WP-2011-028

Monetary Operating Procedures: Principles and the Indian process

Ashima Goyal

Indira Gandhi Institute of Development Research, Mumbai
October 2011
http://www.igidr.ac.in/pdf/publication/WP-2011-028.pdf

Monetary Operating Procedures: Principles and the Indian process

Ashima Goyal
Indira Gandhi Institute of Development Research (IGIDR)
General Arun Kumar Vaidya Marg
Goregaon (E), Mumbai- 400065, INDIA
Email (corresponding author): ashima@igidr.ac.in

Abstract

As markets deepen and interest elasticities increase it is optimal for emerging markets to shift towards an interest rate instrument since continuing monetization of the economy implies money demand shocks are large. In an extension of the classic instrument choice problem to the case of frequent supply shocks, it is shown the variance of output is lower with the interest rate rather than a monetary aggregate as instrument, if the interest elasticity of aggregate demand is negative, and the interest elasticity of money demand is high or low. It is necessary to design an appropriate monetary policy response to supply shocks. An evaluation of India's monetary policy procedures and of the recent fine-tuning of the liquidity adjustment facility finds them to be in tune with these first principles and in the direction of international best practices. But a survey of country experiences and procedures, and some aspects of the Indian context suggest further improvements.

Keywords:

Monetary policy, operating procedures, instrument problem, LAF

JEL Code:

E58, E52

Acknowledgements:

This is a revised version of a background paper for the RBI Working Group on Monetary Policy Procedures set up in 2010. I thank the other members of the group, and the RBI team for very illuminating and frank discussions during the meetings the group had over 2010-2011. I thank Sanchit Arora and Shruti Tripathi for research assistance and Reshma Aguair for help with the word processing.

Monetary Operating Procedures: Principles and the Indian process

1. Introduction

Operating procedures are the variety of rules, traditions and practices used in the actual implementation of monetary policy. Rules as well as the context and history of actual practices are important, so that there are similarities, but also wide divergences in actual practices around the world.

Although the final objectives of monetary policy may be low inflation, high growth and financial stability, the instruments a central bank has available most closely impact short run money market rates or reserve aggregates. These are known as operating objectives. The instruments are used in response to information contained in a variety of intermediate targets or indicator variables.

Operating procedures affect the equilibration of the demand and supply of reserves or deposits held with the Central Bank (CB) against demand deposits of commercial banks.

These deposits are a liability in the CB's balance sheet and it is the monopolist supplier of the deposits. Reserve requirements and characteristics of interbank settlement systems, all instruments of a CB, affect the demand for balances. This is the market the CB most directly influences, over horizons from a day to a month. Other instruments of a CB include policy rates, market operations and direct controls.

In this paper, the classic instrument choice problem is extended to supply shocks, which are common especially in emerging markets. It is shown that when supply shocks are frequent, with a negative interest elasticity of aggregate demand, and a high or low interest elasticity of money demand, the variance of output is lower with the interest rate rather than a monetary aggregate as instrument. Next, the main trends in monetary policy operating procedures in emerging markets, differences from industrial countries, and some special features in India are examined. Country experiences and procedures that are relevant for India are extracted. These and the

underlying optimal criteria are used to assess changes in the Reserve Bank of India (RBI) operating procedures.

The structure of the paper is as follows: Section 2 starts with criteria for optimal choice of operating procedures. Then aspects of current practices are discussed in section 3 for emerging markets, in section 4 for industrial countries, while section 5 takes up future trends. Section 6 highlights some special features in India which help select international practices that could be useful for India in section 7. Section 8 concludes with remarks and policy implications

2. Criteria for optimal choice of operating procedures

Since a CB must set policy before observing current disturbances to goods and money markets the choice between a monetary aggregate or an interest rate as the instrument, depends on the implications of each for the variance of output. That is, will output fluctuations be lower if the monetary variable is held constant and the interest rate allowed to vary, or vice versa?

Consider the simplified IS (1) and LM (2) curve equations below:

$$x_t = -\alpha_1 \left[r_t - \left(E_{t-1}\left(p_{t+1} \right) - p_t \right) \right] + u_t \qquad (1)$$

$$m_t - p_t = \beta_1 x_t - \beta_2 r_t + v_t \qquad (2)$$

Where x is real output; r is the nominal interest rate; m is money supply; p is the price level; and E the expectations operator conditional on information available at time t-1. Standard conventions are followed: all constants are set to zero, so the lower-case variables in natural logarithms are interpreted as deviations from equilibrium values, and all coefficients are non-negative. Zero-mean disturbances to equation (1) and (2) respectively, are u and v with variances σ_u^2 and σ_v^2, and covariance σ_{uv} is assumed to be zero. The shocks u and v are not only disturbances to spending and money demand but also capture effects on such behavior due to any other factors, such as financial or external shocks independent of monetary policy actions.

Poole (1970) showed that varying interest rates was preferable when the variance of money demand was high, the IS curve (the good market equilibrium) was flatter and the LM curve (money market equilibrium) steeper graphed in nominal interest rate and real output space. The slope of the LM curve is $1/\beta_2$ and that of the IS curve is $-1/\alpha_1$. Targeting monetary aggregates works better if shocks to aggregate demand are large, and it is the IS that is steep and the LM is flat. Friedman (1975, 1990) extended the analysis to include supply shocks and various lags. Since supply shocks dominate in an emerging market, it is worthwhile to carefully examine their implications for choice of procedure.

With rational expectations, prices in the goods and services market are indeterminate under an interest rate instrument, and the real interest rate is uniquely determined independent of the money supply (Sargent and Wallace, 1975). Monetary policy is neutral. Adding aggregate supply behavior to expand Poole's IS-LM framework is worthwhile if wage or price rigidities make money supply non-neutral. The rigidities then provide the nominal anchor making prices determinate and monetary policy affects real output. The nominal anchor function of money supply is no longer necessary.

Friedman (1990) introduces a supply function (3) derived from an underlying labour market equilibrium with less than perfectly flexible nominal wages, and modified from a large existing literature. Equation (3) is the first-order condition of a Cobb-Douglas production function with labour coefficient δ, so $\phi = 1/(1-\delta)$ where $\delta > 0$, $\phi\delta > 0$, $\phi > 1$, $\theta \geq 0$.

$$x_t = \phi[\delta(p_t - w_t) + z_t] \tag{3}$$

Where w is the nominal wage in logarithms; and z is a zero-mean disturbance to aggregate supply, with variance σ_z^2. If nominal wages are rigid (w = 0), equating labour demand (4) to labour supply (5) to clear the labour market after a supply shock, requires $p = -[\phi/(\phi+\theta)]z$.

$$l^d = \phi(p - w + z) \tag{4}$$

$$l^s = \theta(w - p) \tag{5}$$

Friedman shows that in response to shocks monetary policy can deliver the market-clearing real wage either by setting m as:

$$m^e = v - \left(\frac{\beta_2}{\alpha_1}\right)u + \left(\frac{\phi}{\phi+\theta}\right)\left[(1+\theta)\left(\beta_1 - \frac{\beta_2}{\alpha_1}\right) - 1\right]z \tag{6}$$

Or changing the nominal interest rate to equal:

$$r^e = \frac{1}{\alpha_1}u - \left(\frac{1+\theta}{\alpha_1}\right)\left(\frac{\phi}{\phi+\theta}\right)z \tag{7}$$

The money stock responds to all three shocks, whereas the interest rate must only accommodate aggregate demand and supply shocks, since it automatically accommodates money demand shocks.

But (6) and (7) require knowledge of the shocks. The classic instrument problem arises in the absence of such knowledge. Then the CB can fix either m = 0 or r = 0 based on zero prior expected shocks. But outcomes will differ from equilibrium values. Since now money is not neutral, evaluation of the two instruments requires a policy objective function giving the weight on real versus nominal target variables. The two instruments can then be evaluated by comparing the variance of the policy objective under each.

For example, if the monetary policy objective is to avoid fluctuations in output by stabilizing it around the deterministic value x = 0[1], the choice between fixing m or fixing r depend on the variation of output under each instrument. Friedman (1990) derives these as:

$$E(x^2)\big|_m = \frac{\beta_2^2(\phi-1)^2}{\lambda^2}\sigma_u^2 + \frac{\alpha_1^2(\phi-1)^2}{\lambda^2}\sigma_v^2 + \frac{\alpha_1^2(\beta_2-1)^2\phi^2}{\lambda^2}\sigma_z^2 \tag{8}$$

$$E(x^2)\big|_r = \frac{(\phi-1)^2}{(\phi-1+\alpha_1)^2}\sigma_u^2 + \frac{\alpha_1^2\phi^2}{(\phi-1+\alpha_1)^2}\sigma_z^2 \tag{9}$$

[1] As Friedman points out this implies a loss of welfare since changes in the market clearing equilibrium value due to real production shocks are not taken into account. Stabilization should be around $x\text{-}x^e$ where x^e is the new post shock equilibrium.

Where $\lambda = \alpha_1\beta_1\delta\phi + \beta_2(\alpha_1 + \delta\phi) + \alpha_1$, and the three disturbances are assumed independent for simplicity. The relative values will depend on the parameters and the size of the shocks, which are empirical matters. But targeting *r* shields output from any disturbance to money demand, while targeting *m* exposes output to all three disturbances. Moreover,

Lemma: If

$$\beta_2 < \frac{1}{2} \tag{10}$$

Or,

$$\frac{1}{2} < \beta_2 < \frac{\beta_1(\phi - 1)}{2} - 1 \tag{11}$$

And the IS curve is negatively sloped, an equivalent supply shock increases output variance more under a monetary compared to an interest rate instrument.

Proof: Algebraic manipulation of the two coefficients shows the condition for the σ_z^2 coefficient of $E(x^2)\big|_m$ to be greater than the σ_z^2 coefficient of $E(x^2)\big|_r$ is:

$$\alpha_1 > \frac{(\phi - 1)(1 - 2\beta_2)}{2\beta_2 - \beta_1(\phi - 1) - 2} \tag{12}$$

The condition is automatically satisfied if the RHS of (12) is less than 0, since then the positive α_1 must exceed the RHS. If (10) holds the numerator of (12) is positive and the denominator of (12) is negative. Alternatively, if (11) holds the numerator of (10) is negative and the denominator is positive. So in either case the RHS of (12) is negative. So condition (12) holds implying a greater impact of σ_z^2 on $E(x^2)\big|_m$.

Example: If the income elasticity of money demand, $\beta_1 = 1$ and the coefficient of labour demand $\phi = 2$, the conditions (10) and (11) reduce to:

$$\beta_2 < \frac{1}{2}$$

Or

$$\frac{1}{2} < \beta_2 < \frac{3}{2}$$

Thus the condition (12) implies simple restrictions on the interest elasticity of aggregate demand α_1, and the interest elasticity of money demand, β_2.

In the presence of large or frequent supply shocks, if the LM curve is flat or not very steep interesting rate targeting would result in lower output volatility compared to monetary targeting. According to Poole's result, the interest rate instrument was preferable when the LM curve was steep. The Lemma, together with Poole's result, implies when supply shocks occur, interest rate targeting is to be preferred for all slopes of the LM curve and for all negatively sloped IS curves. A monetary instrument may do better only if aggregate demand shocks are large[2].

Worldwide, since the 1980s, CBs have increasingly focused on short-term interest rates, implying accommodation of the demand for bank reserves. One reason was steady financial deepening made money demand unstable. In emerging markets money demand shocks are likely to be even higher, because apart from financial innovations following the developed world, there is continuous monetization of the economy. These considerations tend to support an interest rate objective.

The other conclusion is that monetary policy cannot regard its task as acting only on the demand side and neglect supply shocks. It needs to respond to the latter also. These are also likely to be larger and more sustained in an emerging market. The modern approach stresses inflation targeting on the grounds that if a policy response keeps expected excess demand at zero, inflation can be contained at zero output cost. This is the 'divine coincidence' implying there is no need to give any weight to output in the CB's objective function. But the divine coincidence no longer holds under a supply shock. Moreover, after the global financial crisis (GFA) the CB's objective functions have broadened to include financial stability. When money demand shocks

[2] In simulations for emerging markets with $\beta_1 = 1$; $\beta_2 = 0.02$; $\alpha_1 = 0.04$; $\phi = 2$; $\delta = 0.5$; $\theta = 2$; $\sigma_v^2 = 0.1$; $\sigma_u^2 = 0.002$; $\sigma_z^2 = 0.1$; v = 0.5; u = 0.02; z = 0.08 $E(x^2)\big|_m = 0.0076$ and $E(x^2)\big|_r = 6.2870e-005$. In advanced countries if only the elasticity of labour supply θ is reduced to 0.01 there is no change in results. If changes are also made to the shocks reducing the size and variance of supply and money demand shocks and increasing those of the aggregate demand shocks, such as: $\sigma_v^2 = 0.001$; $\sigma_u^2 = 0.02$; $\sigma_z^2 = 0.001$; v = 0.02; u = 0.04; z = 0.02; then targeting money aggregates is more effective as in Poole's results. The output variances then are: $E(x^2)\big|_r = 3.6983e-004$; $E(x^2)\big|_m = 1.6509e-005$.

are large, an intermediate targeting rule based on a monetary aggregate alone does worse than a rule that optimally responds to new information.

Beyond the simple example given, the CB should respond based on its best forecast of shocks to the economy using indicator variables like longer-term interest and exchange rates, commodity and asset prices, money and credit, lagged inflation and growth variables.

3. Emerging Markets

In emerging markets[3], prior to liberalization, and with a bank dominated financial sector, the only two instruments needed to make banks change their loans and deposits were reserve requirements and the discount rate for borrowing from the CB. Other quantity controls were also effective. But as new channels of financial transmission developed, it became necessary to affect the behaviour of participants in markets such as money and interbank markets. Bank interest rates then depended on rates in other financial markets, as did household behaviour. In addition to firms' loan, demand from households was also more sensitive to interest rates. So interest rates began playing a greater role in the transmission of monetary policy. The increasing importance of the price mechanism meant focusing on quantities could make short-term interest rates volatile, reducing policy impact on intermediate targets.

So in the market for bank reserves CB objectives began to be increasingly defined in terms of short-term interest rates. The maturity of the targeted rates also shrank, since better-articulated financial markets transmitted policy impulses down the yield curve, as well as provided valuable information on market expectations to CBs.

While short-term interest rates serve to signal the policy stance, careful liquidity management is required to support the short-rates. This is attempted more through market operations with an emphasis on flexible repo transactions. Standing facilities now play a marginal role but are still very important. The advantages of the repo are they can be done even without liquid underlying security markets; impact on security prices is limited and indirect; the maturity of the paper and the transaction can differ;

[3] Features of, and comparison between emerging and industrial countries, are largely based on Borio (1997) and Van't dack (1999).

temporary reserve adjustment can be done in a single transaction as compared to two outright operations. Standing facilities are also organized through repos.

There is more awareness of market psychology and the advantages of transparency in forming market expectations, since CBs can now achieve their objectives only through the markets. Innovations such as RTGS are pushing the CB to even shorter horizons, so there is a concern also with provision of intraday liquidity.

4. Industrial countries

Similar trends are more advanced in industrial countries. Reserve requirements usually hold on average over a period, and therefore provide a valuable buffer for banks. But they have fallen to reduce the implicit tax on banks, since competition has increased from other financial assets, and substitution occurs away from facilities that attract reserve requirements. The demand for bank reserves now comes largely from settlement balances, which are highly interest insensitive. Therefore variations in liquidity can lead to large fluctuations in interest rates. The demand for settlement balances depends on characteristics of the settlement system such as penal rates or conditions of late day CB assistance.

With the decline of the reserve buffer, liquidity management or forecasting has become an important part of equating the demand and supply of bank reserves for the CB. This is distinct from monetary policy signals, which work largely through short-rates. CBs differ greatly in the variety of signals employed. These perform a number of testing and exploratory roles, but the variety has been reducing in importance due to the emphasis on transparency.

Liquidity management requires distinguishing between the different autonomous sources of bank reserves, which change items in a CB's balance sheet. The major sources of autonomous variation are changes in net foreign assets and in net lending to the government. The net liquidity position (NLP) is the difference between the amount demanded and the autonomous creation of reserves. On an ex ante basis, this is the amount that has to be met by the CB. Forecasts of NLP contribute to liquidity management. CB's in industrial countries prefer to adjust marginal liquidity largely through discretionary OMOs and repos. Standing facilities, which are available on

demand to market participants, help meet end-of-day imbalances, set a range for the overnight rate, or provide subsidized intramarginal liquidity.

5. Future trends

Woodford (2001) argues that it is not correct that the ability of the CB to influence markets will decrease as they become more efficient, that is uncertainties about clearing accounts at the time of trading fall and information flows become so fast that the demand for settlement balances falls and becomes less interest elastic, and they become a small fraction of total transactions. Payments will continue to be settled using CB accounts because of network externalities and the natural advantages of the CB in running a payments system.

5.1 Standing facilities

CBs can continue to set overnight interest rates in a tight range through the use of standing facilities with the target rate between a deposit and (collateralized) lending rate. There is a small penalty to using the lending facility since the rate charged is above the overnight rate, but there is no rationing or implicit penalties such as are often associated with discount facilities. No bank would want to pay another bank a rate higher than at which it can borrow from the CB; no bank would be willing to lend overnight cash at a rate lower than what it can get from the CB; the spread between the rates gives banks an incentive to trade with one another, as long as the overnight rate does not reach one or the other bound.

Accurate liquidity forecasting and supply of aggregate clearing balances is required to keep the overnight rate within the range, and reduce its fluctuations. But the supply is adjusted to match autonomous variation, not to signal or implement changes in the target rate, as happens in countries that do not use a LAF corridor.

Interest rates can be raised even if a higher opportunity cost makes banks economize on settlement balances, since what is important is the range between the lending and the borrowing rates and not the level of rates. If the target interest rate were to be raised, the deposit rate would also be raised. The demand for clearing balances is independent of the absolute level of interest rates but is a function of the location of the overnight rate relative to the boundaries of the corridor. It follows that adjustment

of rates need not require quantity adjustment or change in the supply of clearing balances, just announcement of the new target rate with suitable adjustment of the band. Quantity targeting would be ineffective under inelastic demand for settlement balances, but elastic demand would only require more OMOs to match the changes in demand. In countries where the CB keeps the target rate near the center of the band, a convention develops to trade at that level, since it implies an equal division of the gains from trade, and saves costly auctioning. Then volatility of the target rate falls and it stays perfectly at the center, as for example, in Malaysia.

The width of the channel should be sufficient to ensure an interbank market exists. Under improved forecastability of end-of-day positions this becomes less of a concern, and the channel size can shrink. A smaller channel size also increases the interest sensitivity of demand for settlement balances. In equilibrium a constant range between the overnight rate and the deposit rate implies a constant tax on holding balances with the CB. A constant tax has efficiency properties. Thus there is no conflict between increasing microeconomic efficiency yet ensuring macroeconomic stability.

CBs in emerging markets (EMs) continue to use reserve requirements to offset autonomous variations in liquidity as well as to control monetary policy. But reducing reserve requirements is a long-term aim of reform to make banks competitive as markets develop, and to prevent arbitrage to sections that escape such requirements.

5.2 Financial stability

A major new trend after the global financial crisis is the greater concern of CBs worldwide with financial stability. Although reserve requirements had been falling in order to reduce transaction costs and taxes in markets, the crisis has led to the realization that countercyclical liquidity buffers have an important role in countering the tendency towards procyclical balance sheet expansion in the financial sector[4]. This may reverse the tendency towards falling liquidity ratios. Since such ratios affect the competitiveness of the financial sector, their imposition is best done as part of a

[4] Adrian and Shin (2008) show that contractions in balance sheet growth have tended to precede declines in real economic growth. Funding conditions are closely ties to this leverage of market-based financial intermediaries. Banking and capital market developments become inseparable in a market-based financial system.

global agreement on financial reform. Capital buffers are an important part of reforms such as BASEL III.

Palley (2000) had a suggestion for Asset Based Reserve Requirements (ABRR), where banks have to hold differential reserves based on asset classes. Can be designed to give countercyclical benefits. While cash (capital) reserve requirements operates on the liabilities side, ABRRs operate on the asset side, and could complement risk based capital adequacy weights. They also provide seignorage benefits, which have been shrinking with the reduction in reserve requirements (Nachane, 2010).

6. India: Similarities and differences

Apart from sharing emerging market characteristics, India has some special features. Its large oil imports, continued monsoon dependence of agriculture, changes in the production structure during a catch-up high growth phase, imply it is subject to repeated supply shocks. Ongoing labour absorption in the modern sector increases output response and makes the IS relatively flat. Demand shocks are not so frequent since the ratios of C, I and G to output are relatively stable. Steady financial development has increased the importance of interest rates in monetary transmission, even though the process is not complete. Thin markets led to many monetary and asset price shocks. The causal chain from the monetary base to broad money is more erratic. All these considerations suggest the CB should move towards targeting short-term interest rates rather than the monetary base.

The RBI shifted from monetary targets to a multiple indicator approach in the late nineties. Interest rates were gradually given greater importance. A LAF evolved from the discount rate and liquidity absorption facilities after 2000. Although it is not a pure standby facility, fluctuations in the overnight call money rate have reduced since then. Fixed rate auctions were reintroduced to support interest rate signals to the markets.

Since public sector banks tend to have large stocks of government securities they have greater ability to borrow in collateralized markets and lend to others at higher uncollateralized rates. So during periods of tight liquidity market rates would exceed the LAF repo. In the CLBO mutual funds tend to be on one side, and there are

problems of timing. The interbank market has not developed adequately so the call rate tends to be at the repo or reverse repo rate depending on if the RBI is in net injection or absorption mode. Term money markets for longer maturities and for discretionary operations are even less developed.

In 2011 the LAF system was further fine tuned following a report of a working group (RBI, 2011). The repo rate was chosen as the single policy rate, and the weighted average call money market rate as the operating target, in order to remove possible confusion due to multiple rates and to better focus markets. A fixed corridor of 200 basis points was set with the policy rate in the middle, bounded by a new Marginal Standing Facility (MSF) above and the reverse repo rate below. Since monetary transmission was found to be more effective under deficit liquidity conditions, and the aim was to keep liquidity towards the upper end of the corridor. Under such conditions, automatic collateralized (from the SLR portfolio) loans of up to 1 percent of NDTL from the MSF would buffer against unanticipated liquidity shocks, preventing the interest rate from overshooting. Liquidity shocks in excess of 1 percent of NDTL were to be neutralized through longer term instruments such as OMOs, CRR and MSS.

But large autonomous liquidity shocks, due to large and erratic net foreign inflows and government balances, together with a paucity of discretionary instruments make liquidity balancing difficult. Each country's context varies and the historical path selected impacts the present in various ways. But the experience of other countries can offer valuable insights for key policy issues and decisions.

7. Useful country practices

7.1 Autonomous variation in liquidity: supply of reserves

How have other countries managed large autonomous variations from Government balances and foreign inflows?

Uneven revenue and spending profiles generate lumpy transfers of public funds to and from the CB, which disturb the level of bank reserves. This is the largest source of variation in most countries, since the CB is the banker to the Government. In many countries these transfers follow a pre-specified schedule; large transfers require

formal notice; joint committees forecast government budget transactions; arrangements for tax collection and spending are designed to smooth changes in the government's account; surplus funds held at the CB are lent to financial institutions; CBs have the discretion to shift the Treasury's deposits to commercial banks; incentives are created for the Government by paying lower interest rates on excess balances. Since the Treasury's active management of its funds can interfere with short-term interest rates it is not allowed to place funds in the overnight market, but arrangements are put in place to invest surplus funds in the market.

In most EMs limits are imposed on the Government's recourse to CB credit. Only in a Malaysia and Saudi Arabia, apart from India, is management of the public debt largely the CB's responsibility. In South Africa, separation of the CB's function as market maker in public debt and its monetary policy function was achieved in 1998 through the creation of primary dealers.

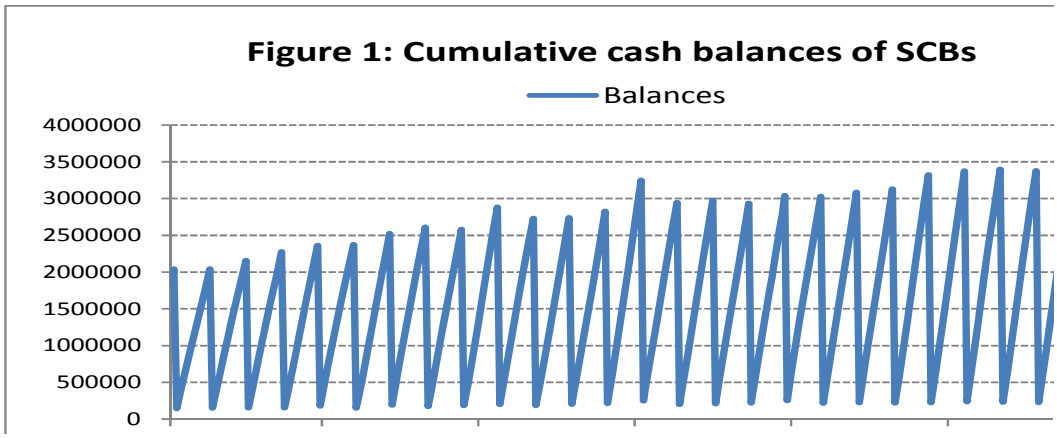
Except at times of exchange rate pressure or large inflows, FX intervention is not such a large source of variation in autonomous liquidity. Since most markets have a two-day settlement lag for FX transactions, these are known with certainty for daily operations. But large inflows have been a major reason for continuation of reserve requirements in EMs since they sterilize the impact of inflows on reserve balances. Reserve requirements are a way to make banks share the fiscal cost sterilization imposes. But, over time, they lead to a substitution away to channels not subject to reserve requirements. A sharp reduction in reserve requirements can also lead to a spurt in credit, which was implicated in the Mexican Peso crisis of 1994.

The buffer function of reserve requirements and active liquidity management are the main ways variability in the net supply of liquidity due to these autonomous sources can be reduced.

7.2 Reserve requirements: Demand for reserves

EMs continue to impose reserve requirements, and although averaging is allowed, the period of maintenance is 2 weeks compared to one month in industrial countries, reflecting their use in monetary control in EMs rather than in liquidity management. Averaging allows banks to use reserves to offset temporary liquidity shortages during

the maintenance period. In countries that follow a policy more oriented towards quantitative controls, reserve accounting and maintenance is contemporaneous. With lags, the requirement becomes known early in the maintenance period, reducing uncertainty about the level of settlement balances. In India it is lagged two weeks.



The figure shows the rise in cash balances held with the RBI over 2007-08, with a rise in the CRR, and their systematic fluctuations over the maintenance period. Sharp peaks coincide with the reporting period.

Despite the compulsory reserves and averaging, demand for reserves is inelastic since banks fear not being able to meet the requirement later in the maintenance period or fear penal interest rates. The conditions under which they can obtain CB credit on demand are important.

So CBs have a trade off. If they do not allow reserves averaging and lags they need to fine-tune the supply of liquidity. If liquidity forecasting is poor, it is better to allow more averaging. Errors in liquidity forecasting will lead to sharp fluctuations in interest rates if interest elasticity of demand for reserves is low, because of the absence of adequate averaging. The introduction of RTGS has led to provision of intraday credit, which avoids excessive reliance on penal end-of-day facilities. EMs also rely more on standing facilities.

CBs informally contact banks to estimate settlement balance needs. Although most CBs do not make their estimates public, since they are subject to large errors, some do, since it facilitates banks' liquidity management.

7.3 Liquidity management: Discretionary operations

Industrial countries have shifted towards liquidity activism as reserve requirements have fallen. In EMs discretionary operations are limited by a shortage of underlying securities and inadequate depth of markets. The dominant instrument is domestic repos, followed by foreign exchange swaps. Short-term paper and secondary market transactions are also used, but direct intervention in money markets is rare. Interventions are based on liquidity forecasts ranging between one day and two months.

Countries specify the underlying assets to be used as collateral for the repo, generally fixed rate Government or quasi-government paper. Some countries have widened the range of eligible paper to get over the problem of lack of eligible collateral in the market. The range of counterparties and maturities used are also wide. In Korea merchant banks, securities, investment and trust companies as well as banks are eligible counterparties and maturities extend upto 91 days. In 1997 as credit risk increased Korean banks became reluctant to deal with other financial institutions, so the volatility of call rates increased greatly. The CB decided to include these institutions in its liquidity providing and absorbing functions.

Like domestic repos, FX swaps affect liquidity without impacting the spot rate and are used where FX markets are liquid or in order to develop them. Valuation changes, however, expose CBs to risk. If intervention to support the currency fails unwinding the forward leg of the swap will impose large losses.

Outright transactions are constrained by the lack of depth of government securities markets, fear of adversely affecting their price, and since a large proportion of such securities may be locked up in liquidity requirements mandated for banks.

CBs also issue their own paper to induce a net deficit in liquidity to add to desirable collateral, or to create a liquid benchmark yield curve. The Bundesbank has used

"liquidity paper" with a maturity of between one and three days, the Netherlands Bank has issued six months certificates, UK has weekly Treasury bill tenders, and the Bank of Japan tenders its own bills, of maturity between one and five days. EMs that auction CB paper include Brazil, Korea, Peru, Thailand and Poland. In Israel the Treasury agreed to issue short-term notes for monetary policy purposes, not for financing the budget.

One or two instruments, which the market has learnt to monitor, may be used in order to send clear signals; instruments used may be varied according to the requirements of the situation. Each CB normally has one keynote operation, with short maturities, that in addition to satisfying the basic liquidity needs, signals its intentions to the market. Often the keynote function can only inject liquidity so that excessive liquidity has to be mopped up to induce a net liquidity shortage.

7.4. Liquidity management: Standing facilities

These have evolved from the merging of various sectoral discount facilities with penal or subsidized deviations from the bank rate, to a general rate at which the CB injects liquidity. Liquidity absorption sets the floor rate. A true standing facility is used at the discretion of market participants, but some CBs impose various kinds of restrictions on quantity and timing so it functions rather as an interest rate corridor or liquidity adjustment facility. By calibrating the need for late day assistance from the CB or the need to deposit surplus funds, the CB can put pressure on interest rates as required, and get an estimate of liquidity pressures in the market.

Since liquidity injection is at above market rates in a standing facility, subsidized discount facilities have lost significance in liquidity management. The interest rate corridor can be widened to accommodate greater volatility due to interest rate pressures, or as Israel did, convert the discount window mechanism into a ladder of windows, each carrying a higher rate. For both industrial and EMs the standing facility serves as a "safety valve"—for the first because of low reserve buffers; for EMs, because of large autonomous variation in liquidity and poor forecasting. As Woodford (2001) notes, for a standing facility to work well to set the policy rate, good forecasting and market-based supply of liquidity, and a well functioning interbank market are prerequisites.

CBs through moral suasion and ensuring sufficient funds are available in the system, so banks do not need to borrow from the CB, help the development of an active interbank market, thus reducing need for CB intervention. Settlement procedures are designed to allow banks to borrow and lend in the interbank market towards the end of the day after third parties have exited and settlement positions are known.

7.5. Price or quantity operating objective

Financial deepening has eroded the usefulness of a monetary aggregate as an intermediate target in industrial countries. Market development and internationalization has increased the role of interest rates in policy transmission, made markets more vulnerable to sharp movements in rates, and increased the influence of expectations on interest and exchange rates.

Many EMs continue to use monetary targets, but in an indicative way, and supplemented with rate variables. A monetary target may be regarded as useful to constrain government spending or prevent asset bubbles in narrow financial markets. Or interest rates may be regarded as noisy indicators of the policy stance due to higher volatility and higher inflation.

In most industrial and several emerging economies the overnight rate is the operating target since that is the rate most directly under the CB's influence. But which rate depends on the characteristics of the financial market and monetary transmission. Since commercial bank rates are based on longer-term money market rates, the Bank of England's operating targets are one to three month rates. In emerging markets, if overnight rates are volatile or market segmentation prevents their smooth transmission CBs may be reluctant to make overnight rates their operating targets. The latter may depend on the maturity chosen for keynote operations.

Lower volatility in the operating target helps transmit policy signals and develop markets, but too little volatility may cloud market signals. Precise liquidity projections are required for more interest rate smoothing.

7.6. Signaling

It is now widely agreed that the economic environment is not stationary so there cannot be a unique rational expectations equilibrium. If the CB just does what markets expect it can lead to a self-fulfilling equilibrium far from fundamentals in some circumstances (Woodford, 2003). The CB has a role in guiding markets. Conventional wisdom for CBs has changed from saying as little as possible to the importance and the art of managing market expectations.

Communication makes monetary policy more effective either by creating news, or by reducing noise (Blinder et. al. 2008). If market participants understand how the CB implements its policy, they may anticipate policy and help the CB achieve its objectives. For example, greater transparency could make the demand for reserves more interest elastic helping the CB control the overnight rate. CBs try to make clear the distinction between technical operations to manage liquidity and actions to change policy. They say as little as possible on non-keynote operations to focus markets on relevant actions.

The policy signal is conveyed through announcements of operating targets or through keynote fixed rate tender operations. In tenders with a pre-announced volume of paper, interest rates are determined in the market. Fixed rate tenders send a strong rate signal to markets. Most repos are through fixed rate tenders. It is always possible for the CB to adjust the rate in frequent tenders depending on market feedback and volume demanded. Since tenders are now more frequent and with lower average maturity market forces can exert greater influence. Standing facilities are also used to signal rates.

Blinder et. al (2001) point out that as CBs become more transparent and credible, markets and individuals become more forward looking. Ultimately the effect of the interest rate on inflation has to work through the yield curve and the wage-price setting mechanism. To the extent the Phillips curve is backward looking, transmission takes long as frictions work through the system. With a forward-looking Phillips curve, interest rate changes quickly anchor inflation expectations, wages are not raised and transmission lags to inflation are reduced.

While there is agreement on transparency of objectives and on general procedures, less clarity on specific aspects gives CBs some discretion to respond to circumstances and gives markets some leeway in affecting outcomes. So CBs always have some freedom and flexibility. Surprising markets sometimes can be good for markets.

8. Concluding remarks and policy implications

As markets deepen and interest elasticities increase it is optimal for emerging markets to shift towards an interest rate instrument. Ironically, the argument of dualism and segmentation, which is used to argue that interest rates are not effective in emerging markets actually supports interest rate targeting after a minimal threshold of market development. The reason is continuing monetization of the economy implies money demand shocks are large. And interest rate targeting is more effective when money demand shocks dominate. But dualism means supply shocks are also more frequent in EMs. And it is necessary to design an appropriate monetary policy response to them.

The working of India's LAF and its recent fine tuning is in the direction of international best practices, and in tune with first principles. The first few months of operation with the revised LAF shows a reduction in the standard deviation of short-term interest rates (Mohanty, 2011).

The signaling of the monetary policy stance has improved with the repo as the single policy rate. The MSF rate at the upper end and the reverse repo at the lower end will change automatically with the repo to maintain a fixed corridor. With the focus on a rate, the RBI will be free to shift liquidity in the opposite direction, without confusing the market[5].

The weighted average call money rate has been identified as the single operating target since it most directly reflects pressures in the money market thus transmitting the monetary policy stance. A keynote operation, such as CBs also use to focus expectations has, however, not yet been identified. Worldwide repo instruments are

[5] In 2010 as Government cash balances grew steeply because of a 3G auction windfall liquidity tightened and banks had to borrow upwards of the RBI's comfort level of 1 percent of NDTL from the markets. The RBI would have liked to increase primary liquidity, but was afraid that markets would misinterpret a rise in liquidity at a time it was raising interest rates as part of a tightening cycle. When the rate clearly reflects the policy stance quantity adjustments can be in the opposite direction.

preferred. That they do not impact government securities (Gsecs) prices much is a particularly useful property in thin markets. Keynote operations of a suitable maturity may be developed, to help manage expectations. The RBI may consider developing a market in its own paper, or special government paper reserved for monetary policy purposes.

In an EM, however, problems remain on both the supply and the demand side of reserve balances. On the supply side large autonomous shocks to liquidity, and the paucity of discretionary instruments to adjust for it, create problems. The MSF will provide some buffer against unanticipated liquidity shocks. It is available more at the discretion of market participants, and the set of paper accepted as collateral has expanded. There is an attempt to improve the accuracy of RBI's liquidity forecasts made available to markets, and to expand the set of instruments for longer-term liquidity adjustment. But demand for Gsecs in OMOs depends on more regular buying and selling of Gsecs—for term markets to develop some portion of SLR holdings should be marked to market so the held to maturity portion decreases.

In the future, penalties such as are imposed on Government balances in various countries could be considered. This would have the desirable consequence of improving discipline in the planning and use of government cash balances, thus saving taxpayers' money. Reducing interest rates on extra balances as is done in some countries is not an option since the RBI does not pay interest on these balances. There is a suggestion for auction of government cash balances (Mohanty, 2011). In some countries excess government deposits are placed in other commercial banks.

The demand for reserve balances depends on the settlement systems, the cost of borrowing from the CB, the depth of the inter-bank market, and legal requirements such as maintenance periods etc. To the extent the interbank market becomes vibrant the rates will stay in the interior of the corridor rather than depend on the RBI at the margins in injection or absorption mode. As markets become more efficient, a norm is established, and volatility decreases, the market rate will stay closer to the center of the LAF corridor, and the corridor itself can shrink. The only current step towards these aims is the extension of timing for T+0 short-term money market segments transactions to match RTGS reducing uncertainty on banks CRR positions. Provided

more instruments become available to adjust longer-term liquidity, the maintenance period for reserve requirements could be increased to one month, with a suitable lag between the calculation period and maintenance period. In Indian conditions since public, private and foreign banks have different borrowing needs, overlapping maintenance periods may help develop a more active interbank market. The sharp fluctuations in Figure 1 would reduce, although the average levels of balances may be similar.

To the extent reserve requirements will have to continue given large foreign inflows they could be better used to improve incentives and stability of the financial sector by converting CRR partially into ABRR.

References

Blinder, A. S., Ehrmann, M., Fratzscher, M., Haan, J. D., and Jansen, D.-J. 2008. Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence. Journal of Economic Literature, 46(4): 910-945.

Blinder, A. S., C. Goodhart, P. Hildebrand, D. Lipton, and C. Wyplosz. 2001. How do Central Banks Talk? Geneva Report on the World Economy no. 3, International Center for Monetary and Banking Studies.

Borio, C. E.V. 1997. "The Implementation of Monetary Policy in Industrial Countries: A Survey". Economic paper no. 47. Bank for International Settlements.

Friedman, B.M. 1975. "Targets, Instruments and Indicators of Monetary Policy". Journal of Monetary Economics,1, no. 4 (October): 443-473

Friedman, B.M. 1990. "Targets and Instruments of Monetary Policy'. in B. Friedman and F. Hahn (eds), The Handbook of Monetary Economics, Vol. 2, 1183-1230. New York: North Holland.

Mohanty, D. 2011. How does the Reserve Bank of India Conduct its Monetary Policy? Speech delivered at the Indian Institute of Management (IIM), Lucknow on August 12, 2011.

Nachane, D.M. 2010. Capital Management Techniques for Financial Stability and Growth. XLV (46): 36-39.

Palley, T. I. 2000. Stabilising Finance: The Case for Asset-based Reserve Requirements. Financial Markets and Society, August.

Poole. 1970. Optimal Choice of Monetary Policy Instrument in a Simple Stochastic Macro Model. *Quarterly Journal of Economics*. 84: 197-216.

Reserve Bank of India. 2011. Report of the working group on operating procedure of monetary policy. March. Chairman, D. Mohanty.

Tobias, A. and H. S. Shin. 2008. Money, Liquidity and Monetary Policy. Paper presented in the Annual Meeting of the American Economic Association.

Van't dack, J. 1999. Implementing Monetary Policy in Emerging Market Economies: A survey of the issues. BIS Policy Papers No. 5, http://www.bis.org/publ/plcy05b.pdf

Woodford, M. 2003. Interest and Prices: Foundations of a Theory of Monetary Policy. NJ: Princeton University Press.

Woodford M. 2001. Monetary Policy in the Information Economy. Presented at the FRB of Kansas City Symposium on Economic Policy for the Information Economy, Jackson Hole, Wyoming.