ratio of vault cash in banks' reserve requirements. Specifically, banks were allowed to hold up to 35% of their reserve requirements as vault cash from 23rd May 1998 against the previous maximum of 25%.

Introducing and reducing the aggregate credit ceiling on the discount window

As a result of government-led economic development during the 1960s and 1970s, the original function of discount policy, to control the availability of bank reserves, had been substantially weakened. This is because a significant proportion of loans through the discount window was to a substantial extent operated as an automatic rediscount facility in support of policy or quasi-policy loans.

At the same time, on the price dimension of discount policy, changes in the discount rate in Korea did not significantly influence the volume of bank reserves. The main reason for this is that the discount rate was set at an artificially low level regardless of the movements of interest rates since the main role of the discount window was to support policy and quasi-policy loans.

The Bank of Korea undertook a couple of measures in this area in an attempt to restore the original function of discount policy. First, in accordance with the progress of financial liberalisation, the Bank substantially revised its rediscount and loan system in March 1994 (Table 3). The Bank of Korea's automatic rediscount facilities for commercial bills, export financing, etc. were then replaced by an aggregate credit ceiling system. Under this system the Monetary Policy Committee sets the aggregate ceiling for the entire banking sector every quarter and the Bank allocates credit quotas to individual banks each month within the range of the quarterly aggregate credit ceiling, according to predetermined performance criteria. Furthermore, several policy loans previously provided through the Bank's automatic rediscount facilities were transferred to fiscal funds.

Despite these measures, flexible adjustment of the aggregate credit ceiling was very limited in practice because a significant proportion of loans were still extended to support SMEs. In consideration of this, the

Table 2
Minimum reserve requirement ratios
In percentages

Type of deposit	Ratio			
	Previous	Revision of 23.04.96	Revision of 08.11.96	Revision of 23.02.97
Domestic currency deposits				
Employees' property formation savings				
Employees' long-term savings				
Employees' savings for housing loans	3.0	No change	2.0	1.0
Long-term savings deposits for housing				
Mutual installment deposits				
Housing installment deposits				
Time deposits with maturities of at least two years	8.0	6.0	4.0	2.0
Installment savings deposits with maturities of at least two years				
Time deposits and installment savings deposits with maturities of less than two years	11.5	9.0	7.0	
Cheque deposits, passbook deposits, savings deposits, preferential savings deposits and company savings deposits	11.5	9.0	7.0	5.0
CDs	None	None	None	2.0
Foreign currency deposits				
Non-residents' accounts	1.0	No change	No change	No change
Residents' accounts	11.5	9.0	7.0	No change

Table 3
Revision of the Bank of Korea's loan facilities

Previous	Revised (March 1994)
– Rediscount of commercial bills – Loans for foreign trade – Funds for SMEs, etc.	– Included within the aggregate credit ceiling
– Loans for agriculture, fishery and livestock	– Transferred to fiscal funds by end of 1998
– Loans for temporary shortages of reserve requirements	– Unchanged
– Loans related to SMEs – Loans for defence industry – Other policy-based loans	– Abolished (or transferred to fiscal funds)

Bank of Korea substantially reduced the ceiling in 1996 and 1997 as part of an operation to sterilise the additional liquidity induced when reserve requirements were lowered on the second and third occasions. More specifically, in accordance with the lowering of the minimum reserve requirement ratios, the aggregate credit ceiling was reduced from 9.2 trillion won to 6.4 trillion won effective from November 1996 and to 3.6 trillion won with effect from February 1997.

However, since the currency crisis in late 1997, the aggregate credit ceiling has been raised twice owing to the extreme difficulties faced by SMEs in accessing loans from financial institutions because of the severe credit crunch associated with financial sector restructuring. More specifically, the ceiling was raised from 3.6 trillion won to 4.6 trillion won with effect from mid-December 1997 and to 5.6 trillion won with effect from March 1998. Furthermore, no significant progress has been made so far in the area of flexible adjustment of the discount rate in accordance with the movement of market interest rates. Since a considerable share of loans through the discount window are still directed at SMEs, the discount rate has remained at 5%.

Elaboration of market-based operations

Along with the progress in interest rate deregulation, the use of open market operations has become the main instrument for the market-based management of reserve money. Since 1989 the Bank of Korea has

employed transactions with repos involving government bonds as an important instrument for the control of banks' short-term liquidity. In 1993 it introduced competitive bidding for repos and monetary stabilisation bonds (MSBs) on a limited basis with the main bidders being non-bank financial institutions. Since December 1995 it has actively employed free competitive bidding for issuing MSBs to banks, reflecting prevailing market rates in setting the acceptance price for bids. As a result, in 1996 the competitive bidding ratio for the Bank's repo transactions (the proportion of the total offered through competitive bidding) rose to 99.1% and that for the issuance of MSBs to 89.1%. Furthermore, the Bank of Korea has since February 1997 applied the method of competitive bidding to all offers of repo transactions and all issues and redemptions of MSBs.

The Bank also wishes to widen the range of instruments used in its market operations, including the activation of outright transactions involving government bonds, and to increase the frequency of market operations. Similarly, the scope of its counterparts for repo transactions was expanded to non-bank financial institutions such as merchant banks, securities companies, and investment and trust companies in September, October and December 1997 respectively. These measures greatly contributed to enhancing the effectiveness of liquidity management as well as the efficiency of monetary policy in respect of non-bank financial institutions.

(ii) Revamping the structure of the call market

The brokers in the call market in Korea had been eight investment and finance companies which converted into merchant banks in 1996. These companies were allowed to participate in the call market as both brokers and dealers in order to promote the smooth adjustment of surpluses or shortages of short-term funds among financial institutions, including non-bank financial institutions, and hence to integrate the segmented market.

However, the actual operation of the call market was not as satisfactory as had been expected. The participation of the merchant banks as brokers and dealers in the call market raised concerns about the transparency of the brokerage system. Since the main business of the merchant banks was to discount CP, there was scope for them to take

advantage of their role as call market brokers and dealers when they needed to raise funds for their own account.

Another more fundamental problem was recognised: since all transactions could be conducted either directly or through the brokers, direct transactions among banks continued at lower interest rates than those among or involving non-bank financial institutions. There were therefore two separate call markets, one among commercial banks and the other among non-bank financial institutions. This segmentation of the call market limited the scope not only for achieving a more efficient allocation, but also for the Bank of Korea to fine-tune short-term interest rates through its liquidity management.

Against this backdrop, after active consultations with the Bank of Korea, the Government took measures to revamp the structure of the call market in July 1996. The main feature was the establishment in November 1996 of the Korea Money Broker Corporation as the sole broker in the call market.

This measure was aimed at integrating the call market which was segmented between banks and non-bank financial institutions so that a more competitive market environment could result. Another objective was to enhance the representativeness of call rates and the scope for the Bank of Korea to fine-tune short-term interest rates.

(iii) Streamlining the payment and settlement system

There are two main categories of interbank payment and settlement systems in Korea. One is the net settlement system which includes the cheque clearing system, the bank giro system, the interbank cash dispenser ATM network system and the interbank funds transfer (IFT) system. It is a service system for transferring amounts of less than one hundred million won between banks. The other is BOK-Wire which is a real-time gross settlement (RTGS) system. At present all domestic banks and some foreign bank branches take part in the net settlement system while all banks including foreign bank branches handling payment and settlements in the interbank market participate in BOK-Wire.

BOK-Wire was launched in December 1994 to cope with the increasing volume of settlements. Through BOK-Wire, large-value financial transactions among banks, urgent money transfers of companies and other financial institutions and transactions with the Bank of Korea

are settled intraday. Even though BOK-Wire is basically an RTGS system, it also provides final clearing for fund transfers generated by the net settlement system.

To ensure settlement, the Bank of Korea employs two kinds of safety devices: a settlement risk management system established in September 1997 and temporary credit facilities. The settlement risk management system imposes net debit caps, collateral requirements and a loss-sharing arrangement among participants as preventive measures. Banks falling short of settlement balances are permitted to access temporary credits from the Bank of Korea, but the interest on them is at a penalty rate, set at 2% above average call rate during the half-month period expiring two days earlier than the maintenance period of bank reserves. Temporary credits are in fact rarely used since banks can borrow funds to cover shortages of settlement balances from the call market in almost all cases and at substantially lower rates.

3. Monetary operating procedures

(i) Strategic aspects of monetary policy implementation

    Objectives and intermediate targets of monetary policy

There is a consensus that the final objectives of monetary policy are the stabilisation of prices, appropriate expansion of output, attainment of full employment and maintenance of external equilibrium. By and large, policies designed to achieve these objectives inevitably involve some trade-offs. Among these objectives, however, price stability is widely accepted to be not only an end in itself but also a necessary condition for achieving the other objectives. Price stability contributes to economic efficiency by reducing the uncertainties that tend to inhibit investment, directs resources to productive economic activity that might otherwise be diverted to mitigating the financial effects of inflation, and ensures greater efficiency of allocation in financial markets by reducing uncertainties associated with business and household financial decision-making.

In carrying out monetary policy, central banks set and operate a variety of intermediate targets so as to work effectively towards their final objectives. The Bank of Korea has long focused on a chosen

monetary aggregate rather than interest rates in its two-stage monetary control procedure to grapple with the persistent high inflation accompanying rapid economic growth.

For over 15 years from 1979, the Bank of Korea adopted M2 as the main intermediate target of its monetary policy. The rationale behind the adoption of M2 was based on empirical findings of a stable relationship between M2 and macroeconomic variables such as a nominal income and price level. In addition, M2 was found to be superior to other aggregates in terms of controllability.

However, the reliability of M2 as the intermediate target has declined noticeably since the mid-1990s, given the large portfolio shifts in the deposits of financial institutions that were to a large extent caused by financial liberalisation. In particular, the realignment of the money-in-trust system in May 1996, carried out to distinguish clearly between money-in-trust products and time and savings deposits, triggered large portfolio shifts from deposits in banks' trust accounts to time and savings deposits due mainly to the lengthening of maturities and the hike in cancellation fees. Hence, MCT which captures the effect of these portfolio shifts was adopted as an intermediate target in 1997 (Table 4).

The Bank of Korea currently uses M3, the broadest monetary aggregate, as its intermediate target, having adopted it in late 1997 in consultation with the IMF. This more closely reflects the large portfolio shifts between banks and non-bank financial institutions, triggered by the implementation of the fourth stage of the interest rate deregulation plan in July 1997.

Table 4

Composition of monetary aggregates in Korea

Reserves money = Banknotes and coin issued + reserve deposits of deposit money banks at the Bank of Korea
M1 =　Currency in circulation + demand deposits at deposit money banks
M2 =　M1 + quasi-money (time and savings deposits and residents[1] foreign currency deposits at deposit money banks)
MCT = M2 + CDs + money in trust
M3 =　MCT + deposits at other financial institutions + financial debentures issued + commercial bills sold + repos + cover bills

Figure 1
Changes in intermediate target
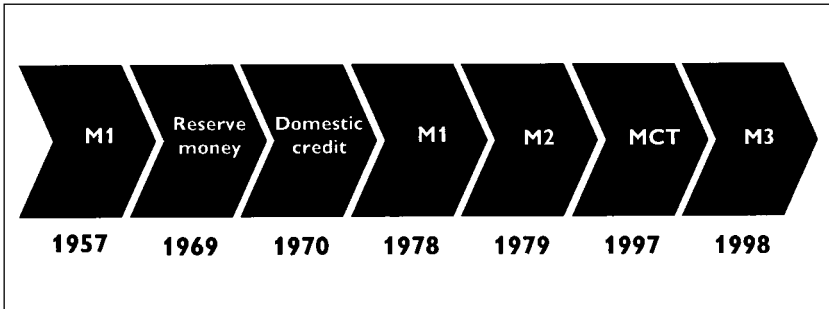
The frequent changes in intermediate target in recent years clearly demonstrate the practical difficulty faced by the Bank of Korea in selecting an intermediate target during the process of financial deregulation (Figure 1). This is because the movements of the monetary aggregates have become more and more difficult to interpret, given the large portfolio shifts among different financial assets during the process of financial liberalisation.

Operational target

Until recently the Bank of Korea exclusively employed bank reserves as its operational target in day-to-day monetary operations. This reflected the fact that the financial environment was not mature enough for the Bank to adopt monetary operations centring on interest rates. More specifically, the corporate sector, given its high leverage ratio, has been generally very sensitive to interest rate movements. At the same time it was difficult for the monetary authority to identify an appropriate short-term interest rate which could fully reflect demand and supply conditions at the very short-term end of the financial markets, due mainly to the de facto segmentation of the call market between banks and non-bank financial institutions.

Nevertheless, the Bank closely monitored the movements of interest rates and tried to influence them, particularly the overnight call rate, while maintaining its control over bank reserves. This is because interest rates played an ever more important role in the transmission mechanism

of monetary policy as deregulation of interest rates neared completion. At the same time call rates have increasingly reflected supply and demand conditions at the short-term end of the yield curve, thanks to the measures aimed at integrating the segmented call market, including the establishment of the Korea Money Broker Corporation as the sole broker for the call market in July 1996.

Since the economy was hit by the currency crisis of late 1997, exchange rate stability has become a crucial concern for the monetary authority in its daily implementation of monetary operations. The Bank has thus had to manage short-term interest rates more flexibly in view of their close linkages to the foreign exchange market. Acting in close consultation with the IMF, the Bank of Korea decided to adopt the overnight call rate as its key operational target in addition to bank reserves.

Consequently, the Bank of Korea now uses both bank reserves and the overnight call rate as its operational targets. In its actual implementation of monetary operations, however, the relative importance of the two operational targets depends critically on ongoing monetary conditions. For instance, if the recent development of monetary growth is judged to be stable enough to sustain price stability over the medium and long term or if restoring the stability of the foreign exchange market becomes a more urgent task for the monetary authority, greater emphasis is placed on the overnight call rate in day-to-day monetary operations. However, if the development of monetary growth raises concerns about an acceleration of inflation over the medium and long term, the monetary authority focuses more closely on the actual level of bank reserves vis-à-vis its bank reserves target in its day-to-day monetary operations.

Monetary programming

In order to control the money supply, the Bank of Korea needs to set the target level of its intermediate target, M3. The Monetary Policy Committee is responsible for formulating the stance and direction of monetary policy. It approves monetary policy directives in its regular meetings on a monthly, quarterly and annual basis.

The process of setting the monetary target starts with projections of key macroeconomic variables including inflation rate and GDP growth rate. Once the projection of key macroeconomic variables is finalised,

Table 5

Monetary aggregates: target and actual growth rates
In percentages

	Target growth		Actual growth	
	M2	MCT	M2	MCT
1989[1]	15–18	–	18.4	25.7
1990[1]	15–19	–	21.2	27.6
1991[2]	17–19	–	18.3	21.4
1992[2]	18.5	–	18.6	24.9
1993[2]	13–17	–	17.3	23.2
1994[2]	14–17	–	17.6	23.6
1995[2]	12–16	–	13.7	22.0
1996[2]	11.5–15.5	–	17.8	18.6
1997[2]		15–20		14.9

[1] Annual growth rate compared with averaged monetary aggregate of the preceding year.
[2] Growth rate of averaged monetary aggregate calculated on a December-to-December basis.

the Bank decides its target inflation rate. Using these variables, the monetary authority decides the level of its intermediate target.

Currently, the EC method or a modified version of the Fisher equation is used to estimate the annual and quarterly target range of M3, considering GDP growth projections, the target inflation rate and projected changes in the velocity of money. In this process, one practical difficulty is the projection of changes in the velocity of M3. For this, both trend analysis and an econometric model are employed. While trend analysis captures the long-term trend and seasonal factors of the velocity, the econometric model captures the effects on the velocity of economic variables such as permanent income and degree of financial sophistication.

At the same time the Bank of Korea sets up annual and quarterly reserve money target ranges, which are consistent with the corresponding M3 targets by using the M3 multiplier. The Bank also makes projections on reserve money during the corresponding target periods. In the case of monthly programming, the Bank focuses more on the reserve money target rather than the M3 target because there is a two-month lag in the collection of preliminary data on M3.

Once all this work of targeting and forecasting has been done, the Bank's staff prepare a set of documents for approval by the Monetary Policy Committee including: (i) the most up-to-date developments in the financial markets and monetary area as well as real economic activities; (ii) the most likely monetary and financial environments during the target period; (iii) projections of its intermediate and operational targets; and (iv) alternative thrusts of monetary operations under a number of different scenarios. This set of documents is prepared on a monthly, quarterly and annual basis.

The Monetary Policy Committee meets on the first and third Thursday of the month. It discusses the direction of monetary policy at its first meeting of every month, quarter and year. After its deliberations, the Committee decides and approves the policy directives concerning monetary operations during a specified period and passes the approved directives to the operational department. The Committee has full autonomy in deciding the policy directives which include, among others, operational targets such as the overnight call rate and bank reserves. The operational targets in the policy directive are usually specified as a range rather than a specific level, given the volatility of financial markets.

(ii) Implementation of monetary operations

Forecasting liquidity

The successful implementation of a central bank's liquidity management depends critically on the monetary authority's ability to project the volume of liquidity generated by autonomous factors and sterilise the disturbances caused by them. The starting point in this context is how to forecast demand and supply in bank reserves as accurately as possible.

In principle, the Bank of Korea projects bank reserves at the beginning of each reserve maintenance period since the standard planning horizon of liquidity management in Korea is 15 or 16 days, coinciding with the maintenance period of bank reserves. The Bank currently adopts semi-lagged reserve requirement rules. Under these rules, banks have to hold required reserves computed on the basis of every half month's average deposits outstanding during a maintenance period that lags the computation period by seven days. The maintenance period corresponding to the first half month's computation period falls

between the eighth day and twenty-second day of the month, while that corresponding to the second half runs from twenty-third day of the month to the seventh day of the following month.

In the first stage, the Bank of Korea forecasts the expected level of demand for bank reserves at the beginning of each half-month reserve maintenance period by using the reserve money and M3 target. In estimating demand for bank reserves, the Bank first estimates reserve requirements which are consistent with the reserve money and M3 target. It also forecasts cash demand by the private sector, an important factor affecting demand for bank reserves, on the basis of information from various sources including payroll and bonus payments of diverse entities such as major corporations, schedules of national holidays and the historical trend of cash movements.

Once demand for bank reserves is estimated, the Bank of Korea forecasts the expected supply of bank reserves with particular emphasis on the autonomous factors which generate their supply. In doing so, it takes into account demand and supply in fiscal funds, schedules for government bond issuance and redemption, its own rediscount loans and repayments, interventions in the foreign exchange market and flows of currency to and from banks. During the reserve maintenance period, the Bank estimates the autonomous factors of bank reserves and revises this projection every business day based on newly acquired information.

Historically, net lending to the government has been the most volatile sector in Korea (Table 6). Fluctuations are particularly wide during the period from October to February, reflecting the heavy concentration of government expenditures around the end of the year. The variation in net foreign assets can also be quite substantial, especially when the foreign exchange market is more volatile.

The forecast autonomous factors, which affect bank reserves, are always subject to sizable errors even though considerable resources are devoted to obtaining timely information on the past and likely future behaviour of the more volatile factors. In particular, notwithstanding the day-to-day revisions, net lending to the government is the most difficult area to forecast since the amount and timing of disbursements of government expenditures are always very uncertain and subject to frequent change. For instance, scheduled disbursements of certain government expenditures which are confirmed one morning are often

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delayed owing mainly to technical problems in the process of gaining approval for them.

Net foreign assets are also a difficult item to project, especially when the Bank of Korea needs to intervene heavily in the foreign exchange market. However, since the value dates of a major proportion of transactions in foreign exchange markets were changed from "value today" to either "value tomorrow" or "value spot" as part of the modernisation of the foreign exchange markets in 1994, the Bank's staff now know the scale of intervention at least one day before settlement.

In collecting the various types of information which may affect the autonomous factors, the Bank does not rely on any formal institutional arrangements. Instead, to gather the relevant data, its staff make frequent phone calls to the many related departments within the Bank and to various outside institutions ranging from the Ministry of Finance and Economy to local tax collection authorities.

Day-to-day liquidity management

While the Monetary Policy Committee is primarily responsible for formulating the monetary policy stance, the Financial Markets Department is solely responsible for day-to-day implementation. The staff of the Financial Markets Department decide details of monetary operations including the choice of instruments and the timing, frequency and size of operations.

Table 6

**Mean and standard deviation of autonomous factors:
January 1993 – May 1998**

In billions of won

	Mean* (A)	Standard deviation* (B)	Coefficient of variation (B/A)
Bank reserves	− 58.4	1,221.1	20.90
Autonomous liquidity position			
Net foreign assets	273.4	1,646.0	6.02
Net lending to government	147.5	2,368.4	16.06
Other net assets	−534.9	3,551.8	6.64
Cash	56.2	1,184.3	21.08

* Of monthly changes.

At the end of each reserve maintenance period, staff finalise the projection of bank reserves on a daily basis during the coming reserves maintenance period. At the same time they make sure that projected bank reserves are consistent with achieving the reserve money or M3 target. Based on this information, staff decide the general direction of monetary operations including the setting of the bank reserve target during the reserve maintenance period.

The direction of day-to-day operations is set every day, considering the most recently revised projections of bank reserves, demand for bank reserves, the target level of operational targets and the most up-to-date information on movements of supplementary indicators. In this context, the role of supplementary indicators is to judge the thrust of monetary policy from a medium-run perspective and make sure that the current stance of monetary policy is in line with achieving its ultimate objectives.

As supplementary indicators, the Bank of Korea currently uses: (i) the exchange rate; (ii) narrower monetary aggregates such as M2 and MCT; (iii) long-term interest rates; and (iv) domestic credit. The selection of supplementary indicators and the relative importance attached to each of them depend on the priority of the policy objectives and the ongoing conditions of the financial and monetary environment. For instance, when achieving the stability of the foreign exchange market was an urgent task for the monetary authority after the recent currency crisis, the exchange rate became a relatively more important supplementary indicator.

Once the direction of its daily operations is determined, the Bank's staff decide on the instruments and size of the operations. In selecting the tools to be used, an important consideration is whether an excess or deficiency of bank reserves is a structural or a short-term phenomenon. In general, instruments with long-term maturities are employed when the imbalance is judged to be a structural phenomenon, while instruments with a short-term maturity are employed when the excess or deficiency is judged to be a short-term phenomenon.

After the implementation of its monetary operations, the Bank's staff check whether the outcome of the operations is consistent with the monetary authority's intention and determine whether or not additional operations are desirable. Since the Bank's projections of bank reserves are subject to sizable errors, a close look at the response of market participants after the operations is an important step in this context for

the monetary authority to check the accuracy of its projection of bank reserves and decide on the need for additional operations. This is because unexpected reactions on the part of the financial markets after an operation often reflect a difference between the markets' projections and those of the monetary authority and hence provide useful information as to the accuracy of the monetary authority's projections. At the close of the business day, staff evaluate the performance of the day's operations and revise their projection of bank reserves on the basis of information acquired during business hours.

Available monetary policy instruments

In implementing its monetary operations, the Bank of Korea essentially uses three orthodox instruments – reserve requirement policy, lending and rediscount facilities, and open market operations – to affect the availability and cost of liquidity to banking institutions and influence overall monetary and credit conditions. In addition to these policy instruments of an orthodox nature, the Bank is endowed with such policy instruments as setting and altering interest rates and controlling the volume of bank credits directly in periods of excessive expansion in money supply and intolerable acceleration of inflation.

However, as the liberalisation of financial markets had progressed remarkably, both direct controls and moral suasion such as window guidance were lifted in February 1991 so that they are no longer available. At the same time, among the three orthodox policy instruments, changes in reserve requirement ratios might not be well suited for normal monetary operations while the scope for flexible adjustment of the aggregate credit ceiling of the Bank's discount window and the announcement effect of changes in the discount rate are very limited at the moment. Open market operations have therefore become the main instrument in daily monetary operations.

Open market operations

The Bank of Korea currently has two tools for open market operations: repos involving government and government-guaranteed bonds and MSBs, and outright transactions involving government bonds and MSBs. Repos are used when an excess or deficiency of liquidity is judged to be a temporary phenomenon or short-term interest rates need to be fine-tuned, while outright transactions are employed when

an excess or deficiency of liquidity is confirmed as a structural phenomenon.

Repo operations

Since 1989 the Bank of Korea has developed repos as its main tool in open market operations. This is because repo operations do not require a liquid secondary market for the underlying securities. This aspect is particularly important in the case of Korea where the secondary markets for government and government-guaranteed bonds are not well developed.

However, one practical difficulty faced by the Bank is that it is difficult to assess the proper collateral values of the underlying securities involved in repos because their secondary markets are too thin for their market values to be quoted. In these circumstances, a potential problem faced by the Bank is that lack of proper assessment of the collateral value of the underlying securities could leave it vulnerable to loss. For instance, if the Bank provided liquidity through its repo operations based on an overvalued assessment of the underlying assets and its counterparts failed to repay, it could incur a loss. In order to overcome this problem, the Bank currently uses what is termed the "conservative haircut" assessment method. Under this approach, the collateral value of the underlying securities is determined uniformly by the lowest market value of any of them.

Repos are generally used to fine-tune bank liquidity. Although their periods range from one day to 91 days, repos with a maturity of 10 days or less are most frequently chosen. In general, longer-term (7–15 days) repos are used to absorb (cover) non-temporary reserve surpluses (shortages) while very short-term (2–3 days) repos are intended to modify day-to-day fluctuations in bank reserves.

When the Bank of Korea detects a clear tendency towards reserve surpluses (shortages), it selects longer-term repos to tighten (ease) bank reserves. These longer-term repo operations are called "keynote operations". Through them, the Bank can signal clearly its intention to financial institutions so that they can adjust their reserves smoothly during the maintenance period. Short-term repos are implemented mainly to smooth out temporary fluctuations in reserves and their use is confined to reserve surpluses (shortages) arising for reasons which are both unexpected and not easily avoidable.

Repos used to be carried out on the basis of amount-tenders. However, in March 1993 the Bank adopted a new scheme for repo transactions whereby their amounts and interest rates were determined by a process of competitive bidding aimed at enhancing market-based liquidity management. This method has been applied to all repo transactions since February 1997. When offering repos by competitive tender, the Bank selects either of two methods to set the price depending on financial market conditions: the American type method where the price or interest rate is that offered in the tender, or the Dutch type method where the lowest price or highest interest rate among successful tenders is uniformly applied. The Bank currently makes use of the Dutch type method on sales of repos and the American type method on purchases of repos.

The Bank of Korea began repo operations with merchant banks in September 1997, with securities companies in October 1997, and with investment and trust companies in December 1997. The main reason for this was that commercial banks, in the wake of the increasing credit risk of their counterparts in call markets, became more reluctant to deal with other non-bank financial institutions from the latter part of 1997, greatly heightening the volatility of call rates. To deal with this problem, the Bank decided to include additional institutions in the range of participants in its repo auctions. As a result, its counterparts for repo transactions increased during 1997 from 30 banks to 87 financial institutions. The Bank's operation desk sends counterparts the auction notice by BOK-Wire, the Bank's electronic funds transfer network, around half an hour before the auction. The auction itself is carried out by means of the electronic bidding system, introduced in July 1997 as a subsystem of BOK-Wire. Successful bidders must clear their settlement balances within banking hours on the same day.

Outright transactions

In operating outright transactions, the Bank buys and sells government bonds, government-guaranteed bonds and MSBs issued by itself in the open market. In practice, outright transactions mainly involve MSBs, reflecting the still limited availability of government and government-guaranteed bonds. However, outright transactions in government and government-guaranteed bonds have been employed more frequently as the secondary markets in these bonds become more active.

At present, MSBs are issued by competitive auction or direct sale. The interest rate on an MSB issued by competitive auction applies equally to all successful underwriters through the Dutch type method, while the direct sale rate is set at a slightly lower level than the competitive bidding rate to encourage active participation of financial institutions in the competitive bidding. In contrast, the Bank of Korea selects the American type method when it carries out early redemption of MSBs and outright purchase of government and government-guaranteed bonds. Similarly, the Dutch type method is applied to outright sales of government bonds.

In practice, the Bank notifies the auction of MSBs to its counterparts comprising banks, trust accounts of banks, merchant banks, securities companies, securities investment and trust companies and life insurance companies by BOK-Wire every Thursday. The auction takes place at 2 p.m. on the Friday of the same week by electronic bidding. The Bank also informs all participants of the auction outcome by BOK-Wire. Successful bidders deposit funds with the Bank by the following Monday. Instead of drawing physical securities in bearer form, most financial institutions register their MSBs in book-entry form. The scale of weekly issuance of MSBs is determined on the basis of such factors as MSBs' redemptions and money and reserve conditions.

There are 11 MSB maturities ranging from 14 days to two years: 14 days, 28 days, 63 days, 91 days, 140 days, 182 days, 364 days, 371 days, 392 days, 546 days and two years. In December 1996 the Bank introduced its first coupon-bearing MSBs, which have a two-year maturity with quarterly coupons, in a move to diversify the instruments available to it for open market operations. The ceiling on the volume of MSBs which may be issued is determined by the Monetary Policy Committee as a percentage of M2, currently 50%.

Signalling and transparency

One important consideration in conducting market-oriented monetary operations is how best to reinforce any influence that liquidity adjustments by the central bank may have on interest rates through specific mechanisms vis-à-vis market participants. As reserve requirements have been reduced to approach the level of the working balances banks should maintain for their payments and settlements business, signalling has become more important to achieve interest rate

objectives and limit the volatility of short-term interest rates, given the very low interest elasticity of the demand for working balances and the importance of expectations about future short-term interest rates.

Until recently, the Bank of Korea paid less attention to the market signalling effect of its monetary operations. This reflected, among other things, two reasons: (i) greater focus was placed on quantitative objectives as the country continued to suffer from chronic inflationary

Table 7

Instruments for open market operations

	Repos	Outright transactions
Auction purpose	Fine-tuning	Absorbing structural liquidity surplus (shortage)
Frequency and interval	As occasion demands	Government and government-guaranteed bonds: when needed MSBs: every week
Maturity of auction instrument	Within 91 days	Government and government-guaranteed bonds: no limit MSBs: principally 364 days
Type of underlying security	Government and government-guaranteed bonds and MSBs	Government and government-guaranteed bonds and MSBs
Counterparts[1]	Banks, merchant banks, securities companies, investment and trust companies	Banks, trust accounts of banks, merchant banks, securities companies, life insurance companies[2]
Auction procedure	By tender: Providing liquidity: American-type method Absorbing liquidity: Dutch-type method Auction results made public	By tender: Providing liquidity: American-type method Absorbing liquidity: Dutch-type method Auction results made public
Impact of tender rate on other money market rates	Influences call rates directly and thereby those in other short-term financial markets	Financial debentures with maturity of one year
Incidence of, and measures to prevent, non- competitive practices	No incidence Measures include Suspension of auction participation, cancellation of counterpart status	No incidence Measures include suspension of auction participation, cancellation of counterpart status

[1] No restriction in principle but every year the Bank issues a new list of eligible counterparts.
[2] Excludes life insurance companies for outright transactions of government bonds.

pressure; and (ii) the role of interest rates in the transmission mechanism of monetary policy was relatively weak given the segmented nature of financial markets and the regulation of interest rates.

As the deregulation of interest rates nears completion and domestic financial markets are increasingly integrated into international financial markets with the progressive removal of restrictions on cross-border financial flows, the role of signalling in the process of market operations has become more important. This is particularly so in Korea, where the announcement effect of changes in the discount rate is severely limited due mainly to the lack of flexibility in discount rate adjustment and developing other signalling mechanisms has emerged as an important task.

Before the overnight call rate was adopted as an operational target, the Bank of Korea sent signals to financial institutions by altering quantities, maturities and bidding times of its open market operations. For example, the Bank advanced the bidding time for reverse repos or offered larger quantities or longer maturities than expected in the financial markets when it intended to lower market interest rates.

Since the Bank started to use overnight call rates as its operational target, the public announcement of the successful bidding rate immediately after the auction has become a more important signalling mechanism. By adjusting the amount and the internally acceptable interest rate at auctions, the Bank can change the successful bidding rate, and the subsequent public announcement of this rate can convey its intention regarding short-term interest rates. For instance, if the Bank intends to raise short-term interest rates, it increases the scale of its auction in absorbing operations and raises its internally acceptable bidding rate so as to push up the successful bidding rate of the auction. Thus the public announcement of the higher successful bidding rate is interpreted by market participants to mean that the Bank is about to raise short-term interest rates.

In line with this, the Bank of Korea tries to disclose all the relevant information about the details of its monetary operations on a timely basis in order to enhance the transparency of its monetary policy. Decisions of the Monetary Policy Committee which are followed by immediate measures are made public by press release immediately after the meeting. Resolutions and minutes are published in the monthly bulletin issued by the Bank of Korea two or three months after the

meeting. The Bank also announces a target range for monetary growth and periodically publishes economic statistics. At the same time it discloses information on its open market operation auctions associated with repo transactions, outright transactions of government bonds and issuance or early redemption of MSBs. The auction notice covering bidding time, quantity and maturity of an operation is circulated to its trading counterparts through BOK-Wire and released to the press half an hour before the auction. Details of the outcome of the auction including quantity and average interest rate of successful bids are made available to the press immediately after the auction. However, information on individual contracts is never released.

One important issue in the context of the transparency of monetary operations is whether or not a central bank should make public the specific level of operational targets. Making public the specific level of its operational targets might well help a central bank since it would give clear signals of the monetary authority's intention to all market participants and thus help bring about the desired monetary environment. However, it could also result in a loss of central bank credibility if the monetary authority frequently deviated from its announced course in the face of sudden changes in financial market and monetary conditions. The likelihood of this problem would be much greater in countries suffering severe financial turmoil.

In the case of Korea, the specific ranges of the operational targets are not made public after the Monetary Policy Committee meeting. There are two main reasons why the Bank of Korea believes it premature to make specific targets public. First, since the Bank has only recently adopted the overnight call rate as an operational target and the financial market environment has remained volatile following the currency crisis, public announcement of a specific short-term interest rate target might well result in a loss of market credibility for the Bank. This is because the highly volatile financial market environment makes it difficult for the Bank to commit itself to a pre-announced target. Secondly, Korean financial markets need to be further widened and deepened. Managing the short-term interest rate strictly in line with a pre-announced target might prevent market forces from playing a fully effective role in interest rate determination, further delaying financial market development.

4. Recent experiences in monetary operations

(i) Monetary operations before and after the currency crisis

Patterns of the autonomous factors of liquidity generation

Figure 2 displays the recent pattern of selected autonomous factors: net foreign assets, net lending to the government, other net assets and cash. Net foreign assets became a huge liquidity absorption channel between October and December 1997, reflecting the contemporary currency crisis. However, net foreign assets have shifted to a liquidity supply channel since the beginning of 1998, following the country's adoption of a floating exchange rate regime and the resumption of capital inflows. Figure 2 also shows the heavy bunching of government expenditures around the end of 1997. The sharp drop in other net assets in December 1997 reflected offsetting changes in the higher valuation of net foreign assets following the sharp depreciation of the won. Cash has become a liquidity supply channel since December 1997, reflecting the fact that the public sought to minimise their cash holdings in the face of the severe contraction of economic activity and higher interest rates.

Figure 2
Recent pattern of autonomous factors
In trillions of won
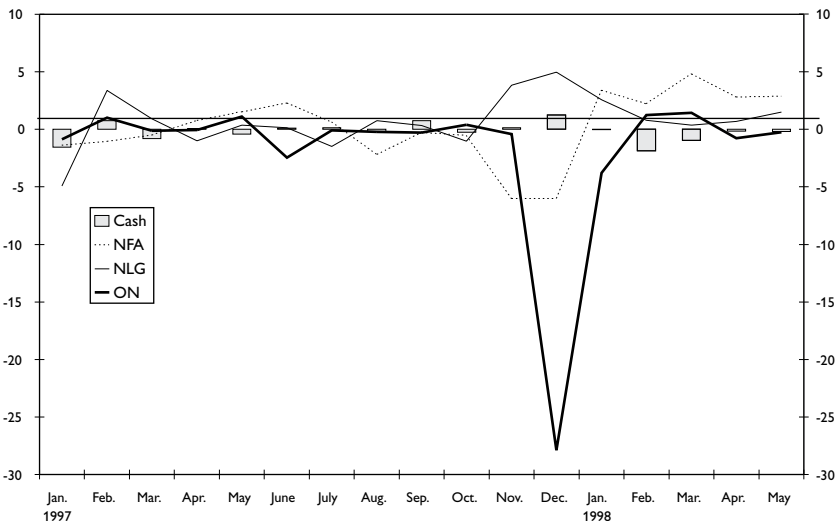
Table 8 compares the average and the variability of each autonomous factor during the recent period with those of the previous period. Most notably, net foreign assets have become the most variable item, reflecting the volatile movements of foreign capital flows. Both net lending to the government and cash have shifted on average to a net supply channel during the recent period, and their variability has declined significantly.

Implementation of monetary operations

In early 1997 a large number of highly leveraged *chaebol*, interlinked Korean business groups or conglomerates, became insolvent. The high rate of insolvencies reflected a number of factors, including excessive investment in certain sectors, weakening export competitiveness and the Government's new-found willingness to allow troubled *chaebol* to fail. The insolvencies spilled over into a sharp increase in the non-performing assets of financial institutions.

At the same time Korea's external financing situation deteriorated markedly in late October 1997 following the sharp decline in the Hong Kong stock market on 23rd October and the downgrading of Korea's sovereign risk status by credit rating agencies such as Standard & Poor's. New external financing virtually dried up and substantial difficulties were experienced in rolling over the relatively large amount of short-term debt, bringing about a currency crisis. In just two months, between the end of October and the end of December 1997, the won lost around 32% of its value.

Symptoms of the twin crises, both the financial crisis and the currency crisis, have made the Bank of Korea's monetary operations very complicated. While the deterioration of profitability in both the financial and the corporate sectors called for lower interest rates, the heavy pressure on the won required a high level of interest rates. Before an impending currency crisis became clearly apparent, the response of the Bank's monetary policy was to adopt an eclectic approach in day-to-day monetary operations while keeping the growth in MCT, its intermediate target, at a lower rate. The Bank of Korea tried to raise the overnight call rate when pressure on the won appeared to be very heavy and it tried to lower the overnight call rate when the foreign exchange market appeared to be stabilising. Consequently, the call rate was stabilised at around 14% and MCT growth edged below the bottom of its target range.

Breakdown of net autonomous position
In billions of won

	January 1993 – December 1996			January 1997 – May 1998		
	Mean* (A)	Standard deviation* (B)	Coefficient of variation (B/A)	Mean* (C)	Standard deviation* (D)	Coefficient of variation (D/C)
Net foreign assets	304.6	779.0	2.56	185.6	3,007.3	16.20
Net lending to government	–53.9	2,394.4	44.39	716.3	2,265.1	3.16
Other net assets	–58.5	656.1	11.21	–1,789.7	6,825.9	–3.63
Cash	143.0	1291.7	9.03	– 189.1	788.8	–4.17

* Of monthly changes.

However, this eclectic approach could not be sustained as there was mounting downward pressure on the won and the Bank's official reserves dried up rapidly from early November 1997. As a result, the Korean Government turned to the IMF at the end of November 1997.

In the face of mounting downward pressure on the won, an urgent task for the Bank of Korea was to prevent its further depreciation. Under these circumstances, the Bank of Korea needed to manage short-term interest rates flexibly in view of their close linkages to the foreign exchange market. Therefore, acting in close consultation with the IMF, the Bank of Korea decided to adopt the overnight call rate as an operational target in addition to bank reserves.

After adopting the overnight call rate as its operational target and in a desperate bid to stabilise the foreign exchange market, the Bank raised the overnight call rate to 25%, the legal maximum interest rate, at the beginning of December 1997. Despite this measure, the strong downward pressure on the won did not ease and it depreciated sharply. In view of this, the Bank raised the overnight call rate to over 30% in late December 1997 after the ceiling on interest rates had been raised to 40%. This high level of short-term interest rates was maintained until the foreign exchange market had stabilised in February 1998.

Table 9
Recent trends of selected economic indicators

	March	June	Sept	Nov	Dec	March	June	Aug
			1997				1998	
Overnight call rate[1] (%)	13.03	11.55	14.42	12.10	31.32	22.05	14.41	8.51
Won/US dollar exchange rate[1]	897.1	888.1	965.1	1,163.8	1,415.2	1,378.8	1,385.2	1,331.8
Official foreign reserves[1] (US$ bn)	29.15	33.32	30.43	24.40	20.41	29.75	40.90	45.09
Usable foreign reserves[1] (US$ bn)	21.14	25.31	22.42	7.26	8.87	24.15	37.04	41.35
MCT growth[2] (%)	17.7	14.8	14.1	13.3	14.7	9.5	8.4	6.6
Current account[1] (US$ m)	−1,793.5	−223.0	−509.9	864.0	3,585.4	3,630.4	3,240.8	–
Capital account[1] (US$ m)	2,309.1	1,929.4	452.3	−4,464.4	−6,370.5	−192.1	−47.9	–
Monthly change in CPI (%)	0.4	0.2	0.5	0.1	2.5	− 0.2	0.0	0.3

[1] Month-end. [2] Average rate of increase compared with the same period of the previous year.

After the strong downward pressure on the won had eased owing mainly to overshooting of domestic short-term interest rates and partial restoration of confidence in the international financial markets, the Bank's dual aims in its monetary operations were to build up and maintain a cushion of foreign reserves and to bear down progressively on the upward trend of inflation. In this context, the Bank faced a practical problem in determining the level of the overnight call rate consistent with achieving these goals.

First, in seeking to build up and maintain a comfortable level of foreign currency reserves, the Bank of Korea was in a dilemma. In the short and medium term, it had to secure inflows of foreign portfolio investment. At the same time, however, it needed to prevent any further

deterioration of the export industries which would generate foreign currency reserves in the long term. Achieving short and medium-term objectives called for higher interest rates, while lower interest rates were required for achieving long-term objectives. The ideal level of interest rate might therefore be the lowest possible rate that could still attract sustainable capital inflows in the form of foreign portfolio investment.

Theoretically, one way to find this target level of the interest rate would be to apply the interest rate parity theory. In this way, the target level can be estimated by adding to the annual benchmark yield of foreign investors in Korea the annualised rate of the forward premium over the spot exchange rate. However, given the instability of spot rate movements since the crisis and the high volatility of the forward exchange rate reflecting the thinness of the market, applying this method has been problematic.

At the same time the Bank faced two other practical problems in finding the target level of the interest rate consistent with curbing inflation in the medium term: (i) uncertainty as to how rapidly the lagged effects of changes in the exchange rate feed through into inflation; and (ii) difficulty in assessing the effects of exchange rate movements on inflation given the greater increase in exchange rate volatility since the crisis broke.

In order to overcome these practical problems, the Bank of Korea tried to find the ideal level for the overnight call rate on a trial-and-error basis. More specifically, it gradually lowered the rate within a very narrow range, keeping a close watch on the development of the foreign exchange market and foreign capital inflows as well as on inflation. Consequently, the overnight call rate, which had been running at 30% in late December 1997, was progressively brought down to around 8% at the end of August 1998.

Thanks to these efforts by the Bank of Korea as well as other measures taken by the Government, the foreign exchange market stabilised markedly from March 1998. The won stabilised at around 1,300 won per US dollar in August 1998 from a peak of 2,100 won in December 1997. In addition, the country's usable foreign reserves increased sharply to over $41 billion at the end of August 1998 from around $7billion at the end of November 1997. At the same time monthly inflation, in terms of the consumer price index, eased to 0.3% in August 1998 from a peak of 2.5% in December 1997.

(ii) Empirical assessment of the performance of recent monetary operations

As the Bank of Korea accommodates the movements of financial market conditions with a primary emphasis on market sentiment, market-oriented operations play an increasingly important role in its implementation of monetary policy. However, their employment is based on the recognition that a more quantity-oriented approach may well result in greater volatility in interest rates with little or no gain in the controllability of the intermediate target. The Bank's reactions to disturbances in financial markets depend on its assessment of their causes, severity and likely duration and on judgements about market sentiment and dynamics.

In this context, the Bank of Korea had in recent years strengthened its focus on interest rates, mainly the overnight call rate, and it had also attempted to smooth out sudden large swings in short-term market interest rates. As a result, the volatility of the overnight call rate had been declining until November 1997. However, it increased substantially after the crisis in response to the Bank's attempt to manage short-term interest rates to stabilise the foreign exchange markets. On the other hand, the volatility of the reserve accumulation ratio (RAR), a proxy for bank liquidity positions, has continuously increased over the same period. This implies that the Bank has focused more on financial market conditions, such as short-term interest rates and the exchange rate, than on bank reserves as it had before the crisis.

Table 10

Volatility of interest rates and the reserve accumulation ratio

	Coefficient of variation standard deviation/mean			
	1995	1996	Jan.–Nov. 1997	Dec. 1997–Aug. 1998
Overnight call rate	0.17	0.16	0.09	0.26
91-day CD yield	0.11	0.11	0.07	0.21
Three-year bond yield	0.10	0.04	0.07	0.22
Reserve accumulation ratio	0.19	0.16	0.25	0.38

Note: Figures calculated on daily data.

An interesting empirical question is whether it is possible for the Bank of Korea to use the call rate as its operating target by using time-series data before the currency crisis. To test this possibility, a structural VAR model is estimated using recent historical data, following Clarida and Gertler's methodology, to identify the Bank of Korea's behaviour with respect to the overnight call rate. The notional policy reaction function of the overnight call rate is estimated under an assumption that the Bank has used the overnight call rate as its operational target. If the estimated policy reaction function of the call rate is consistent with economic theory and its coefficients are statistically significant, the call rate could be adopted as a useful policy variable by the Bank of Korea. The signs of the coefficients are estimated to be in accordance with economic theory, implying that the Bank has raised the call rate in the event of an unanticipated increase in money supply or depreciation of the currency, although the significance level of each coefficient is quite low.

The empirical result weakly supports the possibility of adopting the overnight call rate as an official operational target. The result appears to reflect the fact that the Bank of Korea has become increasingly dependent upon market-oriented operations, which inevitably demands that it maintain an acceptable level of market interest rates, either covertly or overtly (details of results in Annex II).

Another interesting empirical question is whether the effects of the monetary operations on financial market conditions have changed following the adoption of the overnight call rate as an operational target. More specifically, the question is whether the effects of bank reserves, which have been used by the Bank as its operational target for more than 10 years, or of the public announcement of the repo rate on selected market interest rates have changed before and after the adoption of the overnight call rate as an operational target. To do this, Granger's causality tests are applied.

Granger's causality tests are carried out using daily time-series data to analyse the precedence of these two variables vis-à-vis financial market conditions during the period from January 1995 to October 1997 and during the period from January 1998 to August 1998 respectively, excluding November and December 1997 which were particularly influenced by the currency crisis. The same test is run for the repo rate and market variables for the post-crisis period when the Bank has made

intensive use of the overnight call rate as its operational target. The RAR is used as a proxy variable for bank reserves. The repo rate is the successful bidding rate at auction for maturities of one or two days. As variables to represent financial conditions, the overnight call rate, yields on three-month CDs and yields on three-year corporate bonds are employed.

During the period from January 1995 to October 1997, the causality turning from the RAR to all three interest rate variables is found to be significant. However, after the beginning of 1998, the causality from the RAR to interest rates is not clear while the unidirectional causality of the repo rate on market interest rates becomes strongly significant. From these empirical results (Annex III), it is fair to infer that bank reserves influenced financial market conditions until 1997, but that the repo rate, rather than bank reserves, has indeed influenced financial market conditions since the beginning of 1998.

5. Conclusions

The pace of change in monetary operations in Korea has accelerated since 1996 as financial liberalisation including interest rate deregulation, capital market opening and foreign exchange liberalisation nears completion. During liberalisation the Bank of Korea has been concentrating its efforts on elaborating its monetary policy instruments. Measures adopted have included lowering the reserve requirement ratio, reducing the aggregate ceiling on rediscounts and introducing competitive bidding for open market operations. In addition, reforms of the call market and the payment and settlement system have been carried out with a view to enhancing the efficiency of financial markets.

At the same time various efforts have been made to reform the actual execution methods of monetary operations. Market-based monetary operations have been more actively used and the Bank of Korea has made efforts to enhance its signalling capacity and the transparency of its operations in order to convey its intentions regarding money market conditions in a convincing and credible manner. It has increasingly emphasised the movements of short-term interest rates and the exchange rate in its monetary operations. In addition, the

Bank has employed the overnight call rate as its operational target since December 1997.

Despite these efforts, it must be admitted that there remains scope for further progress in the area of monetary operations in Korea. The apparent stickiness of central bank lending and rediscount facilities has made the Bank of Korea rely more on open market operations. While heavy reliance on this market-oriented instrument is desirable in a normal situation, the limited scope for alternative instruments leaves open the possibility of the sustainability of market-oriented operations being jeopardised in the event of a sharp deterioration of macroeconomic conditions. The diversification of monetary policy instruments thus appears important.

To alleviate the burden placed on open market operations and establish a mechanism for transmitting signals of central bank intentions, the rigidity of the Bank of Korea's lending and rediscount facilities must be lessened. In this context, an initial step should be to remove the direct linkage between the remaining loans subject to the aggregate credit ceiling system and directed loans as soon as circumstances permit so that discount policy can serve as a safety valve to complement the Bank's open market operations in the event of an unexpected change in macroeconomic conditions and a sharp fluctuation in the money market situation. In addition, the Bank of Korea's rediscount rate needs to fully reflect the prevailing market-determined interest rates and regain its function in transmitting policy signals regarding the desired level of interest rates.

Annex I

Financial institutions in Korea
August 1998

Central bank		The Bank of Korea
Banking institutions (deposit money banks)	Commercial banks	Nationwide commercial banks (13) Local banks (8) Foreign bank branches (52)
	Specialised banks	Industrial Bank of Korea National Agricultural Cooperative Federation National Federation of Fisheries Cooperatives National Livestock Cooperatives Federation
Non-bank financial institutions	Development institutions	Korea Development Bank Export-Import Bank of Korea Korea Long-Term Credit Bank
	Savings institutions	Trust accounts of banking institutions Mutual savings and finance companies Credit unions Mutual credit facilities Postal savings
	Investment institutions	Merchant banking corporations (14) Securities investment trust (management) companies (30) Korea Securities Finance Corporation
	Life insurance companies	Life insurance companies (33) Postal life insurance
Other institutions		Securities companies (54) Credit guarantee funds (2) Leasing companies (25) Non-life insurance companies (17)

Annex II

Policy reaction function

Structural VAR approach

The Bank of Korea's policy reaction function is estimated by using a structural VAR model, following the methodology developed by Clarida and Gertler (1996), on the assumption that the Bank has treated the overnight call rate as its operational target. The estimation of the policy reaction function is carried out in order to confirm whether a short-term interest rate, namely the overnight call rate, could be adopted as an operational target.

The general model is

$$\text{Structural VAR:} \quad Y_t = CY_t + \sum_{i=1}^{\infty} A_i Y_{t-i} + e_t \tag{1}$$

$$\text{Reduced form:} \quad Y_t = \sum_{i=1}^{\infty} B_i Y_{t-i} + u_t \tag{2}$$

where C, Ai and Bi are square coefficient matrices and the diagonal elements of C are equal to zero.

The relationships among the coefficient matrices and the innovations of the variables are derived from equations 1 and 2.

$$B_i = (I - C)^{-1} A_i \quad \Rightarrow \quad u_t = (I - C)^{-1} e_t \tag{3}$$

For the analysis, five variables are chosen to describe the Korean macroeconomy: the industrial production index (ip) and the consumer price index (p) characterise the real economy, and money supply (M3), the overnight call rate (r) and the won/US dollar exchange rate (er) are the Bank of Korea's policy variables. All the variables used in this analysis are monthly data and are seasonally adjusted. The data are chosen during the period from January 1991 to August 1997 since interest rate deregulation started in 1991. Finally, four variables (ip, p, M3, er) are logged and the model includes six lags (1, 2, 3, 6, 9, 12) for a parsimonious parameterisation, given the inadequate length of the sample period.

In order to solve the identification problem, a number of assumptions are adopted. First, there is a recursive structure among variables with ordering ip, p, M3, r and er. Secondly, the innovations of M3 are determined by those of ip, p and r, while innovations of r are influenced by those of M3 and er. Finally, exchange rate innovations may be influenced by any of the other innovations in the system.

The estimates of the structural VAR are shown in Table 11. The signs of the estimated coefficients are in general consistent with the economic theory, although they are not statistically significant. The policy reaction function of the call rate suggests that the monetary authority raises the overnight call rate upon unanticipated increases in the money supply (M3) and currency depreciation. The impulse responses of the call rate (Figure 3) also indicate that a rise in the call rate induces the temporary reduction of inflation and M3, and causes the currency to appreciate, but its impact on industrial output does not appear to be clear enough.

Table 11
Structural VAR estimates

u_p	$= -0.005u_{ip} + e_p$
	(0.019)
u_{M3}	$= 0.017u_{ip} + 0.480u_p - 0.268u_r + e_{M3}$
	$(0.279) \quad (0.510)$
u_r	$= 1.814u_{M3} + 0.945u_{er} + e_r$
	(1.741)
u_{er}	$= -0.170u_{ip} - 0.461u_p + 0.730u_{M3} - 0.097u_r + e_r$
	$(0.059) \quad (0.540) \quad (1.748) \quad (0.415)$

Note: Figures in parentheses are standard errors.

Table 12 displays a variance decomposition for the call rate according to which both money supply (M3) shocks and exchange rate shocks are the main source of the variation in the overnight call rate. Over the 12-month horizon, however, the CPI also accounts for the

Figure 3

Impulse responses of the call rate to other variables
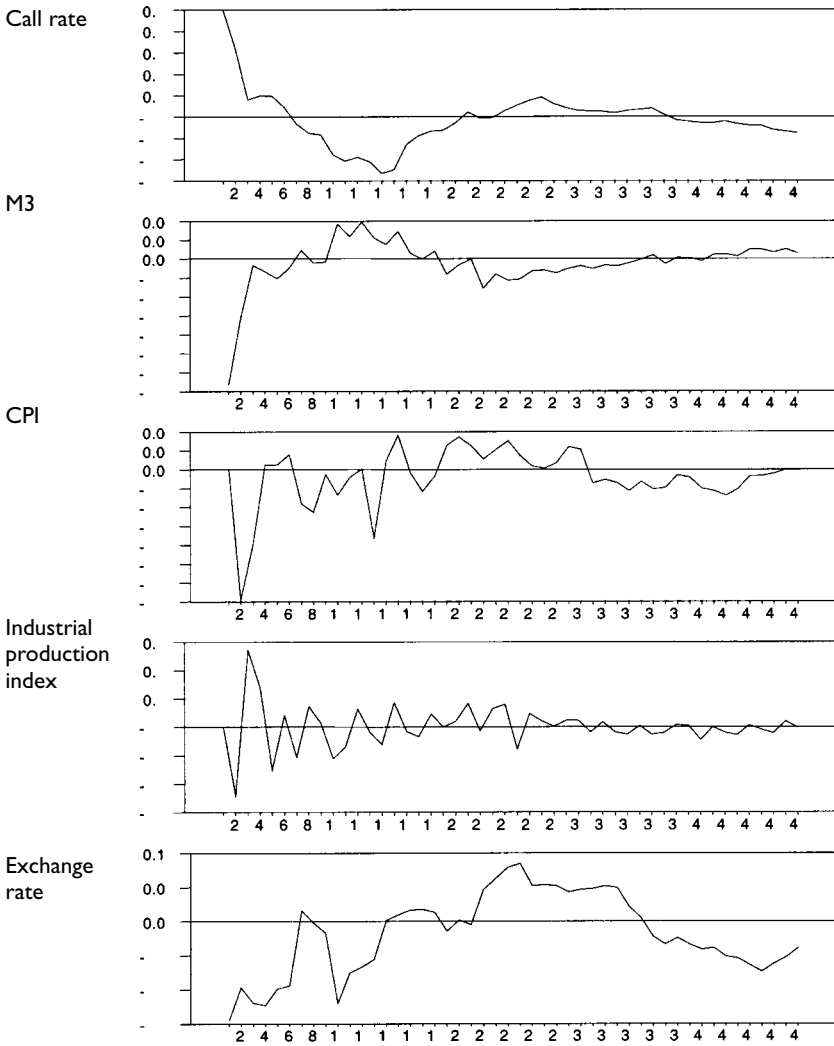
behaviour of the call rate. In addition, it is found that the shocks to industrial production appear to have little influence on the call rate.

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Table 12
Variance decomposition for the call rate

Horizon in months	Percentage of forecast error variance due to				
	Call rate	M3	CPI	IP	Exchange rate
6	25.9	48.2	2.9	0.7	22.3
12	24.0	40.1	18.0	1.3	16.6
24	26.0	31.2	20.7	2.0	20.1
48	25.7	29.4	19.7	2.2	23.0

Annex III

Granger's causality test

Granger's causality test is employed to analyse the precedence of the reserve accumulation ratio (RAR), as a proxy variable for bank liquidity positions, and the repo rate to market interest rates. The RAR is defined as the sum of required reserves and accumulated excess reserves divided by reserve requirements. The choice of the RAR instead of actual reserves is due to the fact that the level of actual reserves dropped sharply to one third after 1996, following the lowering of reserve requirement ratios (Figure 4). The repo rate is the successful bidding rate at auction for maturities of one to two days.

The causality test from the RAR is carried out using daily data during the period from January 1995 to October 1997 and during the period from January 1998 to August 1997 respectively, and that from the repo rate during the period from January 1998 to August 1998. Figures 5 to 7 plot the movements of the RAR, repo rate and interest rates, namely the overnight call rate and yields on CDs and corporate bonds.

The empirical results are summarised in Tables 13 and 14 according to which unidirectional causality running from the RAR to the call rate as well as from the RAR to yields on CDs and corporate bonds is detected during the period from January 1995 to October 1997. After 1998 the causality from the RAR is not clear while the repo rate unidirectionally influences market interest rates. However, bidirectional causality is found between the call rate and yields on CDs and corporate bonds during the entire test period.

The change of unidirectional causal variable from the RAR to the repo rate after 1998 shows that the repo rate, the public announcement of the successful bidding rate at auction, has become a more important signalling mechanism. This result appears to support the hypothesis that the repo rate, by affecting the overnight call rate, an operational target of the Bank of Korea, does influence short-term and long-term interest rates. Furthermore, the bidirectional causality relationships between the call rate and yields on CDs and corporate bonds could be interpreted as indicating that there is some feedback among them, reflecting moderate arbitrage between short-term and longer-term financial markets.

Table 13

Granger's causality test results (I)
January 1995–October 1997

Null hypothesis	F-statistic		Causality results
	4 lags	8 lags	
RAR not cause call rate	3.02**	1.74*	RAR $\Rightarrow$ call rate
Call rate not cause RAR	1.43	1.21	Call rate $\not\Rightarrow$ RAR
RAR not cause CD yield	5.06***	3.60***	RAR $\Rightarrow$ CD yield
CD yield not cause RAR	1.26	1.24	CD yield $\not\Rightarrow$ RAR
RAR not cause bond yield	5.02***	3.30***	RAR $\Rightarrow$ bond yield
Bond yield not cause RAR	1.56	1.10	Bond yield $\not\Rightarrow$ RAR
Call rate not cause CD yield	12.11***	6.76***	Call rate $\Rightarrow$ CD yield
CD yield not cause call rate	6.77***	3.32***	CD yield $\Rightarrow$ call rate
Call rate not cause bond yield	4.13***	2.09**	Call rate $\Rightarrow$ bond yield
Bond yield not cause call rate	3.69***	1.74*	Bond yield $\Rightarrow$ call rate

*** significant at 1% level. ** significant at 5% level. * significant at 10% level. RAR = reserve accumulation ratio.

Figure 4
Actual reserves and required reserves
In trillions of won

164
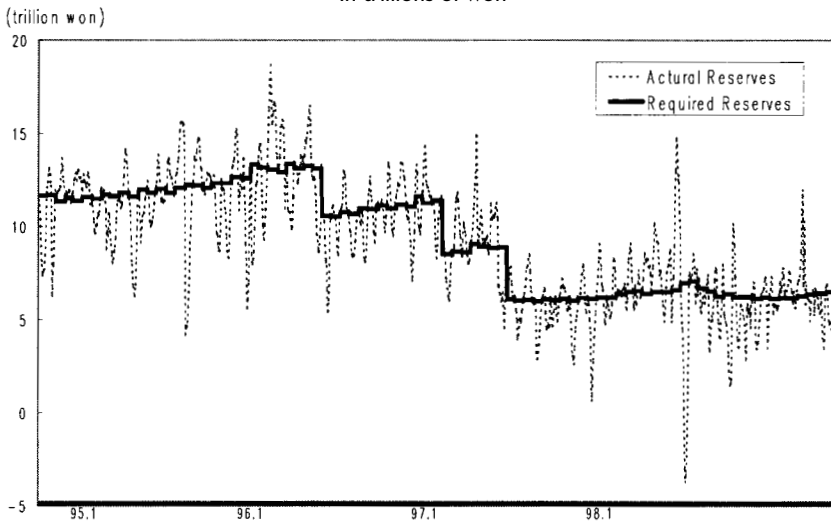
Table 14
Granger's causality test results (II)
January–August 1998

Null hypothesis	F-statistic		Causality results
	4 lags	8 lags	
RAR not cause call rate	0.09	0.53	RAR ≠> call rate
Call rate not cause RAR	0.85	0.85	Call rate ≠> RAR
RAR not cause CD yield	2.34*	2.47**	RAR ⇒ CD yield
CD yield not cause RAR	0.91	0.78	CD yield ≠> RAR
RAR not cause bond yield	1.84	1.70*	RAR ≠> bond yield
Bond yield not cause RAR	0.54	1.60	Bond yield ≠> RAR
RP rate not cause call rate	2.71**	3.41***	RP rate ⇒ call rate
Call rate not cause RP rate	1.86	1.48	Call rate ≠> RP rate
RP rate not cause CD yield	5.94***	4.08***	RP rate ⇒ CD yield
CD yield not cause RP rate	1.57	1.17	CD yield ≠> RP rate
RP rate not cause bond yield	13.74***	8.11***	RP rate ⇒ bond yield
Bond yield not cause RP rate	1.98*	0.88	Bond yield ≠> RP rate
Call rate not cause CD yield	4.05***	3.06***	Call rate ⇒ CD yield
CD yield not cause call rate	2.10*	2.66***	CD yield ⇒ call rate
Call rate not cause bond yield	3.93***	5.68***	Call rate ⇒ bond yield
Bond yield not cause call rate	4.93***	3.70***	Bond yield ⇒ call rate

*** significant at 1% level. ** significant at 5% level. * significant at 10% level. Repo rate is the successful bidding rate at auction for maturities of one or two days.

Figure 5
Reserve accumulation ratio
In percentages
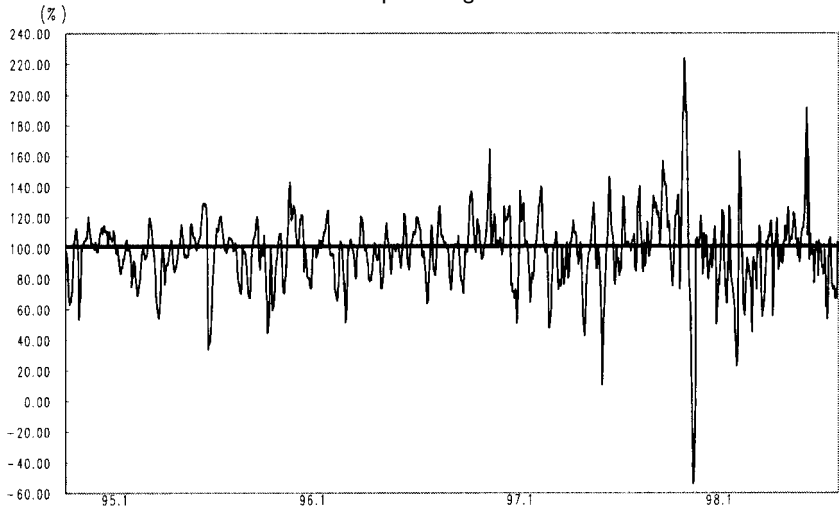
Figure 6
Repo rate
In percentages

166
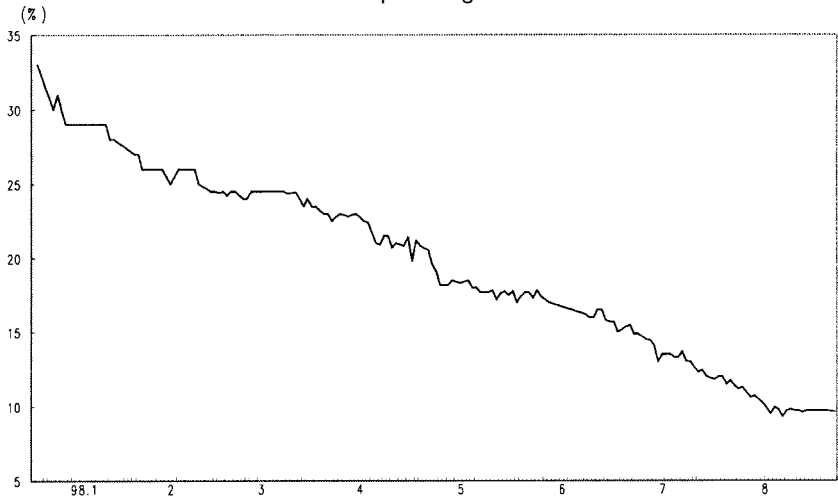
Figure 7

Market interest rates

In percentages

167
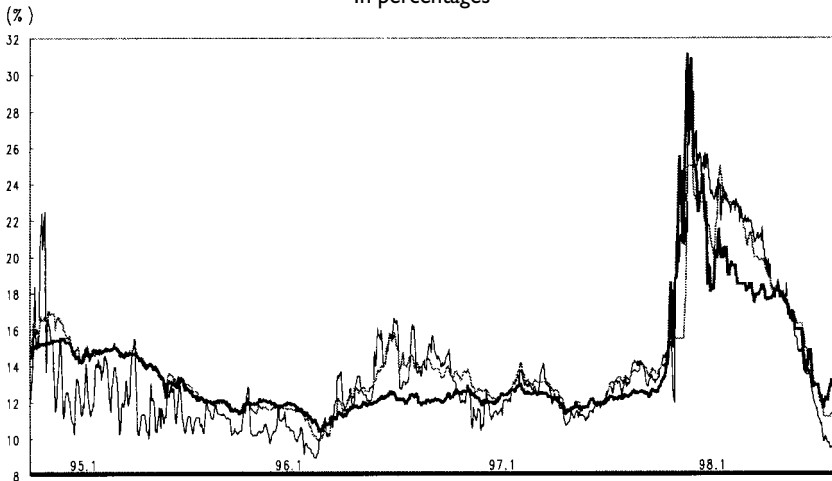
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The implementation of monetary policy through the zero-average reserve requirement system: the Mexican case

Jesús Marcos Yacamán

Introduction

In December 1994 the Mexican peso was allowed to float. The abandonment of the fixed exchange rate regime compelled the Bank of Mexico to look for new intermediate objectives with which to anchor and conduct its monetary policy. The Bank decided to set quantitative targets consistent with its inflation objective for the annual growth of the monetary base and use the observed behaviour of the monetary base as a guideline for its actions in the money market. It also decided to establish limits on the expansion of domestic credit.

The 1994 crisis brought a nominal depreciation of the exchange rate of more than 100%, high and variable inflation and a plunging real economy. In such a context it was considered unrealistic to use interest rates as an operating target, since it would have been impossible to find adequate levels. Thus, to conduct its daily operations, the Bank of Mexico uses, as its primary operational target, the average level of settlement balances on banks' accounts, and leaves the market free to determine equilibrium interest rates. To be able to send signals to the market without setting any specific level for interest rates, the Bank adopted an operational system commonly known as "reserve averaging around zero" or the "zero-average reserve requirement system".

This paper describes how the central bank implements its monetary policy using the zero-average reserve requirement system, as well as the manner in which it operates in the money market.

1. The monetary policy objectives of the Bank of Mexico

The Mexican experience, like that of many other countries, has

confirmed the notion that the best possible way monetary policy can contribute to the sustained growth of employment and economic activity is through the pursuit of stability of the general price level. Hence, the Mexican Constitution states that the Bank of Mexico's priority is to seek stability in the purchasing power of the national currency.

To implement its policy, the Bank of Mexico monitors the behaviour of the monetary base and several economic indicators, such as the exchange rate, differences between observed and projected inflation, the results of surveys on the public's and specialists' inflation expectations, revisions of collective employment contracts, producer prices, and the balances on the current and capital accounts. Special importance is attached to the monetary base as an intermediate target because the public can follow it very easily. However, the central bank does not always react to deviations of the monetary base from its expected path: those that are considered non-inflationary do not call for intervention.[1]

2. The zero-average reserve requirement system

The system works within 28-calendar-day maintenance periods in which each bank strives to manage the balances on its current account at the central bank so that, at the end of each period, its daily balances sum to zero. The incentive for doing so lies in the fact that if the accumulated balance is negative, the bank in question would have to pay high interest rates on it, whereas if it is positive, the bank forgoes any return it might have earned by investing the funds elsewhere. Table 1 exemplifies how accumulated balances are computed for a hypothetical credit institution.

This reserve requirement system is designed to induce credit institutions to avoid, on an average basis, overdrafts or positive balances on their current accounts, and offset any excess or lack of resources they might have by lending to other banks or borrowing from them at market interest rates. It is for this reason that, during maintenance periods, the Bank of Mexico does not pay interest on positive balances or charge interest on overdrafts posted at the end of each day, as long as both are kept within certain pre-established limits.

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[1] As an example, during 1997 the monetary base grew more than anticipated owing to a larger-than-expected drop in interest rates and a faster recovery of economic activity.

Table 1

Computation of the accumulated daily balances of a hypothetical credit institution's current account

Day	Balance at the end of each day	Accumulated balance	Day	Balance at the end of each day	Accumulated balance
1	10	10	15	0	40
2	10	20	16	0	40
3	10	30	17	0	40
4	10	40	18	0	40
5	0	40	19	0	40
6	0	40	20	0	40
7	−100	− 60	21	0	40
8	−100	−160	22	− 10	30
9	100	− 60	23	− 10	20
10	100	40	24	− 10	10
11	100	140	25	− 10	0
12	0	140	26	0	0
13	−140	0	27	−100	−100
14	40	40	28	100	0

Notes: the accumulated balance equals the sum of both positive and negative balances (overdrafts) reported at the close of each day on each credit institution's current account at the central bank (including non-business days). The shaded areas indicate non-business days.

However, at the end of the maintenance period the central bank charges interest at twice the 28-day CETES[2] rate on all negative accumulated balances. In this manner, the costs incurred by commercial banks that post positive accumulated balances at the end of any given period are similar to those incurred by banks which do not offset their accumulated overdrafts. These costs are similar because banks with positive accumulated balances incur an opportunity cost for not having invested those resources at market rates. Banks with negative accumulated balances have to pay interest equivalent to twice a market-determined rate on those balances; on the other hand, they benefit from returns earned on resources obtained through overdrafts. Thus, the net cost in either case is similar to the market rate.

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[2] CETES are zero coupon government securities.

(i) Monetary policy signals

The central bank intervenes in the money market, offering credit, deposits or repurchase agreements, or carrying out direct purchases or sales of government securities, all through auctions. It determines the amounts to be auctioned so that the sum of all banks' balances may close the day at a pre-determined level. In order to help the participants in the financial markets understand its monetary policy intentions, the Bank publishes the information contained in Table 2 every day at noon.

Table 2
Information for the market

Bills and coins in circulation.
Net balance of banks' accounts at the central bank, at the close of the previous day.
Sum of accumulated balances.
Projected pre-intervention cash position of the banks' current accounts resulting from the expected injections and withdrawals of liquidity caused by the autonomous items.
Central bank intervention in the money market.
Target for the accumulated balance.

The last item of information is the Bank's target for the accumulated balance[3] for the opening of the next business day. A zero accumulated balance target would indicate the central bank's intention to meet, at market interest rates, the full demand for bills and coins. Thus, the central bank provides the necessary funds so that no commercial bank will be forced to incur overdrafts or post unwanted positive balances at the end of the maintenance period.

A negative accumulated balance target would signal the central bank's intention not to provide commercial banks with sufficient resources at market interest rates. This would force at least one credit institution to obtain part of the needed resources by means of an overdraft on its current account. Other things being equal, this could give rise to increases in market interest rates, for banks would try to avoid paying high rates on overdrafts by obtaining the required resources in the money market.

[3] The accumulated balance is the sum of the accumulated balances of all current accounts held by credit institutions at the Bank of Mexico.

Table 3
Sum of the accumulated daily balances of
two hypothetical banks

Day	Bank A Accumulated daily balances	Bank B Accumulated daily balances	Sum of accumulated daily balances of banks A and B
1	10	− 10	0
2	20	− 20	0
3	30	− 30	0
4	20	− 10	10
5	40	−100	−60

When a negative total accumulated balance target is announced, the central bank exerts some upward influence on interest rates or, conversely, downward pressure if the target is positive. This influence is, more than for any other reason, the result of the signal sent by the central bank to the market because the amounts of credit granted through overdrafts represent a minimal part of the total credit granted to the banking system at market interest rates. In fact, modifications to the accumulated balance target seem to exert a greater influence on interest rates than the existence of a negative or positive accumulated balance itself.

The total accumulated balance plays a significant role as operational target for the Bank. The choice of operational target was made considering the difficulties and political pressures that any central bank would face in setting an equilibrium interest rate. Before the 1994 crisis the Bank did not explicitly use interest rates as an operational target. However, it very often sent policy signals through the use of rate caps and floors in its daily interventions in the money market with very mixed results. After the floating of the exchange rate and the interest and exchange rate volatility that came with that, the need for a quantitative target was clear. Any attempt to set an "official rate" in such an environment would have been not only technically impossible but also politically untenable.[4]

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[4] Annex 2 presents a brief summary of the main changes to the Bank of Mexico's monetary policy implementation in recent years.

(ii) Positive and negative limits

In order to prevent fluctuations in commercial banks' current account balances at the central bank from translating into upward pressures on interest rates in the last few days of maintenance periods, limits have been established on the amount of each individual institution's positive daily balances. These limits preclude banks with considerable negative balances from offsetting them at the end of each period. Limits on positive daily balances also imply ceilings on the negative accumulated balances that banks can offset, based on the number of days remaining to the end of any given maintenance period.

There are also limits on the amounts of daily overdrafts that can be offset. These limits have been established in order to prevent commercial banks from incurring excessive overdrafts at the start of a maintenance period, a practice that could result in undue downward pressures on interest rates. When an overdraft is beyond its limit for any given day, the excess is not offset and the bank in question must pay a penalty equivalent to twice a market-determined rate on the excess amount. This amount is not taken into consideration later for the computation of the bank's accumulated balance, and therefore does not need to be compensated for with positive balances. Both positive and negative limits are determined on a case-by-case basis, according to the capital and liabilities of each credit institution.

It must be stressed that the Bank of Mexico's monetary policy signals must be inferred from the total accumulated balance target announced, and not from observed total accumulated balances. The former signals the central bank's intentions, whereas the latter may indeed differ from the stated target for the following reasons: (i) differences between the projected and observed demand for bills and coins in circulation; (ii) balances on some banks' current accounts that are not taken into consideration for the computation of their individual accumulated balances as a result of having exceeded the corresponding positive or negative limits; and (iii) adjustments made to the sum of accumulated balances when a credit institution is not able to achieve a zero accumulated balance because of the positive or negative limits imposed and the days remaining to the end of any given maintenance period.[5]

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[5] A detailed explanation of the source of differences between the total accumulated balance targets and the total observed accumulated balances can be found in Annex 1.

3. The operational framework

The Bank of Mexico, like most other central banks, meets the daily fluctuations in the public's demand for bills and coins by "creating" or "destroying" monetary base through operations in the money market. The Bank requires the Government to announce 24 hours in advance any deposit or withdrawal from its accounts at the central bank. Consequently, the Bank has prior information on all operations affecting the balances on commercial and development banks' current accounts, except for cash deposits or withdrawals of currency by credit institutions. On the other hand, the Bank credits (or debits) banks' current accounts on the same day when, without prior notice, banks deposit bills received from the public at (or withdraw cash from) the central bank. Therefore, every day the Bank has only to forecast changes in the demand for bills and coins in order to offset such changes by means of its intervention in the money market.

Graph 1
Bills and coins in circulation
1995–98

175
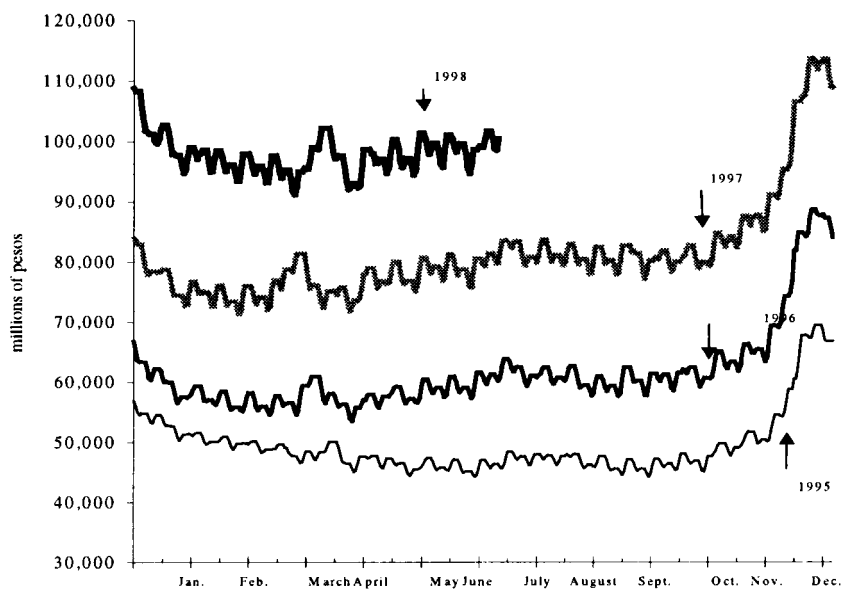
(i) The demand for monetary base

The demand for bills and coins is highly calendar-dependent. It increases on Thursdays and Fridays and decreases on Mondays and Tuesdays. It also grows on pay days (every 15 days), during Holy Week and around Christmas. For this reason it is very easy to forecast.

Commercial banks in Mexico do not maintain on average sizable balances on their cash accounts at the central bank. Banks normally need such balances to protect themselves against deposit withdrawals by their customers or to settle operations in the payment systems. However, the Bank of Mexico provides facilities to enable credit institutions to cope with unforeseen liquidity needs, such as daylight and overnight facilities which enable them to overdraw their current accounts and access to a pre-settlement market. It also intervenes daily in the money market to compensate for any creation or destruction of liquidity caused by the "autonomous items" such as its own interventions in the foreign exchange market, movements in the Treasury's account and changes in the demand for bills and coins. It should also be stressed that there is no obligation to maintain positive balances and that such balances do not accrue interest.

(ii) Intervention in the money market

The Bank of Mexico intervenes in the money market through repos and reverse repos on government securities, and credit or deposit auctions. The Bank also intervenes through auctions to directly buy or sell government securities. In all these operations, it fixes the amounts of credit or securities to be sold or bought, and the market freely determines the corresponding interest rates.

(iii) The pre-settlement market

Every day at 6:30 p.m., after the cheques, securities and electronic clearing processes have liquidated the corresponding debits or credits to commercial banks' current accounts, the Bank of Mexico opens its system for one hour so that banks can carry out transactions among themselves. When this market opens, the Bank may auction credits or deposits in order to offset significant errors in the estimation of the demand for bills and coins. If the central bank decides to intervene, it can

establish a minimum or maximum interest rate, although at levels similar to those observed in the money market during that particular day. These interventions are necessary only when fluctuations in the demand for money differ significantly from expectations forcing several banks to exceed the limits on their accounts at the central bank, and on the last day of the maintenance period described in the following section.

(iv) Operating procedures

The operating procedures have evolved in accordance with the Bank of Mexico's structural position vis-à-vis the money market (Graph 2). In that respect, during 1995 and 1996 the Bank had to modify its operations

Graph 2
The Bank of Mexico's position vis-a-vis the money market
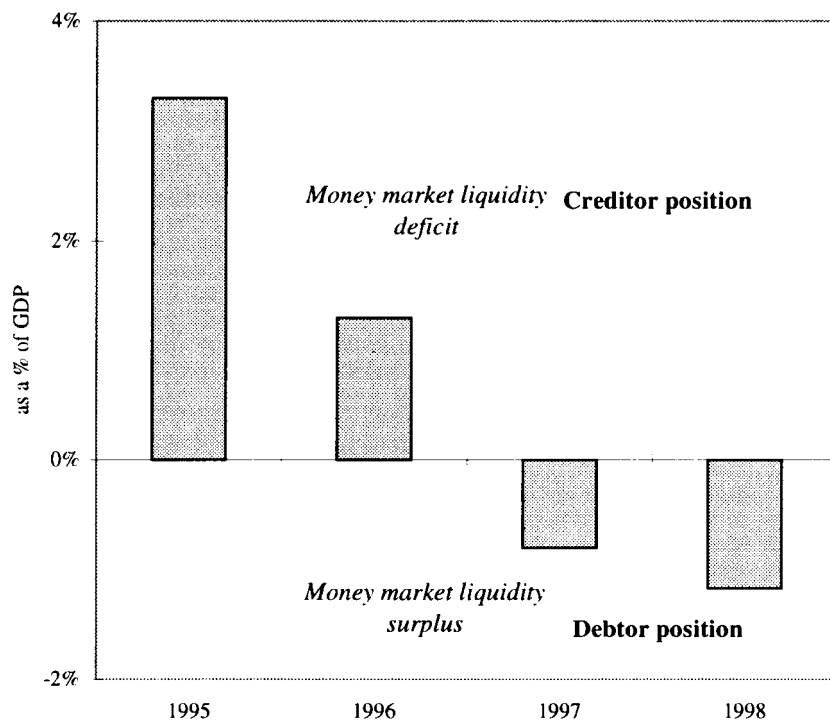
to cope first with a lack of government securities to be used as collateral, and later to extend the maturity profile of its debtor position.

At the beginning of 1995 the Bank of Mexico had a sizable creditor position against the market. Its net creditor position grew so much that eventually the government securities in circulation were insufficient to satisfy the collateral requirements of the repo auctions held by the central bank to provide liquidity to the market. As a result, the Bank switched to auctioning credits collateralised by government and commercial and development bank securities.

The accumulation of foreign reserves by the central bank reduced its creditor position during 1995 and 1996 until it finally reversed that position at the beginning of 1997. The Bank of Mexico started to drain liquidity through the auction of deposits. However, smaller banks find it easier to fund their participation in the auctions through the sale or repurchase of government securities than by obtaining credit in the interbank market. Hence, the central bank moved to subtract liquidity through reverse repos and outright sales of government securities.

Graph 3
The Bank of Mexico's daily intervention in the money market
(1994–98)
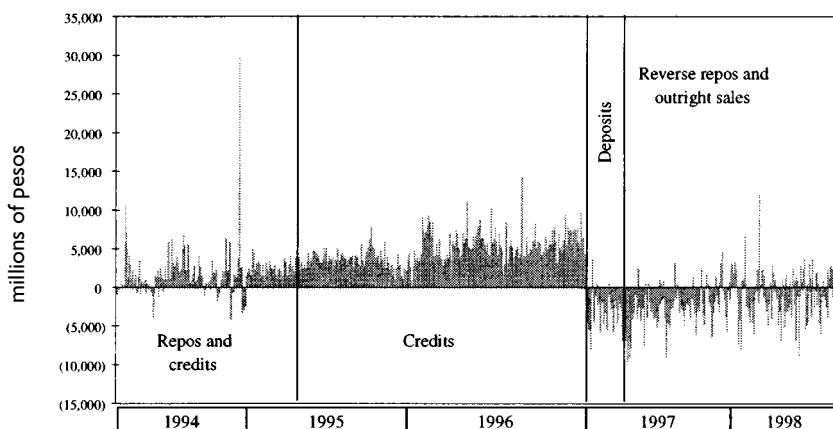
4. Final remarks

The conduct of monetary policy in Mexico relies heavily on the policy signals sent to the market by the central bank. These policy signals are announced every day through the publication of the Bank of Mexico's target for the accumulated balances on banks' accounts at the central bank. The market reacts to these signals with movements in the overnight rate, which in turn affect the market's expectations with regard to the exchange rate and the rate of inflation. The Bank does not provide the market with any information about desired levels of exchange rates or interest rates, nor does it intervene in the money or foreign exchange markets when those rates react to changes in market expectations. Graph 4 shows the recent behaviour of the overnight rate (at which banks lend to each other) and the exchange rate, in response to modifications by the central bank of its target for the accumulated balance during 1996, 1997 and the first half of 1998. Table 4 shows the reaction of the exchange rate, equity prices and interest rates in several

Graph 4

**Overnight rate, exchange rate and central bank objective
for accumulated balances**

(1996–98)
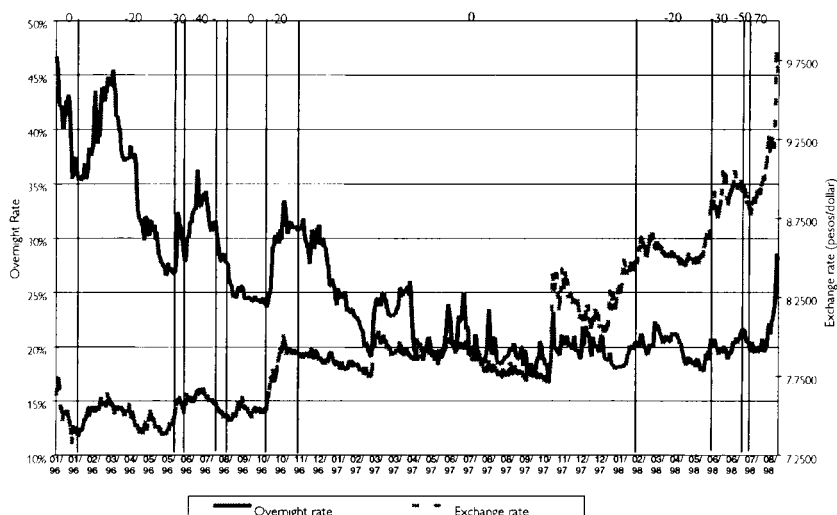
Table 4

Behaviour of the exchange rate, equity prices and interest rates in selected countries between July 1997 and July 1998

	Exchange rate[1]	Equity prices[2]	Interest rates[3]
Argentina	0.00%	−26.89%	75
Brazil	8.30%	−25.99%	− 95
Chile	9.78%	−39.33%	38
Colombia	25.89%	−28.59%	1,351
Mexico	**12.52%**	**−14.38%**	**− 73**
Venezuela	15.18%	−53.91%	3,409
China	−0.13%	−69.84%	− 11
Hong Kong	0.01%	−47.85%	241
Indonesia	462.09%	−88.24%	5,684%
Japan	22.77%	−34.94%	0
Korea	38.54%	−68.07%	20
Malaysia	63.55%	−77.11%	368
Philippines	58.44%	−63.52%	− 519
Singapore	19.76%	−55.32%	−63%
Thailand	68.24%	−69.93%	− 475
Russia	7.92%	−66.91%	4,143

[1] Units of domestic currency per US dollar. A positive figure indicates a depreciation. [2] In US dollars. [3] Change in basis points in the domestic markets, except for China (dollar bond yields).

Source: Bloomberg.

emerging economies during 1997. As can be seen, the reaction of Mexico's financial markets was remarkable.

Annex 1

Differences between the central bank's accumulated balance targets and the total observed accumulated balance

Differences between projected and observed demand for bills and coins

The sum of commercial banks' current account balances, and therefore the total accumulated balance, observed on any given day may differ from the accumulated balance target set by the Bank as a result of differences between the expected and observed demand for bills and coins. When this happens, the sum of banks' current account balances at the close of that day will be different from the amount needed to bring the total accumulated balance to its target.

Throughout the maintenance period, the Bank takes these differences into consideration in order to assess its intervention in the money market the following day. In other words, these deviations are corrected by the central bank with a one-day lag.

On the last day of each maintenance period, and on some occasions when the difference between the projected and observed demand is substantial, the Bank offsets deviations by auctioning credits or deposits in the pre-settlement market that same day.

For example, on a particular day, the central bank may estimate that the public's demand for bills and coins will increase by 500 million pesos, and thus inject liquidity in an equivalent amount. If the aforementioned demand increases by 450 million pesos only, the banking system will close the day with a 50 million pesos unwanted positive balance. Likewise, the total observed accumulated balance will be 50 million pesos above its target. The next day, the Bank will have to offset the positive balances by injecting a lower amount of liquidity into the market, forcing banks to incur overdrafts for a total of 50 million pesos.

Similarly, should the demand for bills and coins be greater than that expected by the Bank, commercial banks will be forced to overdraw their accounts in order to meet the public's demand for cash, and the total observed accumulated balance will be below the target. The next day, the Bank will have to provide the banking system with more resources so that banks may offset the overdrafts with deposits at the central bank, and thus bring the total accumulated balance to its target.

The total accumulated balance may also differ from its target when the current accounts of one or more commercial banks post positive balances or overdrafts exceeding their respective positive or negative limits. The amounts exceeding these limits are not taken into consideration for the computation of the accumulated balances of the banks in question, and therefore are not considered in the total accumulated balance either.

For example, if a bank incurs a 150 million pesos overdraft while subject to a 100 million pesos negative limit, on the following day it will have to pay a penalty equivalent to twice the CETES rate on the 50 million pesos by which it exceeded its limit. Nonetheless, in the future the bank will have to offset a 100 million pesos overdraft only, for the 50 million pesos excess overdraft will not be considered in the computation of the bank's accumulated balance or in the system's total accumulated balance. The latter item will then surpass the target announced by the Bank for that day by 50 million pesos. In its intervention in the money market the following day, the central bank will have to reduce the amount of resources provided to the market by 50 million pesos, so as to bring the total accumulated balance to its target.

By the same token, should a bank report a 150 million pesos positive balance in its current account while its positive limit is 100 million, the bank will have the right to overdraw, without cost, up to 100 million pesos on its account during the days remaining to the end of the maintenance period. The 50 million pesos in excess will not be considered in the bank's accumulated balance or in the system's total accumulated balance. Therefore, the latter will be 50 million pesos below the amount announced by the central bank for that day. On the following day, the Bank will have to increase the amount of resources provided to the market by 50 million pesos, so as to bring the total accumulated balance to target.

Adjustments to the total accumulated balance

There are some cases where one or more credit institutions cannot close a given maintenance period with zero accumulated balances because, given their respective positive or negative limits, the positive or

negative balances they have accumulated throughout the period cannot be offset in the days remaining to the end of the period.

For example, a hypothetical bank has a 500 million peso positive accumulated balance and a 100 million peso negative limit per day with four days to go to the end of the maintenance period. In this case, the bank will only be able to accumulate 400 million pesos' worth of over-drafts in the days remaining (100 million times four days). Therefore, its positive accumulated balance cannot be eliminated by the end of the maintenance period. In turn, the Bank of Mexico will not take the 100 million pesos that cannot be offset into the calculation of the system's total accumulated balance; hence, the total accumulated balance will be 100 million pesos below the target for that day. On the following day, the Bank will have to increase the amount of its intervention in the market by an equivalent amount in order to bring the total accumulated balance to target.

Likewise, if a bank has a 500 million peso accumulated overdraft while its positive limit is 100 million pesos per day and only four days remain to the end of the period, the bank will only be able to offset 400 million pesos. At the close of the maintenance period, the bank will have to pay the predetermined penalty on the 100 million overdraft, and the total observed accumulated balance will exceed the announced target by 100 million. This amount will be deducted from the Bank of Mexico's intervention on the following day.

Annex 2

Main changes in the implementation of monetary policy in Mexico during the past three decades

The Bank of Mexico has over the years introduced several changes to the procedures used to implement its monetary policy. These changes have moved the central bank away from setting liquidity coefficients, interest rates and even ceilings for different types of bank credit to the sole use of market-oriented instruments. This annex briefly describes the main changes that have taken place in the last three decades.

During the 1970s two key developments enabled the Bank of Mexico to adopt new procedures to carry out its monetary policy. The first was the introduction of the Securities Market Law in 1975 and the second the issuance for the first time in 1978 of zero coupon government bonds known as CETES. These bonds are issued at a discount and registered in book-entry form at the central bank, thus facilitating trading in them. The enactment of the Securities Market Law allowed the establishment of some brokerage houses and invested the National Securities Commission with greater powers for regulating financial intermediaries and stock markets. All these changes opened up the possibility for the Bank to implement its monetary policy through open market operations with government securities. The establishment in 1978 of a national securities deposit agency (INDEVAL) also contributed to the development of a market for private securities.

The oil crisis of 1982 and the nationalisation of the commercial banks at the end of that year forced the central bank to temporarily abandon its market-oriented operations and return to its traditional policies of setting interest rates. However, by 1987 it was again using open market operations to supply or withdraw liquidity to/from the commercial banks. At the end of 1990, another important change took place with the abandonment of positive reserve requirements or liquidity coefficients. During that year, the Bank of Mexico started facing increasing difficulties in implementing its monetary policy. The fiscal surplus run by the Government as a result of the privatisation of very important sectors of the economy and some cuts in government spending led to a sharp decrease in the supply of government securities. Liquidity coefficients had to be invested in government securities; hence, the

growth of bank deposits observed during those years combined with the relative decrease in the supply of securities generated major distortions in the behaviour of interest rates. This situation led to the removal of both the reserve requirement and the liquidity coefficient, leaving open market operations as the main policy tool used by the central bank to implement its monetary policy.

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Monetary policy operating procedures: the Peruvian case

Marylin Choy Chong

1. Background

(i) Reforms

At the end of 1990 Peru initiated a financial reform process as part of a broad set of structural reforms which enabled a series of markets to be liberalised, such as the financial and labour markets. Among other things, these reforms granted equal treatment to local and foreign investment. The objective of the reform programmes was to give the market a greater role as resource allocator.

In order that both interest rates and the distribution of financial resources would be determined by the market, the central bank started a process of financial deregulation,[1] liberalising interest rates and the exchange rate as well as abandoning various administrative measures which restricted the functioning of the financial system.

A new banking law was enacted in 1991 (amended in 1996) which established universal banking as well as the Basle Committee guidelines concerning capital adequacy and consolidated supervision, among other aspects. Likewise, a deposit insurance system was introduced to replace the state guarantee which formerly covered customer deposits. At the same time, the functions and objectives of the Superintendency were redefined as the supervisory and controlling entity, while the preservation of monetary stability became the sole objective of the Banco Central de Reserva del Perú.

As part of the financial system reform, the state commercial banks were privatised and the state development banks were liquidated together with other insolvent financial entities.

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[1] Such as lowering reserve requirements and eliminating selective credit controls, interest rate subsidies and subsidised lines to specific sectors.

(ii) The financial market

In 1990 the financial market was basically restricted to the banking sector. Practically the only financial option consisted of bank deposits, since there were almost no negotiable securities issued by private firms.

Liquidity (currency + deposits with financial institutions) had declined from over 20% of GDP in the 1970s to just 4% in 1990. This was the result of the hyperinflation in the 1980s that culminated in an inflation rate of about 7,500% in 1990. Furthermore, more than 70% of liquidity was held in dollars as a protection mechanism against hyperinflation. Liquidity is now almost 19% of GDP although the degree of dollarisation is still high: more than 60% is held in dollar deposits, in spite of the reduction of the inflation rate to 7% in 1997.

Real interest rates in new soles were at one time highly negative because of the administration of nominal interest rates. Financial liberalisation corrected this distortion in interest rates (see Table 1).

At present, the capital market is gradually growing, leading in turn to the emergence of fixed income securities, encouraged by the appearance of institutional investors such as mutual funds[2] and private pension fund managers.[3]

The banking system is made up of 25 private banks, representing 90% of the financial system. As of December 1997, foreign holdings amounted to more than 35% of total banking equity while foreign loans to local banks totalled US$ 3,330 million. Total deposits in the banking system were US$ 11,800 million (just over 18% of GDP). The four largest banks held 71% of total deposits, while 15 banks held only 13% of total assets. Concentration and segmentation are therefore present in the Peruvian banking system. Other entities making up the financial system include seven financial firms, ten leasing companies, 13 municipal associations and 16 rural credit firms.

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[2] Having grown more rapidly since 1996, mutual funds under management as of December 1997 totalled US$ 515 million, of which 23% was invested in the banking system.

[3] The appearance of these funds was a consequence of the 1993 reform of the pension fund system replacing the pay-as-you-go scheme by a system of individual capitalisation accounts managed by private firms. At the time of writing, private pension funds under management totalled US$ 1,400 million (45% invested in the banking system, 19% in corporate bonds and 34% in equities).

Table 1
Interest rates[1]
At an annual rate

	Local currency				US dollars			
	Savings deposits		Loans[2]		Savings deposits		Loans[2]	
	Nominal	Real[3]	Nominal	Real[3]	Nominal	Real[3,4]	Nominal	Real[3,4]
1980	30.5	−18.8	32.5	−17.6	..	..	..	..
1985	50.0	−41.9	68.7	−34.7	..	..	..	..
1990	888.7	−87.2	1,674.3	−77.1	8.3	−47.4	15.0	−44.2
1995	12.5	2.1	33.3	21.0	5.3	1.3	16.6	12.1
1996	11.0	− 0.8	26.1	12.8	4.9	5.7	16.0	16.8
1997	10.7	3.9	30.0	22.0	4.6	2.7	15.3	13.3

[1] Annual average. [2] Short-term loans. [3] Calculated on the basis of cumulative annual inflation.
[4] Devaluation is calculated using the exchange rate set in the banking system.
Source: Central Bank of Peru (BCRP).

The opening of the financial system and macroeconomic stability have allowed local companies direct access to the capital market to finance their operations, albeit still for limited amounts. Despite this progress, the capital market remains small and there is still no developed secondary market, particularly for Treasury bills.

2. Monetary policy design

Up to 1990 the central bank implemented its monetary policy in a setting of expansionary fiscal policies and strict controls on foreign exchange and capital flows. The central bank had three aims – monetary stability, strengthening and stability of the financial system and support to economic growth and employment – which usually implied opposing objectives and constrained its effectiveness.

As a result, monetary policy aimed at reducing financial pressures induced by fiscal policy, mainly using direct instruments: reserve requirements, selective credit controls, and interest rate and foreign exchange controls. However, this policy generated financial repression, hyperinflation of more than 7,000 in 1990 and a severe recession.

Table 2

Fixed income securities

Stocks, in millions of US dollars

	End-1994	End-1995	End-1996	Sept. 1997
Treasury bills[1]	295	323	297	279
BCRP certificates of deposit	160	190	31	234[2]
Privat sector bonds	325	595	1,054	1,210
Financial institutions bonds	236	387	582	696
Leasing	203	291	371	440
Subordinate	33	96	211	256
Non-financial institutions bonds	89	208	472	514
Plain corporate	49	168	432	514
Convertible corporate	40	40	40	0
Total	**780**	**1,108**	**1,382**	**1,723**
As a percentage of GDP	1,4	1,8	2,2	2,4
One year or less	160	190	66	272
1 year to 3 years	133	244	295	229
3 years to 5 years	207	422	777	874
Over 5 years	280	252	245	344

[1] Includes US$ 232 million held by the central bank. These Treasury bills were issued to capitalise the central bank. [2] The stock as at 11th December 1997 was US$ 244 million.

Source: BCRP.

(i) Purpose

As already mentioned, in 1992 financial reform modified the legal framework within which the central bank operated. Its sole purpose became the maintenance of monetary stability and its autonomy was clearly established. The central bank's monetary policy objective is therefore to control inflation, for which it establishes an annual inflation target range and uses the control of monetary aggregates as its intermediate variable.

In order to achieve its prime objective, the monetary authority exerts strict control over the monetary base, employing for this purpose a monthly monetary base growth target. The reasons for using this target are that in Peru inflation expectations are closely related to the expansion of the monetary base, and that the central bank has control over this monetary variable. The central bank increases or reduces the monetary base by managing both its internal and external sources, that

is, credit from the central bank and factors related to foreign currency with local money creation implications.

The management of these variables permits the central bank to inject or withdraw liquidity from the economy, affecting the monetary aggregates. To do this, it relies mainly on market-oriented instruments.

(ii) Monetary Programming

At the beginning of each year, a monetary programme is constructed, that is based on the macroeconomic and fiscal forecasts and is consistent with the announced inflation target. Thus, liquidity flows are projected on the basis of the forecasts for production growth and inflation. The multiplier, together with the demand for currency and bank reserves is used to forecast monetary base growth. The source of growth in the monetary base and in credit to the private sector are determined and macroeconomic consistency is analysed. This programme, which includes monthly targets for the monetary aggregates, is periodically revised in order to ensure its consistency with the development of the fiscal and macroeconomic variables.

The central bank's day-to-day monetary management is based on a daily estimate of banking system liquidity, calculated from a series of indicators such as banks' cash balances, current account balances kept at the central bank, the system's reserve position, the level of interbank interest rates, the net cheque clearing position and banks' net foreign exchange position. Using this liquidity estimate, the central bank decides whether to inject or withdraw liquidity from the market.

3. Monetary policy instruments

Within this new free market setting, the central bank has varied the way in which and the objectives for which the monetary policy instruments are utilised. For example, before the stabilisation programme was started in 1990 and 1991, monetary policy instruments were applied with the purpose of granting multisectoral credit support, including to the Government, either through central bank credits or the channelling of funds under the credit control arrangements. At present, however, the exclusive purpose of the monetary instruments is the control and

management of the monetary base, the final objective being to reduce inflation. Preference is given to market mechanisms.

The central bank uses its instruments to eliminate excess liquidity in the banking system so as to reduce the volatility of interbank interest rates and avoid inflationary pressures. The major instruments are described below.

(i) Reserve requirements

Reserve requirements seek to control monetary growth, through a lower bank multiplier which counteracts the effects of a larger monetary base or the inflow of foreign capital into the financial system.

Since 1991, the importance of reserve requirements as a direct instrument of monetary policy has gradually diminished, since liquidity management depends increasingly on intervention in the foreign exchange market and open market operations. The rules presently in force are:

- The central bank establishes which liabilities of the banks are subject to reserve requirements and what constitutes reserve funds.
- The reserve period established by the central bank is one month. Control is based on daily averages and deficits carry a penalty rate significantly higher than the market lending rate.
- The minimum legal reserve ratio cannot be set at a level higher than 9%; nevertheless, for monetary policy reasons the central bank can establish additional or marginal reserve requirements.

At present, the minimum reserve ratio is 7% and there is a marginal reserve requirement of 45% for foreign currency deposits (introduced in 1994). The central bank remunerates the additional reserves in foreign currency at a rate equivalent to LIBOR less $1^3/_8$%. The minimum reserves do not bear interest.

In practice, reserve requirements mean a tax on lending rates. Nonetheless, some important benefits can be gained. The high reserve requirement in foreign currency seeks to reduce both the pressure exerted by capital inflows on the exchange rate to appreciate and the monetary growth that can occur due to this dollar flow, which is beyond the central bank's control. It should be stressed that approximately 70% of deposits are in foreign currency. The marginal reserve

requirement of 45% for foreign currency deposits[4] also means that there is a substantial reserve with which to meet unexpected foreign currency outflows which could put the financial system at risk.

(ii) Open market operations

The central bank is increasingly using open market operations to regulate market liquidity, sterilising excesses or injecting new soles when needed by the market, so as to keep the monetary base and liquidity within the target range. The monetary base is reduced through the placement of central bank certificates of deposit and is expanded by repurchase agreements against these certificates or their redemption.

As there is no market for Treasury bills, the principal instrument employed to absorb excess liquidity is the sale of certificates issued by the central bank. The maturity of these instruments varies from four to 12 weeks and sales are organised through auctions where the central bank pre-announces the total amount of certificates on offer. The main intervening agents are banks and institutional investors, which notify to the central bank the amount of certificates they wish to acquire, together with the respective interest rate. The central bank ranks offers by interest rate and accepts them up to the maximum amount announced in the auction. Interest rates on central bank CDs constitute a market signal as to the direction of monetary policy.

In late 1997, the central bank started implementing repurchase agreements on its own securities. These operations are used as a mechanism to inject very short-term (overnight) liquidity into the system. Repos take place through an auction procedure in which the central bank announces the amount while the price is determined by the market. This is also a multiple price auction; hence, the banks agree to pay different interest rates for the central bank's resources. The availability of these funds is immediate.

These repurchase operations enable both more precise monetary management and better treasury management by the banks, as they use their financial assets to obtain short-term liquidity. As a result of these operations, banks' excess reserve funds have decreased while demand for

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[4] As a result of the marginal reserve policy, the average reserve ratio is approximately 43% of foreign currency deposits.

Graph 1
Bank's average excess reserves
In percentages

Aug. 97   Sept.   Oct.   Nov.
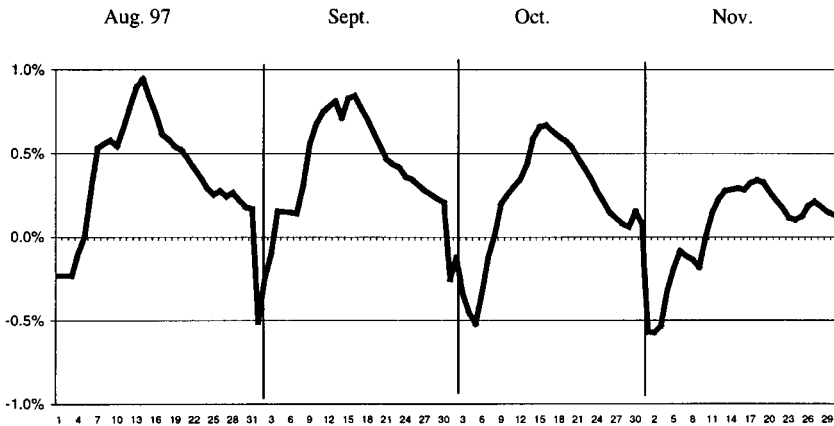
central bank CDs has increased, given that banks can use them to cover periodic liquidity needs.

Interbank interest rates used to fluctuate widely in response to seasonal changes in liquidity. Large amounts of excess liquidity at the beginning of the month and large deficits in reserve positions during the tax collecting week made the interbank interest rate very volatile. However, since these fluctuations lasted only a few days, other interest rates did not show a similar degree of volatility, although in a sense they represented a cost that put a floor on other interest rates.

The introduction of repurchase operations has thus been also instrumental in promoting the stability of interbank interest rates (see Graph 2), as they enable banks to reduce excess reserves; these previously represented the main source of funds available to banks to cover occasional liquidity needs.

(iii) Collateralised credit

The central bank may grant credit against collateral in order to provide temporary liquidity assistance to the financial system. It is very short-term, usually overnight, which means that the resulting monetary base

Graph 2
Interbank and central bank's credit rates
January–December 1997
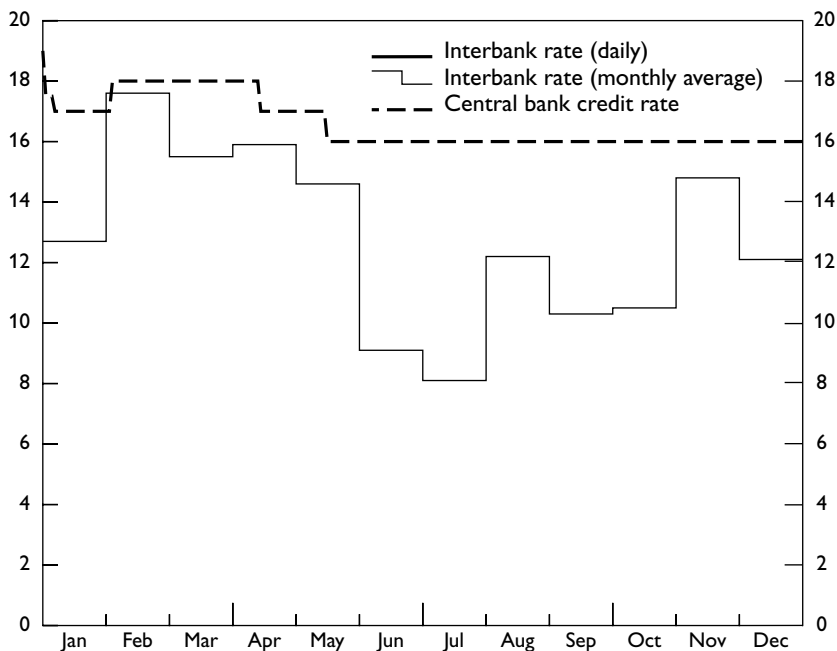
growth is temporary. It usually offsets the contraction in banking system liquidity generated by a variety of factors such as tax payments. The maximum term of these credits is 30 days and the maximum amount of credit that a bank may receive is the equivalent of its equity, with recourse to the facility limited to a maximum of 90 days within any 360-day period.

During the week of tax collection, banking system deposits are transferred to the Treasury's financial agent, Banco de la Nación, to pay tax liabilities. These fund flows result in temporary illiquidity in the banking system, which is offset by the combined use of repurchase operations and collateralised credits. Interest rates on these credits are generally higher than those on repurchase operations. The total of credits granted against collateral is decided at the end of the day, after the results of

intervention in the foreign exchange market and of open market operations. Likewise, as the use of repurchase operations increases, it is expected that collateralised credit will be used only in emergencies and as a last resort.

(iv) Public sector deposits

Monetary policy is implemented in close cooperation with fiscal policy, both being aimed at controlling inflation. During the last years, the government has generated a primary surplus that has enabled it to keep resources in the financial system. In order to facilitate monetary management, these government resources are kept at the central bank, their effect being similar to the issue of central bank CDs. These deposits make it possible to sterilise the liquidity generated by the central bank's need to intervene in the foreign exchange market, without exerting additional pressure on interest rates. Public sector deposits within the central bank, provided they are term deposits, carry a similar interest rate to central bank CDs.

The Treasury is also obliged to deposit its daily cash surpluses with the central bank through Banco de la Nación. This is to prevent Treasury funds generating opposite liquidity flows to those of other monetary policy instruments, especially during the tax collection period.

(v) Foreign exchange swaps

Foreign exchange swaps are available for financial institutions. However, since Peru does not have a developed forward market, this instrument differs from traditional swaps so as to avoid the danger of sending wrong signals to the market about the central bank's exchange rate view.

Foreign exchange swaps have an implicit interest rate. However, if the exchange rate change is higher than this implicit rate, the central bank charges the higher rate. This transfers the exchange rate risk to the commercial banks.

The uncertainty of their cost (which depends on changes in the exchange rate the following day) and the probability that it will be higher than the rediscount rate mean that the use of foreign exchange swaps is limited.

4. Intervention in the foreign exchange market

(i) Objective

Over the last few years, the central bank has had a major presence in the foreign exchange market. Given high capital inflows, extensive dollarisation of the economy and the absence of Treasury bills which could be used to supply financial resources, the central bank has been using its dollar purchases to inject liquidity.

Foreign exchange intervention consists mainly of the purchase and very occasionally the sale of dollars by the central bank, which consequently affects the monetary aggregates through the injection and withdrawal of liquidity.

The central bank's foreign exchange market intervention is carried out in accordance to the monetary targets. The monetary effect of every intervention generating excess liquidity therefore has to be sterilised so as to obtain the desired change in the monetary base; this is achieved through open market operations.

Foreign exchange intervention also seeks to counteract undesired and temporary exchange rate fluctuations, generated either by speculation or by the financial system's seasonal liquidity requirements. This, however, does not mean that the central bank bases its intervention on exchange rate bands. Rather, the strategy is to avoid abrupt short-term exchange rate movements which could have undesired repercussions on inflation or the competitiveness of tradable goods.

(ii) Factors determining intervention

The intensity of intervention in a given period is determined by the path of the monetary variables, forecast in the monetary programme. This forecast establishes the flow of base money consistent with the expected demand for money and with the inflation target.

There are essentially two causes of base money flows: dollar purchases by the central bank and central bank credit growth. If the projections are for an increase in money due to central bank credit, base money growth induced by dollar purchases must be adjusted in line with the final programmed flows of base money. If for any reason, dollar purchases turn out greater than the original estimated amount, the excess base money must be sterilised through open market operations.

Once the monetary framework and the volume of dollar purchases are determined, the central bank decides on the form and amount of the daily interventions. The daily management of the currency dealing room is based on decisions that chiefly take account of foreign exchange developments and financial system liquidity.

Financial system liquidity is characterised by marked seasonal fluctuations during the month, mainly due to tax payments. During tax collection periods, which usually last a week, a transfer of resources takes place from the private sector to the government, involving a transfer from the commercial banks to the Banco de la Nación and generating a liquidity shortage for commercial banks. To compensate for this shortage, banks usually seek credit from the central bank or sell dollars, thereby inducing an appreciation of the exchange rate, even in the run-up to the tax collection period.

In the last few years, Peru has seen large inflows of foreign currency into the financial system, which have been a major factor in increasing the dollar supply in the foreign exchange market and caused the exchange rate to appreciate. In order to counteract both liquidity shortages and pressure on the exchange rate, the central bank has intervened more heavily by buying dollars in the foreign exchange market. (Conversely, when the currency has tended to depreciate, the exchange rate is subject to a depreciation pressure, intervention has decreased (see Graph 3).

Another factor in the central bank's decisions regarding dollar purchases is the Treasury's need for dollars to service foreign debt. In doing so, the Treasury buys dollars from the central bank, thereby withdrawing new soles from the financial system. The central bank buys foreign currency in the market to meet the Treasury's requirements, and replenishes the liquidity in local currency. Hence, the larger the Treasury's needs for foreign currency, the larger the central bank's inter-vention volume in the foreign exchange market.

The daily variables that determine the system's liquidity, as well as the capital inflow, can show an unexpected behaviour during the programme period. For this reason, the central bank can intervene, if necessary, for volumes in excess of the programmed flows depending on the required increase in base money. Larger purchases of foreign exchange by the central bank are then sterilised through open market operations.

Nevertheless, it should be noted that intervention requiring sterilisation entails a financial cost for the central bank. Hence, the

Graph 3

Interbank exchange rate sale, tax period and central bank intervention

──── BCRP intervention (in millions of US$; l.h.s.)
- - - - Interbank exchange rate sale (new sol/US$; r.h.s.)
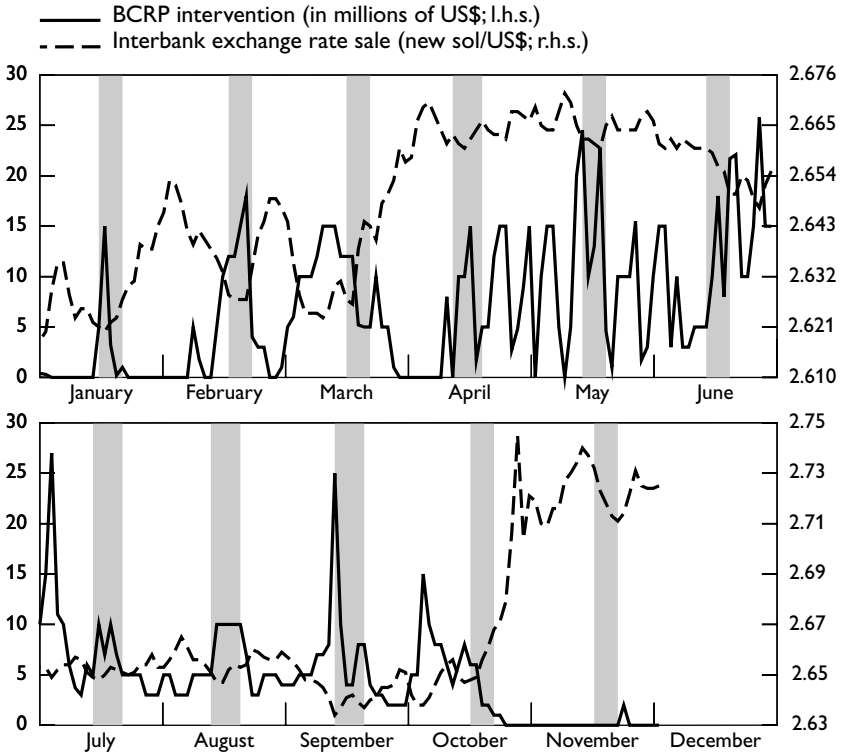
Note: The shaded areas represent tax periods.

central bank's purchases are subject to an upper limit. This limit is raised when the fiscal position supports the monetary policy stance. For instance, a fiscal surplus, with fiscal savings kept as deposits with the central bank, could enable the central bank to buy more dollars.

(iii) Intervention mechanism

The central bank buys and sells dollars at interbank exchange rates. The Monetary and Foreign Exchange Operations Committee meets daily to establish the intervention guidelines with regard to the amounts involved

and the reference prices. On this basis, the dealing room defines the strategy to be followed in terms of:

- purchase amount per telephone call;
- number of quotes permitted per telephone call;
- quantity of calls or sessions per day;
- operation closing price.

In line with the proposed strategy, the operators engage in daily transactions through the dealing system and by telephone. At present, 31 institutions are authorised to operate, 28 from the financial system and three belonging to exporters' associations (National Mining and Petroleum Society, Exporters National Society and Exporters Association).

To make intervention as transparent as possible, communication between the central bank and participating dealers is via Reuters, to which the exchange rates at which the central bank buys or sells foreign currency are reported. Communication takes place in the order in which the institutions' calls are received.

Intervention takes place in "firm" dealing sessions, based on the amount decided by the Monetary and Foreign Exchange Operations Committee: agents quote buy and sell rates for a given amount to three decimal places and the central bank can then accept either rate.

Dealing sessions work with multiples of US$ 100,000. They are conducted at variable time intervals, depending on the scale of intervention and on market activity. Dealing starts at 10:30 and closes at 12:30.

In general, the central bank only intervenes by buying in the market. The purpose is to smooth out occasional large exchange rate variations, but always in line with the financial system's liquidity needs and the increase in base money projected in the monetary programme. In the event of speculative attacks on the local currency, the central bank prefers to increase interest rates rather than sell dollars.

(iv) Results

Dollar acquisitions by the central bank are practically the only source of expansion of the monetary base. Likewise, as is shown in Table 3, whenever dollar purchases greatly increase base money, the effect is sterilised through the placement of central bank CDs or public sector deposits. Sterilisation was especially pronounced in 1994 and 1997.

Table 3
Source of base money variations
Flows, in million of new soles

	1992	1993	1994	1995	1996	1997 (Jan.–Nov.)
I. Foreign sources . .	*496*	*403*	*1,289*	*770*	*150*	*1,360*
US$ million . . .	386	203	597	345	60	510
a. Dealing room net purchases	657	417	1053	653	1,240	1,355
b. Net sales to the public sector . . .	−285	−192	−447	−314	−1,188	− 846
Public foreign debt	−125	− 24	−374	−235	− 802	− 682
c. Other	14	− 22	− 9	6	8	1
II. Internal sources . .	*21*	*49*	*−420*	*216*	*188*	*−1,217*
a. Central bank CDs	0	− 12	−338	− 91	359	− 844
b. Rediscounts . . .	3	− 17	− 10	4	103	− 40
c. Public sector deposits	− 16	19	− 66	− 33	− 427	− 595
d. Other	34	59	6	336	153	182
Total (I +II)	517	452	869	986	338	143

Source: BCRP.

The growth in base money has also enabled the financial system's local currency liquidity to grow. While still at relatively low levels, the monetisation coefficient, measured as the ratio of local currency liquidity to GDP has shown a marked recovery from less than 3% in 1990 to approximately 7% in 1997.

Dollar purchases by the central bank have also led to a strong recovery of net international reserves. Thus, from the negative level of US$ 105 million in July 1990, reserves have grown substantially, reaching US$ 10,202 million in November 1997.

The central bank's net foreign exchange position (defined as net international reserves less its domestic liabilities in foreign currency), which was negative (US$ 1,071 million) in July 1990, turned positive in April 1992 (US$ 44 million) and reached US$ 2,272 million in November 1997.

Table 4

Central bank intervention in the foreign exchange market, net foreign exchange position and net international reserves

In millions of US dollars and percentages

	1990	1991	1992	1993	1994	1995	1996	1997 (Jan.–Nov.)
Dealing room net purchases (flows)	–	928	657	417	1,053	653	1,240	1,355
Net foreign exchange position	−315	−55	311	595	1,179	1,601	1,718	2,272
Net international reserves	531	1,304	2,001	2,742	5,718	6,641	8,540	10,202
Inflation	7,649.6	139.2	56.7	39.5	15.4	10.2	11.8	5.8
Real GDP growth (%)	− 3.8	2.9	−1.7	6.4	13.1	7.2	2.6	7.9*

*To October.

Finally, the central bank's strict monetary management combined with a policy of fiscal discipline, has enabled inflation to be reduced to single figures.

Both international reserves as well as the net foreign exchange position have reached sufficient levels to back not only one year of merchandise imports, but also the total monetary base. Thus, international reserves amount to the equivalent of almost seven times the volume of base money, while the net foreign exchange position is almost one and a half times the same variable.

5. Concluding remarks

Both the objective and the powers of the central bank are clearly specified in its legal framework. In this respect, its aims and activities are transparent and explicit.

Monetary policy influences the monetary aggregates through market instruments, sending clear signals to economic agents regarding the direction and objectives pursued.

Despite major changes in monetary policy management, policy implementation still encounters problems. The main problems are:

- A modest quantity of money: total liquidity (including deposits in local and foreign currency), i.e. the quantity of money in circulation in the economy, is equal to just over 18% of GDP with a high degree of dollarisation (almost 75% of total deposits is in foreign currency). The persistently low level of local currency means that seasonal liquidity flows, generated for example by tax payments, can become quite large in relative terms.
- The central bank's capacity to buy foreign exchange is restricted by the cost of sterilisation. This may induce a rise in interest rates, in turn attracting larger foreign capital inflows and leading to an appreciation of the exchange rate.
- The dealing room's intervention strategy has improved; however, it is still restricted to buy dollars, while maintaining a passive stance when the market requires a larger dollar supply.
- Financial market segmentation: the financial market is made up of groups of institutions of widely different size and performance. Interinstitutional behaviour is therefore not homogeneous. Market segmentation creates situations in which the system as a whole can show a liquidity surplus, while on an individual basis some banks are encountering liquidity problems. Institutions with liquidity problems do not have access to interbank loans, owing either to the market's inefficiency or to the institution's specific situation. This creates a need for collateralised credits, bringing about an increase in the monetary base, despite the excess reserves in the system as a whole. As these entities' demand for central bank CDs is usually small, the scope for repurchase operations as a source of funds is limited.

Monetary policy instruments and procedures in Saudi Arabia

Muhammad Al-Jasser and Ahmed Banafe

Introduction

Monetary policy is one of the ways in which the Government can influence the economy. In Saudi Arabia, this task is carried out by the Saudi Arabian Monetary Agency (SAMA) as an agent of the Government. Monetary policy must pay attention to fiscal policy. Very often monetary policy is used to fine-tune the effects of fiscal policy.

Central banks have a range of targets, which are given different emphasis at different times. Targets include short-term interest rates, growth rates of narrow money and broad money, monetary conditions, inflation, the exchange rate and other economic indicators. Complicated theoretical models of the economy are used by central banks to see how effective their policy has been over time. The job of selecting and hitting targets is problematic because it is often difficult to determine whether changes are being accomplished by monetary policy or fiscal policy.

Limitations to monetary policy in Saudi Arabia are due to the openness of the economy, with the riyal effectively pegged to the US dollar since the suspension of the SDR/riyal link in May 1981. In practice, this has resulted in riyal interest rates closely tracking dollar rates, often with a small premium, since the mid-1980s. It was argued in the past that domestic banks contributed substantially to capital outflow from Saudi Arabia, fanning intermittent bouts of speculation against the riyal, particularly when oil prices remained depressed. It was hard to establish the extent of the banks' responsibility for dislocation in the riyal market, as the banks claimed that their extensive net foreign assets and large net foreign exchange positions were the result of liquidity management rather than a deliberate short positioning of the riyal. There is some credibility to the banks' claim, given that their net foreign assets and net foreign exchange position were significantly reduced once a range of domestic financial instruments was created in the 1990s.

In Saudi Arabia, the exchange rate plays a crucial role in monetary policy. It is an important variable for price stability and the balance of payments. Intervention policy under the fixed exchange rate regime is influenced by the level of foreign exchange outflow and the dollar/riyal interest rate differential. This will have direct effects (due to interest arbitraging) and indirect effects (via current account deterioration) on Saudi Arabia's foreign exchange reserves. With perfect asset substitutability, a small change in interest rates results in a large change in reserves, reflecting the general point that there cannot be an autonomous monetary policy in a fixed exchange rate system with perfect asset substitutability.

1. Factors relevant to the dollar/riyal exchange rate

Under Article 1 of SAMA's charter, "the objective of the Saudi Arabian Monetary Agency shall be to issue and strengthen the Saudi currency and to stabilise its internal and external value". In its exchange rate policy, SAMA takes into account the following elements:

(i) Price stability

In Saudi Arabia, monetary policy is tied to exchange rate policy. The policy objective is to maintain the dollar/riyal exchange rate as stable as possible so that public confidence is maintained and the inflow of capital is encouraged for domestic investment. Against this background, exchange rate policy has generally reflected the goal of internal price stability and balance-of- payments considerations. In achieving these objectives, SAMA moved from the SDR to the dollar as the numeraire for the riyal. In times of capital surpluses (the late 1970s) the riyal remained pegged to a strong numeraire, and the dollar/riyal exchange rate was frequently adjusted to reflect the SDR's strength against the dollar. The adjustment, calculated through a formula, became so transparent and predictable that banks and other market participants could short their dollar positions and profit once the expected revaluation of the riyal materialised. Although the revaluation of the riyal helped to mitigate the effect of imported inflation and structural rigidities (the impact of supply bottlenecks on internal prices), it led to speculative positioning in the currency.

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(ii) Balance-of-payments considerations

SAMA formally suspended the SDR link in May 1981 and has since maintained a de facto link to the dollar, with the last devaluation of the riyal occurring in June 1986 when its exchange rate against the dollar was adjusted from 3.65 to 3.75. In the 1980s, the balance of payments remained the overriding factor in exchange rate policy. The correction in the value of the dollar from the mid-1980s has been instrumental in reducing Saudi Arabia's current account deficit (except in the immediate aftermath of the Gulf crisis). The combination of the decline in the dollar (the numeraire) and low domestic inflation rate has prevented the riyal from becoming overvalued, as measured by the IMF's real effective exchange rate. Sporadic speculation against the riyal until recently emanated from market perceptions that Saudi Arabia would devalue the riyal to help reduce its budget deficit. It is worth noting that dollar/riyal exchange rate adjustments have not been made for budgetary reasons, simply because oil exports cannot be made more competitive by this means, and because gains arising from a devalued riyal are largely accounting gains with no lasting economic benefit to the Government.

(iii) Stability and confidence

Stability is difficult to define, particularly when a currency is pegged to a reserve currency or a basket of currencies. In Saudi Arabia, stability has been defined with reference to the dollar, which is the intervention currency. The dollar is used as an intervention currency because oil income is denominated and received in dollars. This means that the riyal virtually floats against non-dollar currencies. Frequent changes in the exchange rate tend to inject uncertainty in estimating the cost of imported goods and services. It is, therefore, considered desirable to keep the exchange rate as stable as possible and to adjust it only when absolutely necessary.

2. The interaction of exchange rate and monetary policy

The major factors influencing monetary aggregates are the Government's fiscal operations and the private sector balance-of-payments deficits. Changes in domestic bank credit to the private sector play a relatively

smaller role in influencing monetary aggregates. For instance, until 1982 the rate of monetary expansion was quite large reflecting massive development expenditures by the Government. Its inflationary impact was neutralised to a great extent by an exchange rate policy aimed at facilitating cheaper imports (an overvalued riyal). The Government spends a substantial portion (almost two-thirds) of its foreign exchange earnings in the domestic market, with direct foreign exchange expenditures accounting for the remaining one-third. It is net domestic cash spending by the Government which has the expansionary influence on the money supply. The private sector balance-of-payments deficit has a contractionary influence on the money supply. The net effect of these two factors on the money supply is enhanced or reduced by expansion or contraction in bank credit to the private sector. Overall, credit availability has a limited impact on money growth (see the table below).

It is said that central banks can reduce the volatility of their balance sheet stemming from international flows only by adopting a purely floating exchange rate regime. In a fixed exchange rate regime, monetary policy becomes subordinated to exchange rate policy as the authorities are forced to adopt the monetary policy of the country or countries to whose currencies their own currency is pegged. Moreover, targeting the exchange rate means letting interest rates bear the brunt of the adjustment to various shocks.

As noted before, exchange rate policy in Saudi Arabia has generally reflected considerations of internal price stability and balance-of-payments equilibrium. With the Government being the major recipient of foreign exchange earnings due to oil revenues, fiscal policy plays a more dominant role than monetary policy in influencing economic conditions. The role of monetary policy has been circumscribed by the exchange rate regime and the openness of the economy. Riyal interest rates have, therefore, tracked dollar rates, while monetary aggregates have been determined largely by external factors and the Government's net domestic expenditures.

Saudi Arabia's situation is special due to the particular features of its resource-based economy. The outflow of foreign exchange has ranged between 85% and 110% of recorded government expenditure. Net riyal savings which pass through banks are generally converted into dollars for short-term investment. As the domestic capital market develops over time, the outflow pattern will probably change for the better. From the

**Factors affecting changes in M3**
In billions of riyals

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Net domestic cash flows through government spending[1]	71.7	80.9	61.4	69.1	149.7	166.7	88.2	67.6	88.0	96.4	120.8	145.3
Commercial banks' claims on the private sector	1.2	– 0.5	11.7	2.8	– 8.0	8.3	13.5	15.6	11.0	8.0	2.4	10.1
Net private sector balance of payments[2]	–85.7	–97.4	–91.1	–96.0	–110.4	–106.1	–101.0	–132.5	–106.2	–108.3	–120.7	121.9
Net other items[3]	23.3	25.6	27.0	25.9	– 23.0	– 41.5	– 4.6	56.6	9.6	13.2	23.6	–24.2
Change in M3	10.5	8.6	9.0	1.8	8.3	27.4	5.3	4.8	6.7	6.8	18.4	13.5
Annual growth rate of M3 (%)	7.0	5.4	5.3	1.0	4.6	14.5	2.5	2.2	2.9	2.9	7.7	5.2

[1] Including net loans disbursed by government-sponsored credit institutions. [2] Includes payments for goods and services as well as capital outflow.
[3] Obtained as a residual and including gross capital inflow.

Source: SAMA.

Current account balance and exchange rates

Current account balance
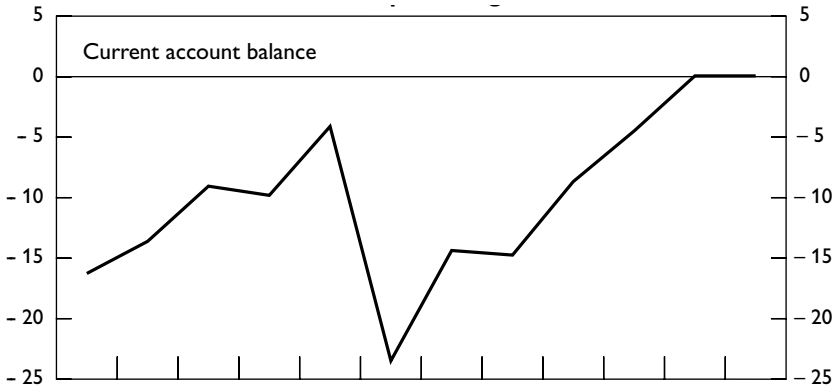
Real and nominal exchange rate of the Saudi riyal

Real effective exchange rate (1990 = 100; l.h.s.)
Nominal exchange rate (Riyal/US$; r.h.s.)
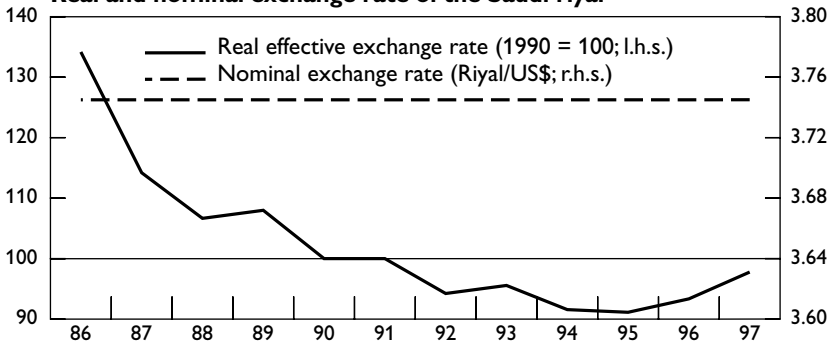
standpoint of inflation, to avoid higher import costs and maintain confidence in the riyal, it is desirable for the exchange rate to be stable against the dollar. For foreign investors, with direct or portfolio investment stakes in Saudi Arabia, currency stability is also an important consideration.

3. Monetary transmission

In Saudi Arabia, changes in bank reserves can be explained as follows: given that SAMA is the Government's banker, there is no impact on

the monetary base when the Government receives dollars or their equivalent in riyals. When expenditures are made, the Government draws cheques on SAMA, which means SAMA's liabilities are shifted to the banks, facilitating credit creation by the banks. Since the monetary base is affected, the money supply is also impacted. The multiplier ($M = m.B$ where M is the money supply, m the money multiplier and B the monetary base) explains how the money supply expands once excess reserves get distributed throughout the banking system.*

Given the predominant role of fiscal policy in influencing monetary developments in Saudi Arabia and the relative passivity of open market operations, the efficiency of monetary policy in regulating the stock of money and, therefore, aggregate demand via open market operations is limited.

The widely observed channels of transmission of monetary policy are as follows:

(a) *Credit availability.* In Saudi Arabia, credit has a limited impact in the transmission mechanism of monetary policy, largely due to the subsidised lending of specialised credit institutions to the various economic sectors, and to banks' lending behaviour (competition is much greater in the deposit market than in the loan market).

(b) *Interest rate changes.* In the absence of long-term bank credit and any meaningful leveraging by households and firms, the significance for disposable income of interest rate changes is less pronounced than is the case in a leveraged financial environment. The demand for money is generally inelastic to interest rate changes.

(c) *Wealth effect.* This factor has its limitations in Saudi Arabia due to limited collateralisation of assets and hence the limited impact on bank credit of a decline in financial asset prices.

(d) *Exchange rate effect.* The effectiveness of monetary policy is limited given Saudi Arabia's policy choice of administering the dollar/riyal exchange rate and the high degree of asset substitutability. Any

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* The relationship between the monetary base and the money supply is determined by the currency/deposit (cu) and reserve/deposit (re) ratios, expressed as $m = (1+cu)/(re+cu)$. Leakages can occur if chequing account deposits included in the money supply are shifted into foreign currency deposits (by selling riyals to SAMA against dollars) or into other forms of deposits not counted in the narrow money supply. Similarly and in a more general sense, if capital inflows cause the traditional net foreign exchange outflow to decrease, then the money supply will increase. This was the case immediately after the Gulf war when the M3 measure of the money supply grew by about 14.5%, partly due to capital repatriation, as well as to statistical effects.

decoupling of riyal interest rates from dollar interest rates (particularly in the event of lower riyal rates) will provoke arbitraging, which will have a negative impact on official foreign exchange reserves.

In an administered exchange rate regime with full convertibility and no restriction on capital flows, monetary policy becomes subordinated to maintaining the desired exchange rate. Moreover, the openness of the economy fosters the quick transmission of monetary influences from abroad. It is thus difficult to have an autonomous monetary policy in a fixed exchange rate system with perfect asset substitutability. This factor is reflected in short-term riyal interest rates closely tracking dollar interest rates (with a small risk premium). A higher risk premium tends to characterise long-term rates (e.g. on Saudi bonds) reflecting the perceived exchange rate risk and marketability considerations of the instrument.

Intervention policy may be warranted when large foreign exchange outflows occur due to: (a) commercial demand; (b) demand for foreign financial assets; (c) short-term liquidity management; and (d) speculation.

Foreign exchange outflows under (a) and (b) are of a fundamental nature due to the relatively small home production base and a less developed capital market. Foreign exchange outflows under (c) have been contained to a large extent by providing banks with money/capital market instruments. Speculation against the riyal, which becomes quite pronounced at times of falling oil prices, places an additional burden on official foreign exchange reserves.

As oil is the main foreign exchange earner for Saudi Arabia and the proceeds are paid into the Government's account at SAMA, SAMA is the sole provider of dollars to the private sector via the domestic banks. SAMA satisfies the private sector demand for foreign exchange by selling them the required dollars on a regular basis. This is a routine operation which lacks the flavour of "official intervention". The net effect is that the spot dollar/riyal exchange rate trades within a very narrow range. However, intervention has an important effect on the more volatile forward dollar/riyal exchange rate only when it influences expectations. This implies that foreign exchange intervention must be publicly known in order to be effective. SAMA's maiden intervention in the forward market in support of the riyal during December 1993 helped steady the forward market and domestic riyal interest rates. SAMA has no implicit

band for the exchange rate, nor does it aim to defend a particular level (rate) in the forward market. The intervention philosophy is very much tied to containing volatility in the forward market and maintaining overall market stability.

When exchange rate policy becomes the anchor for monetary policy, it becomes fairly difficult to pursue a countercyclical monetary policy independent of exogenous factors (i.e. a mix of tight fiscal and easy monetary policy or vice versa). The relevance of the demand function of money in conducting monetary policy under such an environment is no greater than the limitation of monetary policy in influencing the money supply. The role of fiscal policy in Saudi Arabia has an important influence on GDP growth, money demand/supply and structural inflation.

Exchange rate commitments induce a shift from a money supply rule to an interest rate rule and a much constrained scope for independent action in the control of money (the policy constraint in Saudi Arabia). From a policy perspective, ascertaining whether the demand for money balances is driven by long-term forces, or is subject to unpredictable shifts, remains an interesting academic exercise but is not a central concern in the conduct of monetary policy.

Although a well-developed financial structure is generally of crucial importance for the transmission mechanism, this argument has some limitations in Saudi Arabia because the domestic economy is not interest rate sensitive (i.e. output and inflation are not significantly influenced by changes in short-term interest rates). The presence of government-sponsored institutions, which are under little pressure to maximise profits, tends to diminish the responsiveness of loan and deposit rates to monetary policy as they are outside SAMA's terms of reference. In Saudi Arabia, competition among banks is much greater in the deposit market than in the loan market. In the short run, lending rates do not fully adjust to changes in money market rates, particularly when money market rates are falling. The linkage between changes in interest rates and changes in aggregate demand is rather inelastic.

It is difficult for monetary policy to target the level of domestic interest rates and the exchange rate at the same time. If it seeks to do so, imbalances may occur. The combination of tight monetary policy and an overvalued exchange rate cannot be sustained without the risk of aborting economic recovery. To alleviate the dilemma, cooperation between fiscal and monetary policies is essential.

4. Policy instruments

In the pursuit of its monetary policy objectives, SAMA uses the following tools to influence money market conditions:

(i) Minimum reserve policy

Cash reserve ratio (CRR)

Under Article 7 of the Banking Control Law, banks are required to maintain a percentage of their customers' deposits with SAMA as prescribed cash reserves. This is a regulation of principle, designed both as a monetary policy measure and to ensure that the banks have adequate liquidity to cover their customers' deposits. This is the most powerful instrument of liquidity policy available to SAMA. However, it has been applied only for implementing structural changes in bank liquidity (credit creation control) rather than for the frequent fine-tuning of short-term liquidity. Changes in the minimum reserve ratios often produce considerable signal effects, which are by no means always desirable. SAMA last adjusted these reserves (from 12% to 7% on current account liabilities, with an unchanged 2% on savings/time deposits) in February 1980. Lower reserve requirements had the effect of injecting permanent reserves into the banking system which at that time was suffering from an imbalance between sources and uses of funds due to robust economic activity and surging demand for credit in the 1970s. Reserve requirements are imposed on liabilities to non-banks and financial institutions. Interbank transactions in the domestic market are free from reserve requirements. Offshore banks' riyal deposits with the domestic banks are subject to reserve requirements.

There is a growing feeling among bankers, including central bankers, that the reserve requirement system has lost its effectiveness in steering both liquidity and monetary policy while repos and swaps have been successfully used to fine-tune system liquidity. In today's sophisticated money market, reserve requirements do not retain the automatic buffer function. In Saudi Arabia, the availability of other instruments of liquidity management has diluted the role of reserve requirements in steering liquidity, although the instrument itself is still regarded as central to Saudi Arabia's monetary policy.

Statutory liquidity ratio (SLR)

Under Article 7 of the Banking Control Law, banks are required to maintain a minimum amount of specified liquid assets equal to 20% of their demand and time liabilities (known as the statutory liquidity ratio). As a result of the application of the reserve ratios, the free liquidity at the disposal of the banks at any time for lending is the difference between total deposits and the aggregate of the sums constituting the cash reserve ratio and the statutory liquidity ratio.

(ii) Repos

The issuance of government development bonds since June 1988 to finance the budget deficit has been an important milestone in Saudi Arabia's financial market development. The bond market provides an additional policy instrument to SAMA in the form of open market operations.

Open market operations are a flexible instrument of credit control whereby a central bank, on its own initiative, alters the liquidity position of banks by dealing directly in the market instead of using its influence indirectly by varying the cost of its credit. The efficacy of open market operations depends on central bank holdings of securities and the size and depth of the market.

In Saudi Arabia, the bond market is in the early stages of formation. Virtually all the public debt is held by a few institutions and banks. The market is likely to remain narrow for some years to come, precluding large-scale operations by SAMA since these would unduly disturb security prices. Moreover, the risk for SAMA in engaging in secondary market transactions at this stage would be one of acquiring and accumulating government debt over an extended period of time.

In situations that call for only temporary additions to bank reserves, SAMA engages in short-dated repurchase agreements (predominantly overnight repos) with banks. This arrangement permits a very short-term injection of reserves and their automatic withdrawal when the repos mature. The allocation of repos is linked to banks' holdings of eligible securities (government development bonds, FRNs and Treasury bills).

In situations where there is a temporary need to absorb, rather than provide, bank reserves, SAMA engages in overnight reverse repos (matched sale-purchase operations) with banks. For monetary policy

purposes, this procedure has the advantage over a definitive purchase of financial assets of being reversible at short notice, and that transactions under repos do not directly affect prices in the bond market but serve to regulate the money market. Repos are priced broadly in line with short-dated money market rates and reverse repos carry a spread of $1/2\%$ below the repo rate. The repo window is always open to the domestic banks. Banks can raise liquidity via repos to meet unexpected clearing shortages and to temporarily facilitate their secondary market-making operations. Banks cannot buy dollars from SAMA out of the repo proceeds, nor are they expected to use repos to fund assets as part of their asset/liability management, although temporary accommodation at the time of settlement is tolerated.

(iii) Foreign exchange swaps

Foreign exchange swap transactions serve the purpose of influencing capital flows, thereby reducing the disruptions to monetary policy emanating from the foreign exchange market. As far as their significance for money market policy is concerned, foreign exchange swaps are analogous to repurchase transactions in securities. Swaps are more flexible with regard both to their maturities and to the volume which can be traded in any one deal. Reversible assistance operations to drain excess liquidity can easily be executed. Foreign exchange swaps, carried out at the ruling market rates, affect system liquidity but do not generally exercise a direct influence on the exchange rate. Swaps were extensively used to provide emergency liquidity to the banking system during the Gulf crisis. Interbank foreign exchange swaps are actively traded for maturities up to one year, primarily for liquidity management and occasionally against currency speculation.

(iv) Placement of public funds

As part of its regular money market operations, SAMA exercises its discretion in using the government institutions' funds at its disposal to place with the banks. Such placements of public funds are entirely at SAMA's discretion and are complementary to the primary instruments for fine-tuning day-to-day liquidity (repos and foreign exchange swaps). Basically, however, the placement of funds is to be seen as providing longer-term liquidity support (gross or rough-tuning). This rough-tuning

is carried out by placing deposits with domestic banks on behalf of autonomous government institutions or the intervention fund, as opposed to outright purchases of government securities in developed markets. Operations of this kind provide liquidity over longer horizons than regular repo transactions in response to predictable patterns in liquidity (such as seasonal fluctuations). They can also be used for providing soft loans to ailing banks (part of crisis management).

5. Monetary policy operating procedures

(i) Institutional aspects

SAMA, the country's central bank, is solely responsible for monetary policy formulation and implementation. It is also free to select its operating procedures and to determine the choice of instruments as well as when to use them. Only in a few cases like the changing of the statutory reserve requirement for banks, prior approval of the Minister of Finance and National Economy is needed.

There are no direct controls (such as credit ceilings or interest rate and foreign exchange controls) in use as part of monetary policy implementation. While it is difficult to envisage the circumstances in which direct controls might be applied, the main argument for their use could be to prevent undue credit concentration in a particular sector, an excessive rise in interest rates or excessive pressure on the country's foreign exchange reserves.

The bulk of the transfers of public sector deposits from/to commercial banks to/from the central bank are made by SAMA on its own discretion and as such do not affect the planning of monetary policy. The size and timing of such transfers depend on the exigencies of the situation.

SAMA, which manages government debt, does not extend credit to the Government, except for very short-term ways-and-means advances that serve to meet the Government's immediate cash flow needs. SAMA has full discretion in deciding the terms and timing of debt issuance. SAMA monitors closely the impact of fund raising from the market on system liquidity, and to date has not had to postpone the issuance of new debt.

(ii) Operational procedures

The monetary and banking environment is subject to constant surveillance. Whenever the situation calls for action, a decision on the operating procedure is taken by SAMA's senior management. Deliberations/decisions are not made public but changes in repo rates are advised to the banks. SAMA typically makes interest rate adjustments in small and infrequent steps. Foreign exchange swaps and their prices (which are market-related) are left to the operational department. The operational instrument of monetary policy is banks' reserve accounts at SAMA. Interest rates play a subsidiary role as they are predominantly affected by US dollar interest rates. SAMA accommodates day-to-day liquidity needs of the domestic banks at the repo rates and in volumes which it determines. SAMA's informal estimate of the demand function for central bank balances is based on the level of daily repo activity. SAMA does not act proactively on a day-to-day basis as its "reactive repo mechanism" provides the market with a self-correcting adjustment factor. Generally, the demand for liquidity has been driven by the need to acquire sufficient settlement balances, in particular for settling securities transactions, securities settlements, to deal with unforeseen large withdrawals and to meet seasonal demand for liquidity.

It is rather difficult to quantify tolerance against volatility in the operating target and the overnight rate. The general attitude has been to stabilise the market through liquidity management. This is because acute volatility is interpreted as indicative of a dislocation in the market, prompted by capital outflows.

(iii) Transparency and signalling

Transparency contributes to credibility. Indirect (market-related) instruments offer many advantages over direct instruments, notably greater flexibility and effectiveness in the implementation and conduct of monetary policy. This is because indirect instruments work through markets and permit small and timely changes in instrument settings, enabling the authorities to respond rapidly to shocks and to correct policy errors, thereby obviating the need for more massive shifts in policy. SAMA avoids imposing policy-making rigidities in a bid to retain flexibility in liquidity management and interest rate steering. Repos are largely conducted at market-related rates, known as MRR. The amount

of credit available to the banks at the MRR is up to 35% of eligible securities. SAMA also announces its official repo rate, known as ORR. A very limited amount of credit (up to $1/2$% of eligible securities) is available to the banks at the ORR. The ORR has thus a directional (signalling) rather than a transactional influence on the domestic money market. The purpose of the Repo Window is to satisfy banks' day-to-day liquidity needs and keep the clearing system in balance (fine-tuning function). SAMA meets any erratic movements in money market rates through active intervention. Over the years the conduct of liquidity management has become increasingly transparent.

Monetary policy operating procedures in Singapore

Monetary Authority of Singapore

Introduction

The Monetary Authority of Singapore (MAS) is responsible for the formulation and implementation of monetary and exchange rate policies in Singapore. The centrepiece of monetary management rests on the exchange rate with monetary policy playing a complementary role. The policy emphasis on the exchange rate stems from the openness and small size of the Singapore economy. A vast network of international financial linkages exists, overlaid on a large external trade and services sector. As a result, capital mobility is high so that the trend in domestic interest rates is largely determined by external interest rates. There is therefore little scope for completely independent monetary policy and Singapore does not target money supply or interest rates.

Overview of exchange rate and monetary management

Exchange rate policy is formulated with the primary objective of maintaining domestic price stability in the context of sustainable, non-inflationary economic growth. Due to Singapore's small domestic economy which is highly dependent on the external sector, the exchange rate is considered the more important instrument to achieve this policy objective. Singapore's total merchandise trade as a percentage of GDP exceeds 200%, a level virtually without parallel in the world. The import content of expenditure and exports is also very high at 60–70%. Given that Singapore is a price taker in global trade, the high import content means that changes in world prices or in the exchange rate have a powerful direct influence on price levels in the economy. The trend appreciation of the Singapore dollar (S$) over the last decade has helped to limit imported inflation in Singapore.

Domestic cost pressures, on the other hand, reflect the stance of fiscal and monetary policies. The other main influence on domestic inflation has been labour supply. With the Singapore economy enjoying full employment over the last decade, tightness of the labour market can be alleviated through immigration policies. Nevertheless, exchange rate policy has helped to regulate and rein in aggregate demand and dampen wage inflation.

The exchange rate is not used for export competitiveness reasons because the high import content of exports makes the incremental gain in export competitiveness small compared with most countries. Over the longer term, offsetting wage increases in response to rising consumer prices and a tightening of the labour market would raise unit labour costs.

Money supply and interest rates have a relatively modest impact on inflation and the level of economic activity in Singapore, given the greater contribution of external demand to growth than that of domestic demand. Unlike the larger economies where interest rates have a significant impact on investment, Singapore's economy is dominated by foreign multinational companies with foreign sources of funds, thus limiting the importance of the domestic cost of borrowing. Moreover, given a small economic base and the absence of exchange controls, large and rapid movements of capital can occur whenever there are changes in the differential between domestic and foreign interest rates or rates of return. This makes it difficult to target either the money supply or interest rates. Domestic interest rates are largely determined by foreign rates and market expectations of the future strength of the Singapore dollar, while changes in the money supply are mainly accounted for by the net flow of funds from abroad.

In the implementation of exchange rate policy, the Singapore dollar is monitored in terms of a basket of currencies of Singapore's major trading partners and allowed to float within a broad band. The long-term objective is to influence the trade-weighted exchange rate of the S$ within the band, so as to achieve a low and stable rate of consumer price inflation. The basket of exchange rates that is monitored reflects the range of sources of imported inflation and of competitors in export markets. With a floating exchange rate, MAS can directly influence the value of the S$ only by intervening in the market itself. For this reason, large foreign reserves and the readiness to use them for intervention are

necessary. Ironically, having such large reserves serves to deter speculators and makes it less likely that significant amounts will be needed to defend the currency.

In the short term, MAS may intervene in the market to smooth out volatility in the exchange rate. This is necessary as the long-term credibility of Singapore's exchange rate policy is influenced to a significant extent by short-term fluctuations in the exchange rate. Extreme short-term volatility in the exchange rate, if left unchecked, can cause more market attention to be focused on the currency and impair confidence in the currency in the long term, with potential adverse consequences for the economy.

The use of exchange rate policy, however, does not totally obviate the role of monetary policy. Regulating the level of liquidity in the banking system alongside exchange rate policy is still needed to foster stable money market conditions and promote steady and non-inflationary growth. MAS also uses interest rates to support its foreign exchange intervention. Interest rates were thus allowed to fall to dampen the strength of the S$ in periods of strong capital inflows and vice versa (Chart 1).

Chart 1

S$/US$ exchange rate and three-month interbank rate, 1990–97
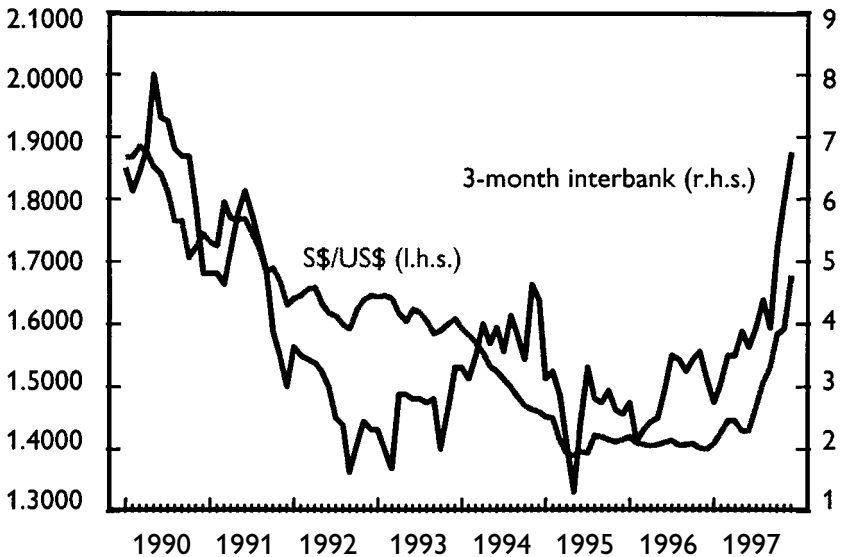
Monetary policy operating procedures

In the early 1970s, MAS relied to a large extent on varying the minimum reserve requirement of banks to conduct monetary policy. The minimum ratio was revised several times in the 1970s to help manage the economy and curb inflation. The ratio was increased from 3.5% to 5% in August 1972 and then to 9% in March 1973 to drain liquidity and curb high credit growth for equity market activities. Interest rates were also raised through the cartel system which existed before July 1975 and resulted in minimum lending rates being fixed by MAS in conjunction with the Association of Banks of Singapore. At a time when financial markets in Singapore were still immature, these measures effectively reined in credit growth and inflation. Given that quantum jumps were irregular and infrequent, these instruments, however, were not really flexible enough for coping with fast changing market conditions. Hence, as money and foreign exchange markets developed, MAS started to rely more on market operations in conducting monetary policy.

   A system of discount houses dealing in Treasury bills, commercial paper and interbank deposits was sufficient for some time. The pool of liquidity between banks and the monetary authority served to smoothen the interest rate effects of oversupply or excess demand. But like most passive instruments of monetary policy, the burden was on the banks to identify any surpluses or shortages of funds in the banking system and access MAS for liquidity indirectly through the discount houses. Although these systems and instruments had their merits, their shortcomings became increasingly obvious as money markets became more active. Instances where liquidity was not homogeneously distributed across banks, or where the majority of banks was not aware of significant shortages or surpluses in the system until they caused interest rates to rise or fall significantly (e.g. when government fiscal operations resulted in significant withdrawals or additions of funds through a single or a few banks), tended to result in marked intraday volatility of interest rates.

   Reserve requirements and passive instruments have remained useful in MAS's arsenal of monetary policy instruments until today, but money market operations conducted at MAS's initiative are now more effective in ensuring stable market conditions. A more proactive stance in deciding the amounts and timing of money market operations can be taken: over time, such operations have therefore become more dominant

as a policy implementation tool. With Singapore firmly plugged into world financial markets and given free capital mobility, the foreign exchange and money markets which developed in tandem to accommodate these flows have provided MAS with a natural medium for monetary intervention. Since the 1980s, MAS has used foreign exchange swaps as the main instrument to regulate the level of liquidity in the banking system, complemented by uncollateralised borrowing from and lending to banks.

Markets for these instruments developed spontaneously to meet demand, but MAS's participation in these markets has probably had the effect of reinforcing their depth and liquidity. The rapid growth of the S$ money and foreign exchange markets provided MAS with more liquid means to effect monetary policy than did the traditional instruments (Table 1).

During the course of a day, banks' cash balances with MAS are affected by various transactions among the banks, MAS and the public sector. The transactions which affect domestic liquidity conditions include changes in banks' cash holdings, the net amount of Treasury bills and other Government securities issued, financial transactions of the Government, foreign exchange transactions, etc. In the day-to-day

Table 1
Estimated size of Singapore money market
In millions of S$

End of Period	Interbank market*	Bills discounted or purchased	Treasury bills outstanding	Total
1987	9,271	2,175	2,780	14,226
1988	8,833	2,693	2,360	13,886
1989	15,166	3,010	1,900	20,070
1990	18,438	3,416	2,070	23,924
1991	12,058	4,134	3,420	19,662
1992	11,936	4,100	4,940	20,976
1993	17,402	4,305	4,990	26,696
1994	28,411	4,301	5,000	37,712
1995	30,927	4,668	5,750	41,345
1996	33,555	5,765	5,990	45,310

* Amounts due from banks in Singapore.
Source: MAS Monthly Statistical Bulletin.

monetary management, MAS monitors money market rates closely as an indication of orderly market conditions. It helps smooth out large fluctuations via the addition/withdrawal of funds via foreign exchange swaps and loans/borrowings. Generally, MAS is in a position of supplying funds to the market as prudent fiscal management by the Government usually leads to a transfer of public sector surpluses from the banking system to MAS. (Chart 2).

Foreign exchange swaps for same day value are transacted in the morning to allow sufficient time for settlement while borrowings and loans can be done throughout the day. Uncollateralised loans are usually transacted on an overnight or short-term basis, while term loans are less frequent. The volume of loans transacted is subject to credit lines. Of course, sound banking supervision to ensure that banks operating domestically are sound will enhance the use of this instrument. The interest rate which is most immediately influenced by MAS's money market operations is the overnight interbank rate. Changes in this rate will feed through to other interbank rates, with the one-month rates still relatively sensitive, while longer-term rates are less so. There are no specific targets for the money supply or interest rates. On a longer-term basis, MAS seeks to maintain money market conditions that complement exchange rate policy in order to sustain non-inflationary economic growth.

The Singapore Government securities market is small because the Government runs budget surpluses and does not need to borrow from the market. The total outstanding amount of Government securities issued to the market as of end-1997 was only S$ 21.8 billion, compared with a stock of M3 money of S$ 152 billion. Nevertheless, it has sufficient liveliness to allow MAS to use auctions (on behalf of the Government) and secondary market trading and repurchase operations to add or withdraw liquidity.

Although monetary policy is implemented mainly through money market operations, MAS still relies on direct credit controls where appropriate. For example, in May 1996, in response to surging residential property prices propelled by the availability of easy credit, MAS imposed a limit on financing residential properties of 80% of the cost of a property, compared with the common practice of 100% financing. The measure succeeded in slowing the rapid increase in property prices and prevented the formation of what could have been a property asset

Chart 2
Flow of funds in Singapore's monetary system
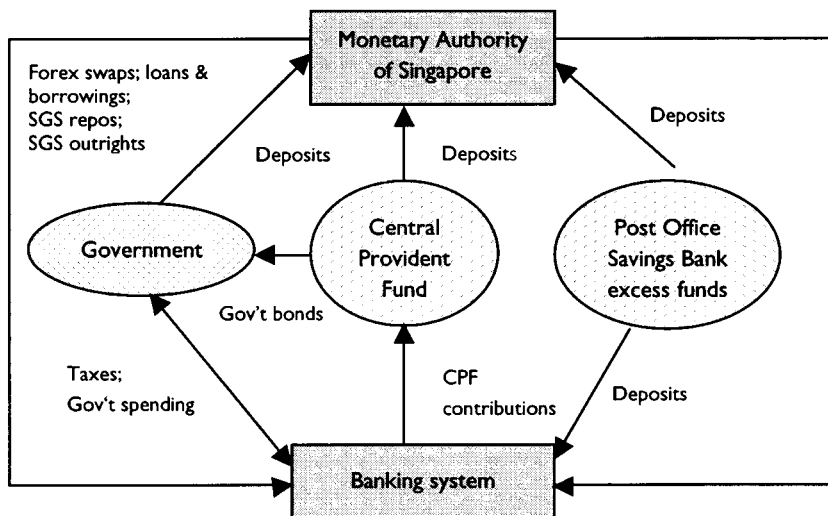
bubble. As of early 1998, property price declines in Singapore in the wake of turmoil in financial markets had been relatively small and non-performing property loans of the banking sector had remained modest.

Transparency and signalling

There is no single rate such as a discount or repo rate which MAS changes to signal its policy intentions. Although it is common knowledge that MAS manages the S$ exchange rate based on a trade-weighted basket, neither the weights in the basket nor the targeted trade-weighted band are made public. However, the general thrust of MAS's intentions with regard to monetary and exchange rate policy is disseminated to the market through occasional policy pronouncements by senior central bank officials. Comments of Government ministers are also scrutinised by market participants, although such statements may have been unplanned or off-the-cuff answers to questions. Otherwise,

banks and other financial institutions would normally monitor movements in exchange and interest rates to draw conclusions about whether MAS is changing its policy. There is no speculative market build-up in the run-up to meetings where changes in policy are announced, e.g. the FOMC meetings in the United States or the Bundesbank Council meetings in Germany.

Implementing policy revisions gradually through market mechanisms as opposed to announcing quantum changes in key variables allows to gauge the effectiveness of policy changes and, if necessary, fine-tune the stance of policy. This would not be possible if a target exchange or interest rate were to be made transparent to the market. Any deviation from the targeted rate would then have to be explained satisfactorily to the market for the central bank to maintain its credibility. If the official target were to be disputed by the market, the debate would be entirely public. Holding up a target disputed by the market is to invite being shot at in the markets, as "notorious" leveraged funds have demonstrated. Hence, it is also a moot point whether the announcement of a targeted rate to the market would actually help in policy implementation. A difficult period was encountered for several months in 1993, when interbank interest rates in Singapore sank to zero and the S$ exchange rate surged due to massive capital inflows in the run-up to the Singapore Telecom initial public offering of shares. Allowing a still stronger exchange rate would not have been appropriate policy-wise, but it was unlikely that the market would have heeded official calls for a weaker S$. The low-key style of policy implementation has served MAS well thus far, and there has been no pressure from the market for more transparency in revealing MAS's policy intentions.

Recent developments in monetary management

In the second half of 1997, amidst the financial market turmoil in Asia, the S$ foreign exchange and money markets were not spared the volatility brought about by the significant depreciation of the currencies in the region. Like other Asian currencies, the S$ weakened, falling against the US$ by 14.8% between end-June and end-December 1997. Singapore dollar interest rates also rose, with the three-month interbank rate climbing from $3\frac{5}{8}$% to 7% over the same period (Chart 3).

Chart 3

S$/US$ exchange rate and three-month interbank rate, 1997
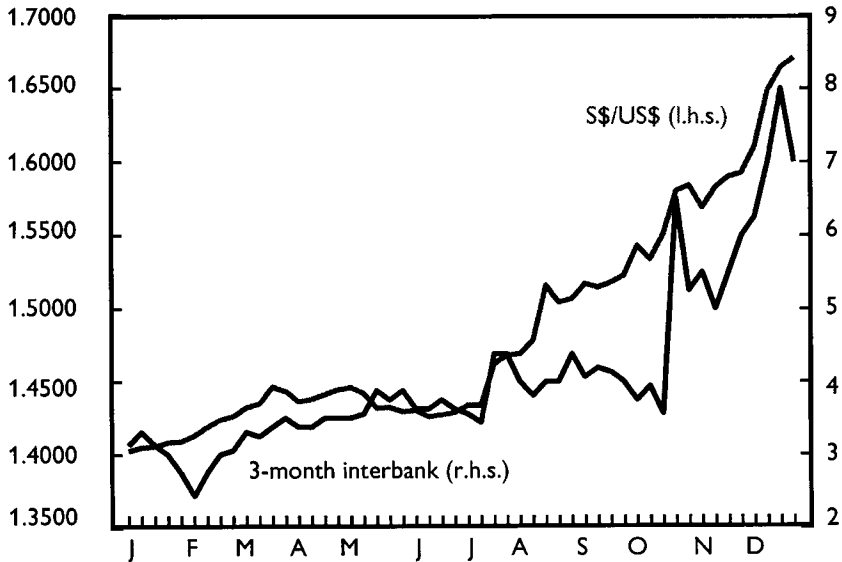
Throughout the period of high volatility, MAS's intervention operations in the foreign exchange and money markets have continued to be aimed at promoting monetary and market stability. Apart from some short-lived spikes, interest rates have risen gradually in response to the downward pressure on the S$ exchange rate. MAS maintained its policy stance of ensuring adequate but not excessive liquidity in the money market.

Notwithstanding market opinion which prescribed a large S$ depreciation given the negative spill-overs from other Asian economies and the need to preserve export competitiveness, the S$ depreciated only to a limited extent as a fitting response to changes in the external environment. The Government addressed the issue of cost competitiveness at a fundamental level, instituting a package of cost and tax cutting measures. This combination of basic re-examination of Singapore's cost position and adjustments to the exchange rate was

similar to that used during the recession in the mid-1980s and, as an approach towards confronting economic stress, again proved reliable.

MAS's modus operandi in the currency markets remained unchanged and proved effective. The low-key intervention operations succeeded despite, or perhaps because of, the non-transparent procedure. While the intervention process seems indeterminate, the pledge to maintain confidence in the S$ is clear. The Chairman of MAS, who is also Deputy Prime Minister, actively reaffirmed the commitment to support the domestic currency against speculation and unwarranted depreciation in the context of Singapore's strong fundamentals.

Conclusion

With an exchange rate-centred monetary policy, MAS's operations in the money market have been aimed at ensuring adequate but not excessive liquidity in the banking system, rather than signalling MAS's intentions with respect to interest rate policy to the market. In periods of intense exchange rate pressure MAS has been prepared to allow interest rates to move significantly in response to market flows. The Singapore Government's prudent fiscal policies and commitment to preserving low inflation have enabled MAS to concentrate on price stability and the pursuit of sustained non-inflationary growth.

In implementing exchange rate and monetary policies, the progressive shift from administrative means to market operations has allowed MAS to react promptly to economic and financial developments so as to steer the economy in the desired direction. Given the potential destabilising effects of sudden large capital flows as shown by recent history, one cannot overemphasise the importance of having the latitude to act promptly and on a sufficiently large scale, together with a sound banking system.

Monetary policy operating procedures in South Africa

E. J. van der Merwe

Introduction

The new socio-political structure in South Africa led to a need to reintegrate the economy into a rapidly changing global financial environment after a long period of increasing isolation. As a result, considerable changes were brought about in South Africa's financial system over the past five years or will be implemented in the near future.

At the centre of the South African programme for financial reform is the gradual phasing-out of exchange controls. Good progress has been made in the liberalisation of the economy in that:

- all effective exchange controls on current account transactions have been lifted;
- exchange controls on non-residents have been fully removed;
- the two-tier exchange rate system for certain capital account transactions was formally terminated in 1995;
- South African resident corporates were given permission to make direct investments within certain limits in branches and subsidiaries in foreign countries;
- South African institutional investors (insurers, pension funds and mutual funds) may now diversify up to 10 per cent of the total assets managed by them in foreign currency denominated assets; and
- South African individuals who are registered taxpayers in good standing and over the age of eighteen years are allowed to transfer limited amounts abroad or to hold foreign currency deposits with domestic authorised foreign exchange dealers; and the gold mines are now allowed to market all their gold directly and not by decree through the central bank.

Further relaxations are planned for the future which will be decided on in accordance with the circumstances at the time and will depend

particularly on the foreign liquidity position of the country and the stability in domestic and international economic conditions.

The removal of direct controls on capital movements led to a large number of foreign banks establishing branch offices and subsidiaries in the domestic market, while many South African banks extended their activities to other countries. Major changes were at the same time introduced in the operations of the South African financial markets in equities, bonds and financial derivatives, which contributed to considerable increases in the turnover in these markets. These changes also caused the participation of non-residents in the domestic financial markets to increase substantially. Non-residents are now responsible for more than half the transactions in the market for foreign exchange, nearly one-third of the turnover on the Johannesburg Stock Exchange and just over one-sixth of the volumes on the Bond Exchange.

The process of financial sector reform in South Africa is continuing. Three important changes were planned for 1998. First, a major revision of the national payment system was implemented from 9th March when the manually operated interbank settlement was replaced by a new automated system. Real-time gross settlements is to be implemented in three phases in the coming years. Secondly, new monetary policy operating procedures were introduced on 13th March because of certain inherent weaknesses in the current procedures. Finally, the Government appointed certain private banks as primary dealers in Government bonds; market-making in government bonds by these primary dealers started in April 1998.

In this paper the current and proposed changes to the monetary policy operating procedures in South Africa will be described in some detail and reference will be made to the other reforms only to the extent that they may influence the operating procedures. As a general background to the discussion, the monetary policy framework followed in South Africa is first explained in Section 2. This is followed in Section 3 by a portrayal of the previous monetary policy operating procedures and the problems experienced in the application of these procedures. Section 4 then provides a description of the new monetary policy operating procedures that were implemented in March 1998,[1] and a few concluding observations are made in Section 5.

[1] The experience with the new procedures in the first few months after their introduction is described in the Appendix to this paper.

1. The monetary policy framework

(i) Institutional arrangements and accountability

The South African Reserve bank is responsible for the formulation and implementation of monetary policy in South Africa. This responsibility of the central bank is spelled out clearly in the Constitution of the Republic of South Africa, which specifies that it is the task of the Reserve Bank to protect the value of the currency in the interest of balanced and sustainable economic growth in the country.

The Constitution further states that in the pursuit of this objective the Reserve Bank must perform its functions independently and without fear, favour or prejudice. However, it is also required that there must be regular consultations between the Reserve Bank and the Minister of Finance. In accordance with this requirement and to ensure coordination between monetary policy and broader macro-economic objectives, regular meetings are arranged at which the Reserve Bank's Governors Committee (consisting of the Governor and three deputy governors) and the Minister of Finance and senior officials from his Department discuss economic developments and policy.

The Reserve Bank is also accountable for monetary policy. In terms of Section 31 of the Reserve Bank Act, Act no 90 of 1989, the Governor of the Bank must submit each year to the Minister of Finance a report on the implementation of monetary policy, while Section 32 of the Act states that the Bank must submit each month a statement of its assets and liabilities and each year its financial statements to the Department of Finance. These annual reports and financial statements are laid upon the Table in Parliament by the Minister of Finance. In addition, the Governor of the Reserve Bank may be, and on several occasions has been, called upon to appear before the Parliamentary Portfolio Standing Committee on Finance to explain monetary policy and to answer questions on the Bank's views on financial and economic developments.

Section 37 of the Reserve Bank Act provides that if at any time the Minister of Finance is of the opinion that the Bank has failed to comply with any provision of the Act or of a regulation made thereunder, he may by notice in writing require the Board of the Bank to make good or remedy the default within a specified time. If the Board fails to comply with such a notice, the Minister may apply to the Supreme Court for an

order compelling the Board to make good or remedy the default, and the Court may make such order thereon as it thinks fit.

(ii) The objectives of monetary policy

In line with the stipulation in the Constitution, the ultimate objective of monetary policy in South Africa is to establish a stable financial environment in support of sustainable real economic growth over the medium and long term. Although financial stability does not guarantee that the real economy will perform at maximum capacity, the Reserve Bank believes that it is an important precondition for the attainment of the economic growth potential. In the end, many other economic as well as non-economic factors will of course determine the actual economic growth performance. Instability in the financial sector will, however, inevitably be detrimental for economic growth.

A low inflation rate, or rather a rate that has no material effects on the macroeconomic decisions of consumers, investors, traders, producers and all other participants in total economic activity, is normally regarded as synonymous with stable financial conditions. In other words, financial stability is obtained when people are not concerned about the rate of inflation or any systemic risks in the financial sector when important economic decisions are made. If these preconditions do not exist, the unstable financial conditions are an important if not overbearing stumbling block in the way of high and sustainable economic growth.

To give greater assurance to economic decision-makers about the stance of monetary policy and underlying financial conditions, a number of countries in the 1990s began to apply inflation targeting as their monetary policy strategy where a precommitment to an explicit quantitative inflation target is made. This monetary policy strategy is primarily motivated by the desire to provide an anchor for monetary policy that can serve as an effective co-ordination device for the setting of prices of final products, production factors and financial assets.

South Africa has not opted for this approach because of the difficulties that are experienced in controlling the inflation rate. Many exogenous supply shocks or changes in other government policies result in price changes over which a central bank has no control and cannot prevent. Some of the countries applying inflation targeting have

attempted to identify these types of developments that cannot immediately be countered by monetary policy measures and to exclude them from their inflation targets. They, for example, adjust the price index that they use for targeting purposes for the effects of factors such as a drought or other climatic conditions on food prices, changes in international commodity prices and indirect taxes.

In view of this difficulty, the complexities of the transmission mechanism of monetary policy and the long time lags associated with monetary policy measures, the South African Reserve Bank has preferred to steer away from inflation targeting. The main objective of monetary policy in South Africa is nevertheless to bring the domestic inflation rate in line with the average rate of inflation in the country's major trading partners and major international competitors. In this policy statement, however, no formal commitments are made about the quantitative inflation rate, the price index involved or the specific time span over which the central bank intends to reach this goal.

In order to provide advance notification of the likely stance of monetary policy, specific money supply guidelines are announced by the Reserve Bank early in each calender year. The rationale for using money supply as an intermediate objective of monetary policy is that the growth in money supply is a vital element in the process of inflation, the greater predictability of monetary policy assists the private-sector enterprises in reaching business decisions and it provides a yardstick against which the actual performance of monetary policy can be judged.

The money supply aggregate that is used to state the intermediate objective of monetary policy in South Africa is M3. This comprehensive aggregate consists of all bank notes and coin in circulation plus all deposits of the domestic private sector with banking institutions. The Reserve Bank decided to use M3 for this purpose because it is the money supply aggregate that has the most stable relationship with domestic demand and is unaffected by deposit shifts between different maturities. The guidelines are normally set in the form of a tolerance range of 4 percentage points in the growth of the average M3 from the fourth quarter of the preceding year to the fourth quarter of the guideline year.

The term "guidelines" is used rather than the more common term "targets" to indicate that no rigid or overriding «money rule» is pursued by the authorities. Instead, the monetary authorities apply the guidelines

in a flexible and low profile manner and do not leave interest rates and exchange rates completely free to find their own levels at all times. The Reserve Bank continues to exercise discretionary judgement in deciding what combination of money growth, interest rates and exchange rates to aim at in any given set of circumstances. As a result of the complexity of functional relationships between economic variables, the Bank feels that it is unwise to rely on only one single indicator under all circumstances.

To achieve overall financial stability, the Reserve Bank accordingly strives to:
- restrict the rate of increase in the money supply to predetermined and publicly announced guidelines;
- maintain the rate of increase in domestic credit extension by the banking sector at a level consistent with the money supply objectives;
- promote a general level of interest rates (and a yield curve) in conformity with the aforementioned objectives;
- lend support to the foreign exchange market to promote orderly adjustments in the floating exchange rate of the rand, and a relatively stable real effective value of the rand;
- support the development of sound and well-managed private banking institutions; and
- encourage the development of efficient and well-functioning financial markets.

2. The operating procedures prior to March 1998

The Reserve Bank can create the monetary conditions to obtain a suitable growth rate in the money supply by controlling the reserve assets that banks have to hold or by operating on the level of interest rates. In the Reserve Bank's previous operating procedures the Bank opted for the so-called classical cash reserve system based on recommendations made by the *Commission of Inquiry into the Monetary System and Monetary Policy in South Africa* (the De Kock Commission). In this system the Bank rate, i.e. the lowest rate at which the Reserve Bank provided accommodation to the banks, was the operating variable for the implementation of monetary policy, while the demand for liquidity by the banks was fully met provided they had the required collateral. Cash reserves were required to create a need for liquidity by

the banking sector. To make accommodation procedures more effective, other operating instruments were also used to influence overall money market liquidity.

(i) Bank rate as operating variable

From the mid-1960s to the early 1980s, monetary policy in South Africa was based on the banks' liquid asset requirements. With the adoption of the classical cash reserve system, the Reserve Bank reinstated the Bank rate as its basic rate for the rediscounting of Treasury bills. Before December 1983 the Reserve Bank's refinancing rates were linked to the recorded levels of the market rates on the paper rediscounted, i.e. the Bank rate was fixed at a predetermined margin above the Treasury bill rate depending on the paper rediscounted. From December 1983 the Bank rate and the other refinancing rates were set by and varied at the discretion of the Reserve Bank. Changes in the Bank rate and associated refinancing rates were then used to influence the general level of interest rates in the economy and, through the transmission mechanism, other economic aggregates such as money supply, bank credit extension and the rate of inflation.

At first the Bank rate was changed frequently and at times relatively large adjustments were made. For example, in the first eight months of 1984 throughout the Bank rate was adjusted sharply upwards in two steps from 17.75% at the beginning of the year to 18.75% in July and 21.75% in August. This was then followed by a decrease of 1 percentage point in November 1984 and an increase of 1 percentage point in January 1985. From May 1985 the Bank rate was then reduced nearly every month to 13% at the end of the year, with an initial reduction of 200 basis points followed by further decreases of generally 100 basis points.

From 1989 the emphasis of monetary policy shifted from a cyclical to a more medium and long-term approach and the Reserve Bank began to adjust the Bank rate more infrequently in several steps in the same direction before reversing the monetary policy stance. For instance, between the end of October 1989 and early 1998 the Bank rate was adjusted twelve times. At first it was reduced in six steps from 19% to 12% between 11th March 1991 and 28th October 1993. This was followed by five increases in the Bank rate to 17% from 26th September 1994 to 21st November 1996. On 20th October 1997 it was lowered

again to 16 %. In all these adjustments changes of 100 basis points were made each time.

The Reserve Bank's rates were effective in influencing other market rates because it forced the banks to borrow smaller or larger amounts from the Bank at the declared refinancing rates through the management of the liquidity shortage in the money market. The Bank's power in this regard resided in the fact that it is the ultimate provider and destroyer of cash reserves. Because the Reserve Bank refinanced the banks fully and automatically at the declared refinancing rates, the Bank rate or the highest refinancing rate placed an effective ceiling on short-term interest rates. A bank expecting a shortage of cash at the daily clearing had no reason to pay more than the Reserve Bank's rate for additional cash balances, while a bank experiencing a surplus position was willing to accept a lower call rate than the Bank rate on its anticipated surplus as it earned no interest on deposits at the Reserve Bank.

This ceiling that the Bank rate and the other refinancing rates of the Reserve Bank placed on money market rates is clearly illustrated in Graph 1. From this graph it is apparent that the interest rate on bankers' acceptances with a maturity of three months generally remained below the Bank rate after the middle of 1991. In the period before 1991 the rate on bankers' acceptances was above the Bank rate because refinancing on this paper was provided at a higher penalty rate. Under exceptional circumstances money market rates might even exceed the Bank rate if an increase in the Bank rate was generally expected. However, this would likely be the case only over a relatively short period of time.

The Bank rate also influenced longer-term lending rates of the banks, such as overdraft rates and the rates on mortgage bonds, because they were normally linked to the Bank rate. The relatively fixed relationship between the Bank rate and the prime overdraft rate of the banks is also illustrated in Graph 1. Banks did not have to observe any obligatory minimum or maximum margins above the Bank rate in the determination of their prime overdraft rates. In fact, the De Kock Commission actually recommended that a bank should be encouraged to determine its own prime overdraft rate in response to market forces and in competition with other banks. The banks in South Africa informally continued to link their prime overdraft rates to the Bank rate and usually quoted the same prime overdraft rate to the public. In some cases, overdrafts were provided to certain clients below prime.

Graph 1
Short-term interest rates
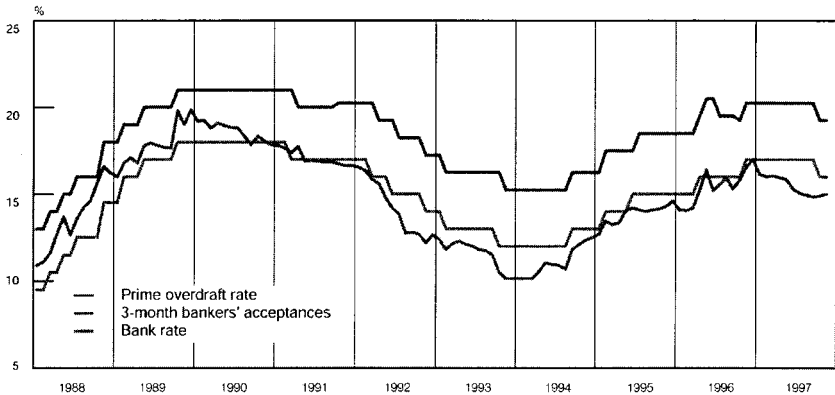
(ii) Refinancing procedures

The liquidity needs of the banks in the current system were fully and automatically met by the Reserve Bank on certain predetermined terms, conditions and costs. The refinancing was granted on the initiative and at the request of banks. Initially the cash shortage of banks was accommodated in two ways viz:

- through the rediscounting of Treasury bills and Reserve Bank bills at the Bank rate, and Land Bank bills and liquid bankers' acceptances at rates fixed at the Bank's discretion, all such paper with a maturity of not more than 91 days; and
- through the extension of overnight loans against security of Treasury bills, Reserve Bank bills, Land Bank bills, liquid bankers' acceptances, and long-term gilt and semi-gilt-edged stock. The interest rates were suitably differentiated, with rates on long-term public-sector stock for example about 450 basis points above the Bank rate.

These procedures for providing accommodation to the banks had certain important disadvantages, namely:

- the wide range of accommodation rates (seven) and a long list of refinancable assets complicated the system;
- the rediscounting of liquid bankers' acceptances represented an openended facility because bankers' acceptances could be readily created and easily tailored to achieve liquid status; and

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- the Reserve Bank was exposed to a credit risk by the rediscounting procedure.

In view of these shortcomings the Reserve Bank discontinued the provision of refinancing through rediscounting from 1st May 1993 and limited it to the extension of overnight loans at:

- the Bank rate when such loans were covered by 105 per cent or better in Treasury bills, central government bonds, Reserve Bank bills and Land Bank bills with an unexpired maturity of 91 days or less;
- the Bank rate plus a margin (which varied between 0.75 and 1.5 percentage points), when such loans were covered by 105 per cent or better in Treasury bills, South African Reserve Bank bills, Land Bank bills and central government bonds with an unexpired maturity of 92 days or longer, but shorter than three years; and
- a discretionary or negotiated rate for limited periods of time against collateral of other forms of security, such as bank-endorsed bills and long-term government bonds. This facility was available only in exceptional circumstances to banks with serious liquidity problems.

These changes in the system of accommodation simplified the accommodation rate structure and ended the open-endedness of the system because refinancing was no longer granted by the rediscounting of liquid bankers' acceptances. The administrative burden of the Reserve Bank in having to verify the liquid status of bankers' acceptances was also removed. The changes introduced in 1993 contributed to more stability in money market interest rates. As illustrated in Graph 2, the monthly interbank call rate range (i.e. the difference between maximum and minimum interbank call rates during a month) narrowed considerably in the 1990s. This was partly caused by the fact that the penalty rate in the accommodation system was reduced from 4 percentage points to only 1.5 percentage points on 1st May 1993, which reduced the aggressive bidding for funds in the interbank market as liquidity needs could be met at the Reserve Bank at relatively low cost. Other factors which led to greater stability in money market rates were the policy to change the Bank rate less frequently and terminating the special status that discount houses enjoyed in the banking sector.

Although the accommodation system brought about relative stability in money market interest rates, it also made these rates insensitive to liquidity changes because the money market shortage was always financed fully and automatically by the Reserve Bank. The size of

Graph 2
Interbank call rate and Bank rate

%

1988	1989	1990	1991	1992	1993	1994	1995	1996	1997

Legend: Interbank call rate range; Bank rate
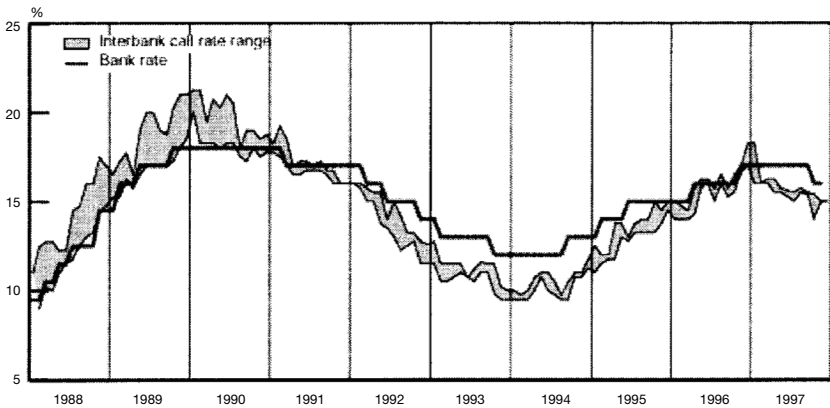
the money market shortage often only had a very limited influence on money market interest rates. As long as the banks believed that the Bank rate would remain unchanged even though the money market shortage was increasing, they did not see any merit in repricing their deposit books on movements in the shortage. For instance, during the turmoil in the South African foreign exchange market in 1996 the money market shortage rose from R5.8 billion at the end of June 1996 to R9.3 billion at the end of September 1996, but money market interest rates showed no clear upward or downward tendency. Only after a prolonged and sustained rise in the money market shortage could some reaction in short-term interest rates be detected.

Graph 3, comparing average monthly values in the call rate of banks with the liquidity shortage in the market, clearly shows that the somewhat lagged relationship between changes in the call rate of banks and changes in the accommodation provided by the central bank that still existed in the late 1980s was no longer discernible from 1992 onwards. In this period expectations about changes in the Bank rate became a much more important factor than the available liquidity in the market in explaining changes in interest rates. Correct signals were not obtained from the market, even at times when money market shortages increased to very high levels. Market interest rates did not reflect the market's

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Graph 3
Total accommodation and the inter-bank call rate
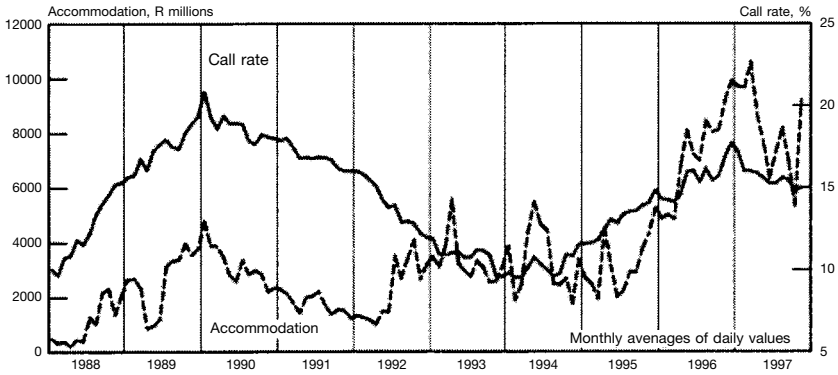
perception of liquidity conditions and were accordingly not an informative indicator to the authorities of underlying conditions. In a liberalised and globalised financial system with large and volatile capital movements between countries, it is of the utmost importance for interest rates to react quickly to underlying liquidity conditions.

The easy access to Reserve Bank accommodation at a fixed Bank rate not only contributed to the rigidity of rates in the money market, but also had a negative effect on the development of interbank trading in surplus funds and discouraged active trading in Treasury bills and short-dated government bonds. At times it also had a perverse effect on some interest rates in the market. For example, a rise in the money market shortage in certain circumstances could lead to an increased demand for Treasury bills, which could, in turn, lead to a decline in the tender rate for Treasury bills unless the amount of Treasury bills on offer at the tender was not increased substantially.

Another important disadvantage of the previous system of accommodation in South Africa was that it did not enable the Reserve Bank to provide clear signals to the market. Although money market interest rate changes were greatly influenced by expected changes in the Bank rate, the system of accommodation was relatively intransparent. The size of the money market shortage was intended to provide a signal of the

policy stance to the market, i.e. a large money market shortage was meant to signal the authority's displeasure or concern about current monetary and credit trends, while a small shortage was meant to show that the central bank had become more relaxed about the monetary policy stance. In practice this was not achieved because the signalling capacity of the shortage was limited by the fact that:

- the monetary authority was not always in control of the shortage because of difficulties encountered in projecting liquidity needs;

- factors that did not warrant interest rate increases could be responsible for a rise in the shortage, such as a strengthening of the Government's cash position; and

- the market might believe that the Reserve Bank was bluffing.

(iii) Cash reserve requirements

A statutory minimum reserve asset requirement has been employed as a monetary policy instrument since the establishment of the Reserve Bank in 1921. The cash reserve requirement has generally been regarded as a useful monetary policy instrument in that it provides a source of demand for central bank reserves in the event of large and sustained changes in domestic liquidity. Variations in cash reserve requirements have generally not been used in the day-to-day management of money market liquidity because they are comparatively unwieldly, take some time to become effective and frequent adjustments could disrupt the efficient management of banks' portfolios.

As illustrated in Table 1, the cash reserve requirement has changed considerably over time in South Africa. Changes were introduced to simplify the system or to counter certain practices applied by banks to circumvent the effects of the requirements. Although the reserve ratio was lowered over time, the amount of cash reserves that the banks were required to hold at the Reserve Bank rose from about R2 billion in 1988 to approximately R12 billion in 1997 due to the growth in the amount of deposits held at the banks. As a ratio of total deposits, the cash reserve holdings of South African banks declined during the 1980s to a lower turning-point at the beginning of 1992 of about 1.5% (see Graph 4). This ratio then rose relatively sharply and fluctuated more or less between 2½ and 3% from 1995 to 1997.

Table 1

Cash reserve requirements applicable in South Africa from September 1983

Effective date	Cash reserve requirements
30 September 1983	8% of short-term liabilities, interest free with the Reserve Bank; 2% of medium-term liabilities, interest free with the Reserve Bank; and 2% of medium-term liabilities, interest free with the National Finance Corporation (a former subsidiary of the Reserve Bank).
15 March 1984	The requirement to hold 2% of medium-term liabilities with the National Finance Corporation was abolished.
31 July 1985	The banks' vault cash could qualify as part of the required cash reserves.
1 April 1986	The requirements were reduced to: 5% of short-term liabilities, interest free; 2% of medium-term liabilities, interest free.
1 February 1991	The requirement of 2% on medium-term deposits was withdrawn and the requirement on short-term liabilities was lowered to 4%.
21 July 1991 term	An additional requirement was introduced of 1% of short- liabilities on which interest would be paid.
26 April 1993	The requirement against short-term liabilities was lowered immediately to 3% and a programme was announced to lower the basic requirement against short-term liabilities to 1.5% and to increase the requirement against all other liabilities from nil to 1.5% over a period of 15 months. The additional requirement was maintained.
20 August 1993	The reserve ratio was lowered from 1.5 to 1.0% of all liabilities. This change was also phased in by lowering the requirements on short-term liabilities with a further 0.1% each month and increasing the requirements on all other liabilities by 0.1% each month up to January 1994.
21 March 1995	The basic minimum reserve requirement was increased to 2% of all liabilities. The supplementary reserve balance equal to 1% of short-term liabilities was retained.

In early 1998, the cash reserve requirements of banks were 2% of the value of their total liabilities (as adjusted) on which no interest was

Graph 4

Cash reserve holdings of South African banks
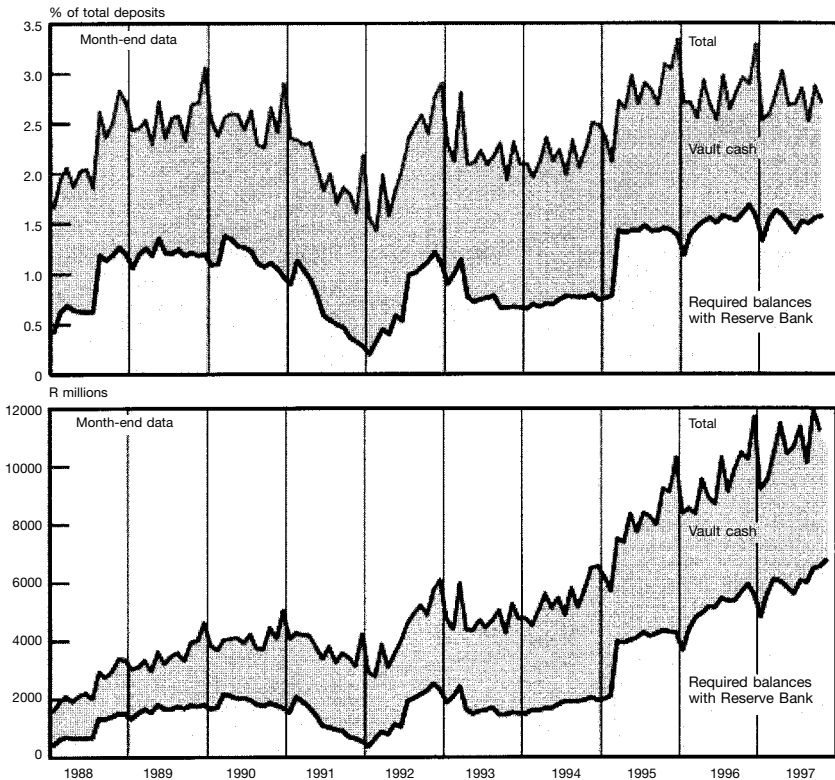
paid. The banks were also required to hold additional interest-bearing cash reserves to the amount of 1% of their short-term liabilities (as adjusted). The reserve base of the banks for the basic requirement was total liabilities as adjusted for capital and reserves less interbank deposits and repurchase agreements of 31 days and shorter with government bonds and Treasury bills as security. The basic requirement was applicable on virtually all liabilities to avoid shifts between the various deposits to circumvent the requirements and because the growth in the broad M3 aggregate was used as a guideline or intermediate objective of monetary policy. The reserve base for the additional

requirement was restricted to only the short-term liabilities less deposits pledged as security for loans granted, the amounts owing by banks and mutual banks, repurchase agreements of 31 days and shorter with government bonds and Treasury bills as security, and 50% of remittances in transit.

The eligible assets for reserve requirements consisted of banks' balances on current and reserve accounts at the Reserve Bank plus their holdings of South African bank notes and coin in their vaults, tills and automated teller machines. Vault cash was included as part of the cash reserve requirements mainly in order to limit the financial, logistical and administrative burden on the banks. If vault cash was not included, some banks could at the end of the day transport it back to the Reserve Bank and redeem it for reserve deposits, thus increasing the administrative burden of the central bank and these banks.

As already indicated, no interest was paid on the basic requirement, while interest was paid on the supplementary requirements equal to a rate of $\frac{1}{2}$ percentage point below the most recent Treasury bill tender rate. The maintenance period of cash reserve requirements was one month, starting from the fifteenth business day after the end of a specific month up to the fourteenth business day of the next month. This lagged accounting was applied to allow the banks enough time to complete their required monthly returns. Under the previous system banks were required to maintain the required reserve balances at the end of every day during the maintenance period, i.e. averaging over the month was not allowed.

(iv) Other operating instruments

Under the previous arrangements the Reserve Bank also influenced the liquidity in the money market by means of other operating instruments, consisting of:

- open-market operations or the outright buying or selling of domestic securities at the initiative of the central bank;
- adjustments in the investment portfolio of the Corporation for Public Deposits;
- the transferring of Government funds between Tax and Loan Accounts at private banks and the Exchequer Account at the Reserve Bank; and

- currency swaps, i.e. the simultaneous spot and forward transaction of dollar against rand.

Open-market operations have been used relatively extensively by the Reserve Bank as an operating instrument to affect liquidity since the early 1980s when South Africa moved away from direct to market-related measures to influence monetary conditions. The Reserve Bank also has been actively involved as market-maker in government paper, making it difficult to distinguish these transactions from "pure" open-market operations. The recent change to appoint private banks as primary dealers in government bonds should strengthen the Reserve Bank's ability to pursue open-market operations more vigorously for monetary policy purposes.

Under the previous arrangements, financial institutions could approach the Reserve Bank directly with bids and offers, or the Bank could take the initiative in buying and selling paper in the open market. Long-term government securities were mainly used in these transactions, because of the shortage of short-term and medium-term government paper which banks needed to comply with liquid asset requirements or to furnish as collateral in refinancing transactions with the central bank. The limited availability of government paper at times forced the Bank to conduct its open-market operations in securities of other public and private-sector entities. Special dated Treasury bills also were used by the authorities to influence money market liquidity. In addition, the amount of Treasury bills issued every week by means of a tender were adjusted specifically to effect money market conditions.

These transactions mainly took the form of outright sales and purchases of securities. Repurchase transactions were seldom employed because of uncertainties that existed about their legal status. The outright sale of government securities and other paper by the Reserve Bank in the open market also was limited due to the lack of sufficient holdings of securities by the Bank. In view of these shortcomings, the central bank resorted to adjusting the investment portfolio of the Corporation for Public Deposits to influence liquidity in the money market. The Corporation for Public Deposits was established in 1984 as a subsidiary of the Reserve Bank in order to rationalise the investment of short-term surplus funds of the public sector and to enable the monetary authority to control the investment of these funds more efficiently. The considerable extent to which the Reserve Bank made use

of open-market operations and adjustments in the portfolio of the Corporation for Public Deposits to influence liquidity in the money market is clearly shown in Graph 5.

The Reserve Bank in co-operation with the Treasury also transferred government funds to and from the private banks as part of its money market operations. Until 1993 all deposits of the Central Government were held on the Exchequer and Paymaster-General accounts at the Reserve Bank. In June 1993, Tax and Loan Accounts, i.e. interest-bearing deposit accounts of the Exchequer with private banking institutions, were opened by the Government. Since then transfers have been made between the accounts at the Reserve Bank and the Tax and Loan Accounts with private banks to neutralise the effect of the flow in government funds on the liquidity in the money market. These transfers are, however, in accordance with an agreement with the Government, generally not used as an open-market instrument. The use of this technique is in any case dependent on the availability of funds. In an attempt to improve its cash management, the Government, as a rule, no longer holds large deposits at the Reserve Bank that can be shifted between the central bank and the private banks. Moreover, frequent and unpredictable changes in the allocation of government deposits could create severe problems for the banks' asset and liability management.

Graph 5

Net purchases and sales of Government stock by the SA Reserve Bank and Corporation for Public Deposits
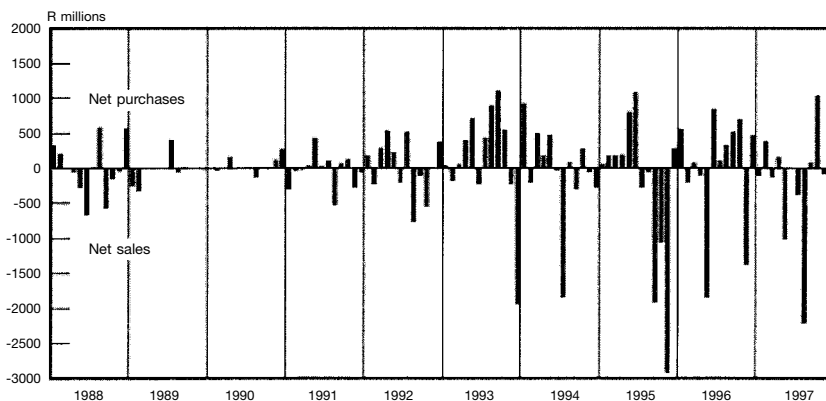
The Reserve Bank has in recent years also made extensive use of foreign currency swaps to withdraw liquidity from the market i.e. the Bank sold dollars spot and repurchased it forward. When the Reserve Bank's foreign exchange holdings were relatively low, so-called "special currency swaps" were concluded with the banks. In these transactions the Bank sold US dollars to the banks, who then deposited this currency again with the Bank; the currency so deposited was, in turn, bought forward by the Bank. Such a transaction accordingly does not affect the foreign exchange rate, but withdraws liquidity from the money market.

3. The new monetary policy operating procedures

In view of the defects of the current monetary policy operating procedures and to improve the utilisation of domestic liquidity management as an operating tool of monetary policy, the Reserve Bank decided to introduce important changes to its operating procedures during March 1998. Instead of refinancing the liquidity needs of the money market fully and automatically at the initiative of the banks, more active liquidity management through discretionary market operations is now applied. In the new operating procedures repurchase transactions between the Reserve Bank and the banks became the main instruments to regulate liquidity. Banks are given the opportunity to tender on a daily basis for central bank funds through repurchase transactions, and accordingly are given more scope to manage their own liquidity position efficiently. These operations have the further advantages that they can be implemented quickly, they do not have a significant effect on the price of the underlying instrument and they can be easily adapted to changed conditions.

The information made available by the Reserve Bank at the daily tender, signals the intentions of the central bank in a transparent way to the market. Repurchase transactions generally are conducted at a variable rate and allotments are made at the individual bidding rates tendered by the banks, i.e. a multiple-rate auction or so-called U.S. style auction is applied. Fixed-rate auctions may at times be used to give the market a clear interest rate signal and, in periods of uncertainty, to exercise a stabilising influence on interest rate movements. In fixed-rate tenders, the banks are required to state in their bid the total amount of

money that they are willing to transact with the Reserve Bank. If the aggregate bid exceeds the total amount of liquidity to be allotted, the submitted bids are satisfied pro rata according to the ratio of the total amount of liquidity to be allotted to the aggregate bid amount.

The maturity of the regular tenders in repurchase transactions is one week. Where repurchase transactions are used to effect structural adjustments in liquidity, the maturity of these transactions tends to be longer than in the case of the regular tenders. Banks are expected to always cover their tender bids by a sufficient amount of eligible underlying assets, which only consist of central government bonds, Land Bank bills and Reserve Bank bills. The counterparties in the regular as well as the irregular tenders of repurchase transactions are restricted to banks, because these transactions are undertaken to regulate the daily liquidity of banking institutions.

The objective with these new procedures is to create more flexibility, but not instability in the determination of money market interest rates. Repurchase transactions are ideal for this purpose owing to the fact that they mature and can be renewed at short intervals and their terms can be adjusted immediately to changed market conditions. Changes in the repurchase rate should therefore be responsive to changes in underlying liquidity. The repurchase rate, in turn, will have an impact on market rates because it can be used effectively by the central bank to send signals to the market without having to change the Bank rate. At the same time, banks through their bids can send more reliable signals to the Reserve Bank about underlying market conditions.

For the effective implementation of repurchase and reverse-repurchase transactions in the management of liquidity, it is important to have reliable liquidity forecasts. The Reserve Bank already prepares liquidity forecasts on a daily basis for the current month, on a weekly and month-end basis for the next month, on a weekly and month-end basis for the following two months and on a month-end basis for a further three months. Projections are made for a six-month period because large fluctuations normally occur over month-ends and such projections allow some forward planning in liquidity management. Obviously, forecasts for the next day or two will be particularly significant for the proposed new operating procedures. Fortunately, the forecasts of the Bank for the next day or two are normally fairly accurate, although fluctuations in the government deposits with the Reserve Bank are

Table 2

Main characteristics of the new operations in repurchase transactions

Purpose	To provide or withdraw liquidity from the market on a regular basis.
Frequency	Regular daily tenders at 09:00. At times additional tenders may be undertaken in the afternoon to correct unforeseen variations in liquidity positions.
Type of tender	Normally variable-rate tenders based on the US-style auction or multi-rate auctions. At times fixed-rate auctions may be used to give the market a clear interest rate signal.
Maturity	One week for the regular tenders. The maturity of irregular tenders may be varied.
Counterparties	Only banks.
Auction procedures	Bids have to be submitted on designated forms to the Reserve Bank quoting tender rates in multiples of 0.005 and in amounts in multiples of R1 million. Bids will be allotted sequentially, by first allotting the highest price and then moving to lower prices until the full amount on offer has been allotted. The results of the tender are announced via the electronic news services and show: – the reference number and the date of the tender; – the type of tender; – the total amount of the tender; – the total amount allotted; – the percentage of the allotment in the case of fixed-rate tenders; – the minimum and maximum bid rate and the average allotment in the case of variable-rate tenders; and – the starting date and the maturity date of the tender.
Underlying asset	All central government bonds, Land Bank bills and Reserve Bank bills, irrespective of their maturities.

sometimes difficult to foresee. The policy now followed by the government to keep relatively small amounts on deposit with the Reserve Bank should alleviate this problem somewhat (see Graph 6).

The daily projections are revised during the course of the day when more accurate figures become available. This may on certain days require irregular operations in the form of additional tenders in the afternoon to

Graph 6
Government deposits with the Reserve Bank

R billions

Exchequer and Paymaster General accounts
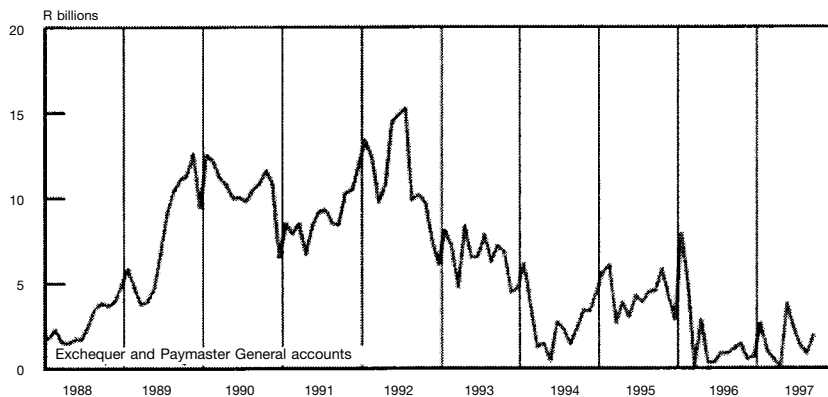
correct the position. Reverse-repurchase transactions may have to be undertaken where too much liquidity was provided in the morning. These irregular tenders are announced at least one hour before they take place and the tender procedures are the same as those for the regular tenders.

The Reserve Bank will of course not always be able to forecast the daily shortage of liquidity accurately and furnish in all the liquidity needs of banks by means of repurchase transactions. In order to enable banks to meet an unforeseen shortage of liquidity in the daily settlement, the present discount window facility has been replaced with a new marginal lending facility where overnight loans or loans for a few days are provided. Banks have unrestricted access to this facility against the collateral of government securities, Land Bank bills and Reserve Bank bills at their initiative for only a short period of time, which should lead to the development of a more smoothly functioning interbank market.

The Bank rate is charged on these loans and is normally at a premium above the interest rate on repurchase transactions. It should form a kind of upper limit or ceiling to the overnight market rate, because when liquidity positions are well balanced no bank will normally be willing to pay higher rates in the interbank market than it has to pay to the Reserve Bank under the marginal lending facility.

As part of these fine-tuning arrangements some other central banks have also opted for a deposit facility. Surplus funds of banks can be deposited with these central banks at a predetermined interest rate, which usually serves as a floor for other short-term interest rates. This provides a corridor wherein market interest rates can move, and in this way stabilises interest rate movements somewhat. Such a corridor system in South Africa may, however, retard the development of the market for interbank funds and will accordingly not form part of the new arrangements.

The South African authorities have decided to use the minimum cash reserve requirements not only to generate a stable demand for central bank money, but also as a short-term money management instrument to avoid excessive volatility in interest rates. To fulfil this function, banks are no longer required to maintain minimum cash reserves on a daily basis. Instead they are allowed to meet the cash reserve requirements on average over the maintenance period. This allows banks to have automatic recourse to their cash balances with the central bank on a daily basis as long as the average level of reserves during the maintenance period at least equals the cash reserve requirements. These balances at the central bank can therefore also be used as working balances.

The introduction of the new payment and settlement system which came into operation on 9th March 1998, has facilitated the use of both the marginal lending facility and the cash reserve requirements. The new system provides banks with their end-of-day settlement obligations from interbank transfers during the day, i.e. in real time, and enables them to receive funds obtained in the interbank market directly in their settlement accounts at the Reserve Bank. At the end of the day, the banks' unsettled intra-day debit position with the Reserve Bank is automatically considered as recourse to the marginal lending facility.

A second phase of the new payments system was introduced in September 1998. In this phase intra-day settlement has begun to operate in order to enable banks to do irrevocable interbank transfer of funds throughout the day. In the final phase on a date still to be determined, same-day settlement for retail payments will be introduced. The end-of-day settlement process will accordingly be moved from the morning following the day on which payments were made to the same day. At that time the new system will provide for real-time on-line settlement on a gross basis for all transactions.

Table 3
New operating procedures

Policy operation	Type of transaction		Maturity	Frequency	Procedure
	Provision of liquidity	*Absorption of liquidity*			
Main refinancing operation	Repurchases	Reverse-repurchases	Weekly	Daily	Standard tenders
Fine-tuning operations	Repurchases	Reverse-repurchases	Non-standardised	Irregular	Quick tenders
	Marginal lending facility		Overnight	Irregular	Discretion of banks
	Cash reserve requirements		One month maintenance period	Irregular	Averaging
	Foreign currency swaps	Foreign currency swaps	Non-standardised	Irregular	Bilateral procedures
	Purchases of Treasury bills	Sales of Treasury bills	3 and 6 months	Weekly/ Irregular	Tenders/ Bilateral
	Portfolio of the Corporation for Public Deposits	Portfolio of the Corporation for Public Deposits	Non-standardised	Irregular	Bilateral procedures
	Transferring of government funds	Transferring of government funds	Non-standardised	Irregular	Discretion of authorities
Structural adjustments	Repurchases	Reverse-repurchases	Non-standardised	Irregular	Bilateral
	Outright purchases of securities	Outright sales of securities	Non-standardised	Irregular	Bilateral
	Variable cash reserve requirements	Variable cash reserve requirements	Non-standardised	Irregular	Discretion of central bank

This system will allow banks to actively manage their liquidity positions even during the day, making intra-day calculations of their compliance with the cash reserve requirements possible. Cash reserves will be held on a bank's settlement account at the Reserve Bank, which will also serve to make and receive payments. Intra-day loans will be allowed, provided they are adequately collateralised, but at the end of the day this account will not be allowed to be overdrawn.

It was also decided that in the determination of the cash reserve requirements banks could deduct their repurchase transactions with the Reserve Bank from their reserve base. Requiring banks to hold cash reserve requirements against these transactions obviously partly offsets the objective of these type of transactions, i.e. to increase their liquidity.

In addition to repurchase and reverse-repurchase transactions, the marginal lending facility and the averaging provision in the determination of cash reserve requirements, other fine-tuning measures are also utilised to neutralise fluctuations in bank liquidity. As in the past, these instruments include sales or purchases of short-term Treasury bills, adjustments in the portfolio of the Corporation for Public Deposits, the transferring of Government funds between Tax and Loan Accounts at private banks and the Exchequer Account at the Reserve Bank, and foreign currency swaps.

As in the previous system, structural adjustments in the liquidity needs of the market, or changes in monetary policy objectives, may at times require more lasting adjustments in the demand for liquidity than that provided by the fine-tuning measures. These adjustments are designed to meet the banks' need for central bank money in a structural way or to limit their liquidity scope. Supplementary to irregular repurchase transactions, outright sales or purchases of domestic securities and variable cash reserve requirements can be applied to adjust the structural liquidity position of banks.

4. Conclusion

The recent changes in the monetary policy operating procedures should lead to:
- a quicker response in shorter-term interest rates to changed liquidity conditions and an improvement in the transmission process of monetary policy;

- greater flexibility in money market interest rates with enough safety valves to prevent undue volatility in interest rates;
- greater transparency in monetary policy through the various forms of signalling that can be used, which should improve the credibility of monetary policy that is extremely important in today's integrated but volatile financial world;
- the further development of the interbank and Treasury bill market in South Africa;
- improved signalling from the market to the Reserve Bank regarding changes in the underlying liquidity position; and
- more flexible options in the management of banks' liquidity positions.

APPENDIX

The first experience with the new monetary policy operating procedures

On 9th March 1998 the South African Reserve Bank changed the procedures of providing liquidity to the banking system from a virtual automatic accommodation of banks' daily liquidity needs to a repurchase-based auction system. To create orderly conditions in the changeover from the old to the new system of accommodation, the repurchase rate was fixed at 15%, i.e. the level of the old Bank rate, during the week from 9th to 13th March 1998. The maturities of the repurchase transactions entered into at the first tender were divided in five amounts spread out over the subsequent five tender days in order to achieve from the outset a relatively even spread of maturing repurchase transactions over one week.

To enable banks to meet an unforeseen shortage of liquidity in the daily settlement and to avoid excessive volatility in interest rates, two additional changes were also announced. First, the discount window facility was replaced with a marginal lending facility where overnight loans or loans for a few days are provided at the marginal lending rate. The banks have unrestricted access to this facility against the collateral of central government securities, Treasury bills, Reserve Bank debentures and Land Bank bills, irrespective of maturity (i.e. the same securities in which the central bank is willing to undertake repurchase transactions). As part of the transition, the marginal lending rate was fixed at 16% so that banks would initially not be penalised too heavily if they had to make use of this facility.

Secondly, banks were no longer bound to maintaining the required minimum cash reserves on a daily basis. Instead, they were allowed from 20th March 1998 to meet the cash reserve requirements on the basis of an average amount over each maintenance period of one month to supplement unexpected shortages of funds. The Reserve Bank also simplified the system of cash reserve requirements by applying one reserve ratio of $2\frac{1}{2}\%$ on total adjusted liabilities from the beginning of the maintenance period starting on 23rd April 1998. This resulted in a reduction in the cash reserve requirements of about R500 million to a level of R11.5 billion on the liabilities at that time. If the vault cash

holdings of banks are subtracted from this total, it left approximately R6 billion available for the averaging provision.

After the Reserve Bank had allowed the repurchase rate to float, the average daily repurchase rate remained at about 15% until the end of March 1998. Subsequently, the repurchase rate became more sensitive to liquidity changes and moved downwards to a level of 14.79% on 11th May 1998.

From the middle of May 1998, South Africa became afflicted by the uncertain conditions in Asia and Russia, which also had ramifications for many other emerging economies. Often fuelled by unfounded rumours and speculation, downward pressure was put on the rand exchange rate. With rigid fiscal and other macro-economic policies, the burden of restoring financial stability fell heavily on monetary policy. In order to create orderly conditions, the Reserve Bank intervened quite heavily in the spot and forward foreign exchange market. Rand liquidity in the domestic money market was also substantially reduced by providing considerably less than the estimated liquidity requirement at the daily tender from 13th May 1998. Initially this had hardly any effect on the average repurchase rate, which moved only marginally upwards to 15.15% on 18th May 1998 despite the fact that only 25% of the liquidity requirement was provided on this day.

The slow response of the repurchase rate at that stage was attributed to a large extent to the low premium of the marginal lending rate above the repurchase rate. Banks were quite willing to borrow under this facility when they could not obtain the liquidity in the market. The Reserve Bank accordingly announced a change in the marginal lending rate from 20th May 1998 to a level that was allowed to fluctuate in accordance with movements in the repurchase rate, but that was fixed at 3 percentage points above the daily average repurchase rate. The daily average repurchase rate then started to move more sharply upwards to 16.09% on 25th May 1998. This was, however, still regarded as a too slow reaction taking into consideration the very small proportion of liquidity provided in relation to the requirements in the market.

On 26th May 1998 the Reserve Bank accordingly suspended the variable-rate auction system and replaced it with a system of fixed rate tenders at 18% conducted daily and with one-day maturities only. The length of the maturities was shortened because of the low level of daily liquidity requirements with a seven-day maturity. Simultaneously,

the marginal lending rate was raised to 10 percentage points above the repurchase rate and the Reserve Bank indicated that it would provide the full market liquidity at the new rate. On 2nd June 1998 the spread between the fixed repurchase rate and the marginal lending rate was widened further to 15 percentage points.

The fixing of the repurchase rate was regarded as a temporary measure and was meant to be maintained only until conditions in the financial markets had calmed down. After it had been concluded in a discussion with the four major banks that some stability had returned to the market at the beginning of June, the Reserve Bank therefore lowered the fixed repurchase rate in two steps by a half percentage point each time on 4th June 1998 and 12th June 1998. This brought the repurchase rate to 17% and the marginal lending rate to 32%.

When it became apparent that the South African rand would remain under attack for a longer period than originally envisaged, the Bank reinstated the variable-rate auction system on 19th June 1998 with repurchase transactions with a maturity of one day, and widened the spread between the marginal lending rate and the repurchase rate to 20 percentage points. At the daily tender the liquidity provided was R3.2 billion less than, or nearly 25% of, the liquidity requirement. As a result, the average repurchase rate increased to 20.38%, i.e. 3.38 percentage points above the fixed rate of the previous day, and the marginal lending rate was adjusted to 40.38%. The next day the repurchase rate jumped further to 23.90% in a nervous market, with the result that the Reserve Bank provided slightly more than the liquidity requirement on 23rd June 1998 to indicate to the market that the rate had over-reacted to the signals of the central bank. The rate then declined again sharply to 17.35% on 25th June 1998.

From 26th June 1998 the Reserve Bank shifted its policy stance again and provided less liquidity than required by the market. Although the amount at the daily tender was only R500 million under the liquidity requirement, or amounted to 95% of the funds required by the banks, this resulted in a sharp upward movement in the repurchase rate to 20.08% on 29th June 1998. After the Reserve bank had again explained its signalling procedures to the banks, the average daily repurchase rate started to stabilise somewhat. Although there was at first still a relatively large upward movement in the repurchase rate to 21.15% on 7th July 1998 with a liquidity provision ranging around 98% of

requirements, the repurchase rate subsequently started to edge up much more slowly to 21.37% on 26th August 1998 under more or less the same conditions.

At the beginning of the introduction of the new system of accommodation, the banks made relatively little use of the averaging provision under the cash reserve requirements. After the spread between the marginal lending rate and the repurchase rate had been widened substantially, the banks started to supplement their liquidity needs from this source in May 1998. From June some of the banks started to hold excess cash reserves at the Reserve bank as a safeguard to avoid making use of the marginal lending facility. The accumulation of large cash reserves created cash shortages in the interbank market and resulted in relatively large unintentional borrowings in the marginal lending facility for other banks, and presumably greater volatility in money market interest rates.

In view of these problems and after discussions had been held between the Reserve Bank and banks, it was announced that from 18th September 1998 surplus balances on cash reserves could not be allowed to be carried forward from one maintenance period to the next and that deposits on cash reserve accounts could only be allowed when a bank had previously made use of this facility to finance an unforeseen shortage. Moreover, deposits at any time during the maintenance period would be limited to the amount required to zero out any shortfalls on the cash reserve requirements.

All in all, the flexible repurchase system proved to be of considerable value with the turmoil in the foreign exchange market because it allowed interest rates to respond relatively quickly to the changed circumstances. The upward adjustment in money market interest rates, however, at times followed a rather erratic path. This was, of course, related to the general nervousness in the market, but also reflected teething problems encountered in the implementation of the new system. The instability in interest rates only disappeared after active guidance had been provided by the Reserve Bank regarding the signals to the market.