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Determinants of Liquidity and the
Relationship between Liquidity and
Money: A Primer

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Determinants of Liquidity and the Relationship between Liquidity and Money: A Primer

A.K. Mitra and Abhilasha*

The term liquidity is varyingly used signifying financial flows of various kinds, ranging from that originating from the central bank to the overall existent financing available in the banking system. By analysing the impact that central bank actions and autonomous factors such as government financial flows, foreign capital flows and demand for currency have on excess reserves of banks with the Reserve Bank, this paper attempts to trace the relationships between the various kinds of liquidity. Eventually liquidity is determined by the net change in the bank reserves through interaction among the various autonomous factors that drive liquidity and its management by the Reserve Bank. To that extent, the daily outstanding position in the Liquidity Adjustment Facility (LAF) emerges as the key indicator of the funding available in the system as well as the need for further action. With the onset of the global financial crisis, the information content of monetary aggregates is perceived to be important among central bankers and academia alike. This study validates the continued importance accorded to monetary aggregates in India as a key information variable in policy formulation. Even though the LAF operations enable banks to extend credit based on demand at the margin, discretionary policy actions as well as autonomous factors drive the liquidity flows. Hence, money supply is found to be largely exogenous over the long run. The liquidity management operations of the Reserve Bank, however, may not always have the desired impact on money supply due to the changing behavior of the public and commercial banks, leading to episodes of endogeneity of money supply.

JEL classification: E50, E51, E52 and E58.

Key Words: Central bank money, Autonomous liquidity, Discretionary liquidity, Reserve money, Broad money

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Introduction

The term liquidity is used in a variety of ways. In this paper, however, ‘liquidity’ has been predominantly used in terms of the amount of money that the central bank makes available to banks on a daily basis (Borio, 1997 and Longworth, 2007). The central bank is a monopoly supplier of such liquidity, also called reserves. Reserves are bank deposits with the central bank. Banks need to maintain deposits with the central bank to meet the central bank prescribed reserve requirements or cash reserve ratio (CRR) as also to meet settlement obligations. The central bank bridges the gap between the demand and supply of reserves by way of various instruments, such as open market operations (OMOs) (including repos), provision of standing facilities and modulation of CRR. While instruments such as CRR and OMO are more suited to address durable or structural liquidity mismatches, overnight repo operations are designed to address frictional liquidity mismatches. On a day-to-day basis, the amount of surplus/deficit at the overnight repo window is another – narrower – measure of liquidity position. In India, this narrower version of liquidity is measured in terms of the net position of commercial banks in the Reserve Bank’s liquidity adjustment facility (LAF).¹ This concept of liquidity appears to have been expounded in the following stance of monetary policy viz., “*Manage liquidity to ensure that it remains broadly in balance, with neither a large surplus diluting monetary transmission nor a large deficit choking off fund flows*” (RBI, 2011a). It is by injection/absorption of liquidity ‘at the margin’ through the LAF that the Reserve Bank bridges the gap between the demand and supply of liquidity on a day-to-day basis.

¹ The Reserve Bank also provides intra-day liquidity to enable banks to meet their settlement obligations. By the end of the day, however, banks are required to square off the availed liquidity by way of call/repo/collateralised borrowing and lending obligations (CBLO) borrowings or, when such liquidity is not available, within 100 basis points (bps) spread over the LAF repo rate, by accessing the Marginal Standing Facility (MSF) of the Reserve Bank. Banks can also access the standing refinance facilities provided by the Reserve Bank at the repo rate. The amount availed by banks under export credit refinance facility was not significant till recently as such refinance was subject to a ceiling of 15 per cent of the outstanding export credit in rupee terms. The limit has, however, been enhanced to 50 per cent with effect from the fortnight beginning June 30, 2012.

The objective of this paper is to study the determinants of liquidity as defined above and the interactions between liquidity and money. There are also various other concepts of liquidity which are closely related to one another. Section II explains these concepts of liquidity and their inter-relationships. Section III discusses the autonomous and discretionary determinants of central bank money and analyses the relationship between liquidity and money. Section IV discusses the operating procedures of monetary policy and the continued importance of money in an interest rate targeting operating framework. Section V concludes.

II. Concepts of Liquidity: the Cobweb of Interactions

‘Liquidity’ is a word that means ‘*slightly different things in different contexts*’ (Longworth, 2007). This Section, therefore, explains the various concepts of liquidity as available in the literature. It also explains the subtle differences among these concepts providing examples from the Indian experience. These are very closely related to one another in theory as also in practice.

Macroeconomic liquidity

Macroeconomic liquidity relates to monetary conditions. The key indicators of macroeconomic liquidity in terms of price are the policy interest rates and the term structure of interest rates (Longworth, 2007). The range of quantitative measures of macroeconomic liquidity varies from the day-to-day liquidity provided by the central bank at one end of the spectrum to the broadest measure of monetary and liquidity aggregates at the other. In India, the key indicators of macroeconomic liquidity are LAF on a day-to-day basis and monetary and credit aggregates over the medium-term.

Many central banks also measure macroeconomic liquidity by formulating various ‘liquidity’ aggregates in addition to the monetary aggregates. While the instruments issued by the banking system are included in ‘money’, instruments that are close substitutes of money but are issued by the

non-banking financial institutions are also included in liquidity aggregates.² In India, based on the recommendation of the Third Working Group on Money Supply (1998), liquidity aggregates are compiled. Liquidity aggregates in India include the liabilities of post office savings banks, select financial institutions and non-bank financial companies (NBFCs).³ In view of their ‘moneyness’ or ‘liquidity’, these instruments compete with bank deposits. The relative share of non-money liquid instruments in the aggregate measures of liquidity has declined. Thus, the share of NM₃ (*viz.*, the broadest measure of new monetary aggregates) to L₃ (*viz.*, the broadest measure of liquidity aggregates) increased to 98.0 per cent as at end-March 2012 from 95.3 per cent as at end-March 1999. The reasons range from the greater liquidity of bank deposits *vis-a-vis* postal deposits, conversion of the larger all India financial institutions (AIFIs) into banks and increased prudential regulation and supervision of NBFCs reducing regulatory arbitrage *vis-a-vis* the banking sector. Besides, there is a considerable lag in the availability of the data. Hence, these liquidity aggregates do not enjoy policy relevance.

Reserve money – also known as central bank money, base money or high powered money – plays a crucial role in the determination of monetary aggregates.⁴ Reserve money has two major components – currency in circulation and reserves.⁵ Currency in circulation comprises currency with the public and cash in hand with banks. The public’s demand for currency is determined by a number of factors such as real income, price level, the opportunity cost of holding currency (*i.e.*, the interest rate on interest-bearing assets) and the availability of alternative instruments of transactions, *e.g.*, credit/debit cards, ATMs, cheque payments. The demand for reserves by banks

² In many countries, as discussed later, the definition of money has undergone a change to include instruments issued by non-bank financial institutions, such as the money market mutual funds (MMMFs).

³ The non-money instruments that are included in the liquidity aggregates are: postal deposits, term deposits, certificates of deposit and term money borrowings of select AIFIs and public deposits of NBFCs

⁴ We shall see later that a reverse causality also exists, *viz.*, from credit demand to supply of reserves.

⁵ Apart from currency in circulation and reserves, reserve money also includes ‘other deposits’ which comprise balances of financial institutions, primary dealers, *etc.* ‘Other deposits’ is a small proportion of reserve money and is, therefore, ignored.

depends on the requirements for the maintenance of CRR and to meet payment obligations. The Reserve Bank is the banker to the banks and is the sole supplier of liquidity (or reserves) to these banks. A part of the reserves is supplied while performing central banking functions other than monetary policy operations and constitute the autonomous drivers of liquidity. These functions include government cash management, meeting currency demand of the public and foreign exchange management (Table 1). Thus, in its role as the banker to the government, the Reserve Bank's cash management operations involve provision of liquidity to tide over temporary deficit of the government as also facilitate investment of the temporarily surplus cash balances of the government. Further, in order to prevent the excessive volatility of the exchange rate, the Reserve Bank intervenes in the forex market which has implications for domestic rupee liquidity. Currency with the public is another autonomous driver of liquidity.

The Reserve Bank operationalises its stance on liquidity through its liquidity management operations which can be distinct from its monetary policy stance. This distinction is important as the Reserve Bank is faced with multiple objectives which can, at times, be conflicting. The broad objective of the Reserve Bank's liquidity management operations is to ensure that liquidity conditions do not hamper the smooth functioning of financial markets and disrupt flows to the real economy (Gokarn, 2011). Through its liquidity management operations, the Reserve Bank either offsets or complements the autonomous liquidity flows in order to maintain liquidity at the desired level. Section III discusses in detail the interaction between the autonomous drivers of liquidity and the Reserve Bank's tools of liquidity management and their impact on money supply.

Table 1: Reserve Bank's Liquidity Management Operations: Annual Variations (₹ billion)

	Item	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
A.	Autonomous Drivers of Liquidity (1+2+3+4)	425	941	797	-313	1,232	3,046	-1,668	-1,008	-1,111	-2,636
1	RBI's net Purchase from Authorised Dealers	790	1,406	911	329	1,190	3,121	-1,786	-120	76	-1,045
2	Currency with the Public	-308	-434	-413	-558	-707	-856	-970	-1,020	-1,443	-1,148
3	Cash balances of the Centre with the Reserve Bank	-36	-178	5	-227	-12	-266	604	-20	18	-576
4	Others (residual)\$	-21	147	294	143	761	1,047	484	152	238	133
B.	Management of Liquidity (5+6+7+8)	-414	-754	-608	579	-301	-1,253	2,352	1,322	1,756	2,794
5	Liquidity impact of LAF Repos	24	-371	153	121	364	212	-518	5	1,070	579
6	Liquidity impact of OMO (net) *	-538	-418	-29	107	-51	59	1,045	824	784	1,420
7	Liquidity impact of MSS	0	0	-642	351	-339	-1,054	803	853	27	0
8	First round liquidity impact due to CRR change	100	35	-90	0	-275	-470	1,023	-360	-125	795
C.	Bank Reserves # (A+B)	11	187	189	266	931	1,793	684	314	645	158

(+): Injection of liquidity into the banking system.

(-): Absorption of liquidity from the banking system.

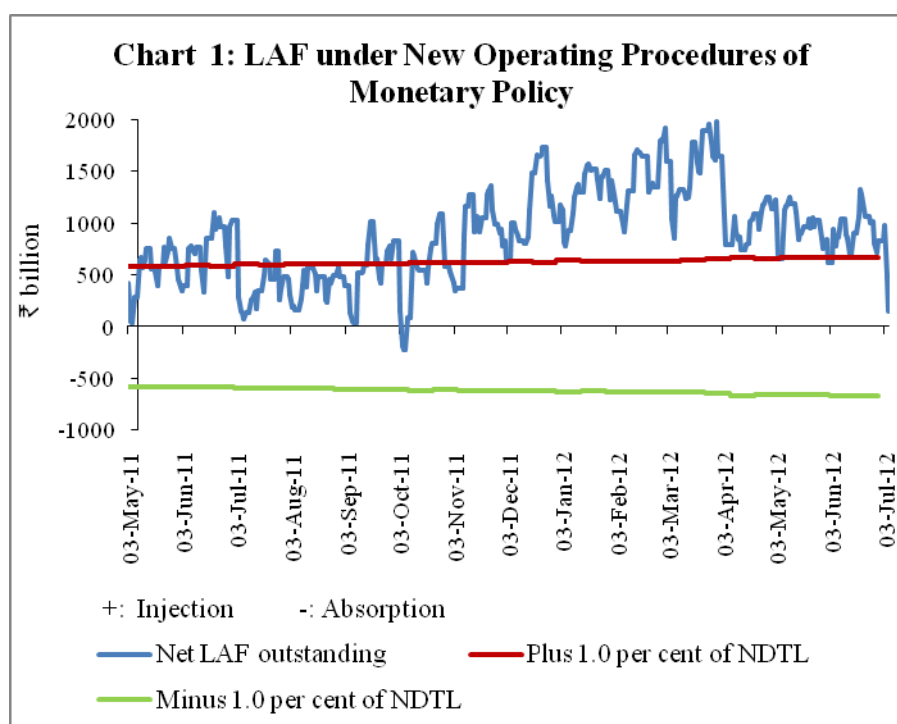
\$: Includes standing facilities, etc.

*: Includes oil bonds but excludes purchase of government securities on behalf of state governments.

#: Includes vault cash with banks and adjusted for first round liquidity impact due to CRR change.

Note: Data pertain to March 31.

In times of excessive surplus or deficit in autonomous liquidity over a prolonged period, the liquidity position of the banking system – as gauged from the overnight liquidity absorbed/injected under LAF – can deviate significantly from the desired level. The desired level of liquidity is currently defined in terms of the end-of-day outstanding daily balances under LAF operations where the range is between (+)/(-) 1 per cent of net demand and time liabilities (NDTL) of the banking sector. As seen from Chart 1, liquidity deficit was above the Reserve Bank’s comfort zone during November 2011 to June 2012 reflecting the Reserve Bank’s intervention in the forex market draining rupee liquidity and the sharp build-up in government cash balance during Q4 of 2011-12.



When the liquidity position under the LAF is outside the comfort zone, the Reserve Bank uses a wide array of instruments to absorb/inject durable liquidity from/into the financial system and thus bring the residual liquidity gap – as measured by the outstanding overnight LAF balance – within the comfort

zone of the Reserve Bank. These instruments include CRR, OMO and market stabilisation scheme (MSS) (Table 1).

In India, under the new operating framework for monetary policy effective from May 2011, this injection and withdrawal of reserves occurs at the repo and the reverse repo rates, respectively, under the Reserve Bank's LAF. This apart, banks can borrow from the central bank at the penal rate under the Marginal Standing Facility (MSF) up to 2 per cent of their respective NDTL.⁶

Since May 2011, the weighted average overnight call money lending rate is the new operating target of monetary policy and the Reserve Bank strives to steer the call rate within the formal corridor defined by the reverse repo rate and the MSF rate. The Reserve Bank normally sets the policy rate in its periodic (eight times a year) monetary policy announcements. Since the call rate is determined in the overnight market for reserves, the Reserve Bank has the maximum influence over the level of the call rate as the monopoly supplier of reserves. When the system is in deficit mode but the extent of deficit is not large, the weighted average call rate is likely to hover around the middle of the formal corridor; *i.e.*, around the policy (LAF repo) rate. Through its liquidity management operations, the Reserve Bank seeks to keep the demand for LAF repos (net) broadly within this range, or preferably in marginal deficit for more effective monetary policy transmission.

Market liquidity

Market liquidity refers to how readily one can buy or sell a financial asset at short notice, at low cost and large quantity, without causing a significant movement in its price. Market liquidity is measured in terms such as the bid-ask spread, the volume and frequency of transactions per unit of time, the turnover ratio and the price impact of a trade. A liquid market is necessary for effective monetary policy transmission.

⁶ While only banks having excess statutory liquidity ratio (SLR) securities (*i.e.*, securities over and above the statutory requirement) can borrow at the repo rate, even banks facing shortage of SLR securities can borrow under the MSF.

Balance sheet liquidity

Balance sheet liquidity refers broadly to the cash-like assets on the balance sheet of a firm or a household.⁷ In the event of a run on banks or faced with asset liability mismatch, balance sheet liquidity provides an assurance of easy conversion of banking assets into cash to help maintain depositors' confidence.

Funding liquidity

Funding liquidity may be defined as the ability of banks to settle obligations with immediacy (Drehmann and Nikolaou, 2009). The Basel Committee on Banking Supervision defines funding liquidity as the ability of banks to meet their liabilities, unwind or settle their positions as they come due.

The common element in these various concepts of liquidity is that liquidity is the ability to obtain cash – either by turning assets into cash at short notice or by having access to credit, including from central banks.

Inter-relationships among the various concepts of liquidity

It is evident from the above that the various concepts of liquidity are related to one another. The interrelationship among these concepts can be further explored with the following examples.

Keeping in view the availability and growth of macroeconomic liquidity and its impact on the Reserve Bank's policy objectives, *viz.*, price stability and growth, the Reserve Bank can tighten or ease the price of liquidity under the LAF at which commercial banks can fund their liquidity requirements. Second, macroeconomic liquidity is closely related to balance sheet liquidity in India since the Reserve Bank accepts only SLR securities for the purpose of LAF

⁷ A somewhat related concept, although statutorily prescribed by central banks, is the SLR, which closely corresponds to the balance sheet liquidity. While banks cannot liquidate their SLR securities below the statutorily prescribed level except on an overnight basis to the extent of 2 per cent of their NDTL to avail liquidity under MSF (the limit was 1 per cent till April 17, 2012), SLR has been lowered by the central bank in times of financial duress.

repo operations.⁸ Third, market liquidity is also an important consideration in the provision of liquidity under LAF; this is reflected in the differential provision of the amount of reserves for using central and state government securities under LAF as the collateral.⁹ The securities chosen for overnight liquidity management need not necessarily be liquid; being eligible for LAF, however, imparts liquidity to these securities.

The size of excess SLR securities in a bank's portfolio enables a bank to meet its temporary liquidity mismatches. However, the liquidity potential of the excess SLR securities goes beyond merely funding the temporary mismatches. For example, the banking system can even meet the entire market borrowing programme of the central and the state governments. The issue is straight forward if the CRR and the margin which banks have to provide for availing liquidity under LAF can be ignored. Under these assumptions, the excess SLR securities can be pledged for reserves under LAF and the banks can invest the entire reserves so obtained in the primary/secondary market for government securities. With these securities, banks can again obtain liquidity under LAF for another round of investment and so on. Even if we consider a withdrawal of liquidity by way of CRR and margin, the steady increase in SLR-NDTL ratio would enable banks to meet the governments' market borrowing programme. If, however, banks use the liquidity obtained from LAF only to provide credit to the commercial sector, banks would soon exhaust their excess SLR securities. Through the credit creation process, there will be an increase in the NDTL of banks that would lower the effective SLR-NDTL ratio. Accordingly, banks can use an appropriate mix of investments and credit that will keep the credit creation process endogenous for a prolonged period of time. However, in view of CRR and margin prescriptions, liquidity expansion under LAF may get

⁸ Currently, only SLR securities can be used as collateral and the non-SLR securities even though issued by the government (such as oil bonds) cannot be used as collateral. The Working Group on Operating Procedure of Monetary Policy (RBI, 2011b) had recommended the use of oil bonds as collateral for reverse repo operations.

⁹ Thus, while the margin for central government securities is ₹5, the same for state government securities is ₹10. In other words, a bank has to offer securities with face value of ₹110 as collateral in respect of state government securities as against ₹105 for central government securities in order to receive reserves amounting to ₹100. In our subsequent analysis, however, provisioning of margin has been ignored for simplicity.

gradually constrained. More importantly, the principles of banks' asset liability management may get compromised. The excessive reliance on LAF for funding asset creation by banks can have financial stability implications if the cost of borrowing over the period of asset creation by rolling over overnight LAF borrowings turns out to be higher than expected.

During episodes of financial crises, an asset that is deemed liquid under normal times can turn illiquid as attempts to sell it in large volume in an uncertain environment reduce its price. When the confidence among market participants gets shaken, call money market volumes dry up and margin requirements in the collateralised repo markets increase. As market liquidity freezes, commercial banks' balance sheet liquidity tends to disappear with the exception that banks can convert their balance sheet liquidity into central bank money to boost funding liquidity. Liquidity shortages have the potential to lead to failure of institutions, which through spill over and contagion effect could give rise to concerns about systemic stability and impinge on the real economy. This necessitates injection of central bank liquidity. Thus, macroeconomic liquidity and funding liquidity are closely related through the central bank's role in the provision of settlement balances.

The period of the onset of the financial crisis in September 2008 presents an example from the Indian experience on the interaction between macroeconomic and funding liquidity. Initially, the banking sector in India was not affected by the global turmoil as it hardly had any direct exposure to the US subprime assets. However, with the drying up of the external sources of funding for corporates, mutual funds that depended on corporates for bulk funding faced redemption pressures from the corporates. This, in turn, translated into funding liquidity problems for NBFCs as mutual funds were important source of funds for NBFCs. Thus, the pressure for funding liquidity needs of corporates, NBFCs and mutual funds came to rest on the banks. To ensure systemic stability and meet credit demand, the Reserve Bank had to step in with liquidity augmenting measures such as cuts in CRR, open market purchases, unwinding of MSS and increase in refinance facilities. Unlike

advanced economies such as the US and the UK, that had direct exposure to non-bank market participants, the Reserve Bank channelised the central bank money to meet funding requirements of non-bank players entirely through the banking system. This helped the market participants to meet their liquidity requirements.

III. Interaction between the Drivers of Liquidity and Money Supply

In the previous Section, we have discussed the various autonomous drivers of liquidity (*viz.*, currency with the public, government cash balance and foreign exchange operations) and the instruments with which the Reserve Bank, at its discretion, offsets/complements the autonomous drivers of liquidity. The impact of the changes in the autonomous and discretionary factors of liquidity on the Reserve Bank's balance sheet and money supply are summarised in Annex.

The relationship between the drivers of liquidity and the excess reserves position of banks is straight forward as seen from columns 1-4 of Annex. Column 5, however, shows that the relationship between reserves and money supply may not always be straight forward. Indeed, the nature of causality between liquidity (in the sense of reserves) and money supply is subject to a wide ranging debate among the economic theorists as also the central bankers. If the relationship holds true, central banks can opt for reserves based monetary targeting where reserves are the operational target. We shall see later that, as in the case of other countries, India's experience with reserves based monetary targeting too did not often yield the desired results.

We shall begin our analysis with an extremely stylised balance sheet of a central bank to study the implications of the autonomous factors of reserve money based on recent experiences. We shall examine as to how the Reserve Bank has deployed the policy instruments to offset the effects of these shocks.

Baseline scenario

A simplified balance sheet of a central bank is presented in Table 2.

Liabilities		Assets	
Currency	400	Government Securities	200
Reserves = (Required Reserves)	100	Forex	300
Total	500	Total	500

In this baseline scenario, banks do not hold excess reserves with the central bank and the amount of LAF outstanding is nil. The central bank's balance sheet size is ₹500 billion. Liabilities other than reserve money comprise non-monetary liabilities.¹⁰ In the baseline scenario, we ignore the presence of non-monetary liabilities¹¹ in the balance sheet. Government's cash position is assumed to be in balance. On the assets side, the lending to banks through refinancing facilities (*e.g.*, export credit refinance) is assumed to be nil as it is not a significant component of the balance sheet.¹² Non-monetary assets, mainly, fixed assets, amounts spent on projects pending completion and staff advances, *etc.*, are also assumed to be nil.

Starting from the baseline scenario of a simplified central bank balance sheet, we shall see in this Section as to how the changes in the various autonomous drivers of liquidity – government cash balance, capital flows and currency demand by the public – impact on the central bank balance sheet. Second, we shall also observe the implications of liquidity management by the central bank on its balance sheet in response to the sharp movements in the autonomous drivers of liquidity. Third, we shall see how changes in liquidity impacts on money supply and the roles played by the money multiplier and the velocity of circulation of money. Fourth, we shall explore the credit creation

¹⁰ 'Other deposits', which is a small proportion of reserve money is ignored. Hence, reserve money = currency + reserves (= bank deposits with Reserve Bank). 'Currency' – a component of reserve money – comprises notes and coins with the public and with banks. Coins are liabilities of the government (and not of the central bank) while notes are the liabilities of the central bank. Here, for simplicity, this distinction is ignored.

¹¹ Non-monetary liabilities comprise, *inter alia*, deposits of government, capital and reserves.

¹² While new refinancing facilities were activated during the financial crisis period, the actual liquidity availed by banks was significantly lower than the potential.

process and the money multiplier process in the absence of excess reserves with commercial banks. Finally, we shall see whether CRR and OMO are substitute or complementary instruments of liquidity management.

1. Unanticipated government expenditure has expansionary effect on money supply

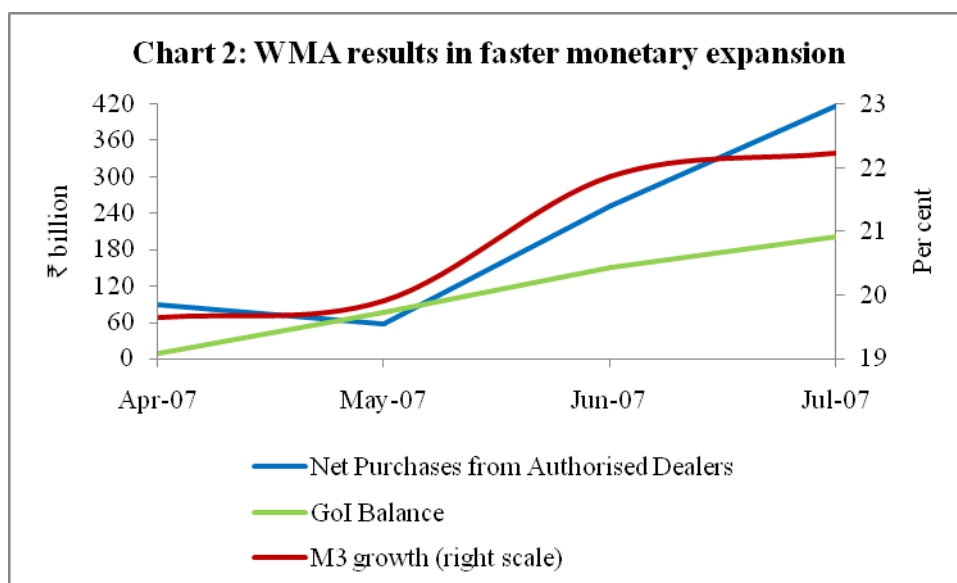
The central and the state governments enjoy a facility called the ways and means advances (WMA)/overdraft (OD) facility whereby the Reserve Bank passively lends to the governments whenever the governments' cash balances fall short of the minimum requirement. The provision of WMA¹³ results in the generation of excess reserves (*i.e.*, excess balances of commercial banks with the Reserve Bank) as government expenditure involves debiting the government balances with the Reserve Bank and crediting the receiver (say, salary account of government employee) account with the commercial bank (Table 3). The excess reserves thus created can potentially lead to an increase in money supply through the money multiplier process. The provision of WMA/OD can compromise the maintenance of a tight monetary policy stance.

Table 3: WMA generates excess reserves with banks				
(₹ billion)				
	Liabilities		Assets	
	Currency	400	Government Securities	200
	Required reserves	100	Forex	300
	Excess Reserves	50	Loans to the Govt. (WMA)	50
	Total	550	Total	550

The Reserve Bank's net purchase of foreign exchange from the authorised dealers (ADs) is also a driver of autonomous liquidity. The Reserve Bank's intervention in the forex market to smoothen the excessive volatility of the external value of the rupee can drive domestic liquidity. For example, if faced with large scale capital inflows, the Reserve Bank purchases forex to prevent

¹³ The government borrows from the Reserve Bank, at the repo rate, under the WMA facility up to an annually agreed limit which varies intra-year reflecting the seasonality of the cash flows. Further, the government can also avail OD over and above the WMA limit at repo rate + 2 percentage points. The government is, however, required to vacate an OD within 10 working days.

excessive volatility in the exchange rate, the excess reserves so created can lead to an increase in monetary growth. Thus, during April-July 2007, an increase in WMA – coupled with the net purchases in the forex market – led to a marked increase in the pace of growth in money supply (Chart 2).



2. Government issues cash management bills (CMBs) to vacate WMA - introduction of CMBs facilitates fiscal-monetary co-ordination

Cross-country experience shows that the government’s cash management operations are pursued in co-ordination with the central bank’s monetary policy operations. In furtherance of fiscal-monetary co-ordination, governments do not borrow from the central bank in many advanced economies, such as the countries in the euro area.

Since 2010-11, the government in consultation with the Reserve Bank has been issuing cash management bills (CMBs) which are of the same genre as treasury bills, but have flexible features that make them amenable for meeting the government’s unanticipated but short-term cash flow mismatches. CMBs are a tool for not only bridging the government’s liquidity mismatch in a cost-effective manner but also a tool that is consistent with the monetary policy objective of the maintenance of a tight monetary policy stance for more effective monetary transmission. Starting from Scenario I, CMBs help neutralise the unanticipated increase in excess reserves brought about by the

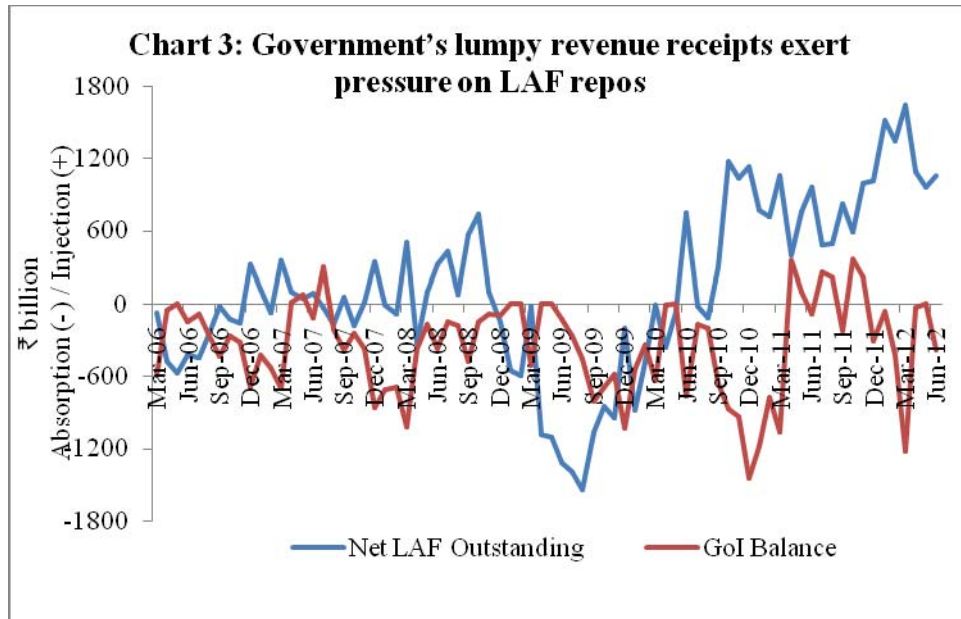
WMA so that reserve money reverts to the initial position depicted under the baseline scenario (Table 4).

Table 4: Issuances of CMBs drain excess reserves holdings of banks				
(₹ billion)				
	Liabilities		Assets	
	Currency	400	Government Securities	200
	Required reserves	100	Forex	300
	Excess Reserves	0	Loans to the Govt. (WMA)	0
	Total	500	Total	500

3. Government's bulky revenue receipts (quarterly tax receipts/one-off non-tax receipts) affect liquidity

Government cash flows largely follow a seasonal pattern. Typically, the government has negative net cash flows during the first quarter of a year; cash balances improve during the second quarter and remain positive during the third and fourth quarters.¹⁴ This unevenness in cash flows mainly reflects the back-loaded revenue receipts. The government receives quarterly direct tax receipts which are usually concentrated on the last payment date (*i.e.*, 15th of June/September/December/March); higher proportion of tax is payable during the second half. As a result, government cash balances spike up during these dates (Chart 3). During 2010-11, the government received one-off non-tax revenues from the telecom spectrum (Broadband Wireless Access/3G) auctions; the amount was significantly larger than that budgeted. The unanticipated liquidity drain from the banking system had to be offset by the provision of central bank liquidity.

¹⁴ The year 2011-12 was an exception with the government remaining mostly in WMA even during the third quarter and for the initial part of the fourth quarter, mainly reflecting the quality of fiscal marksmanship. On the other hand, a front-loaded borrowing programme for 2012-13, with 39 per cent of the net borrowing through dated securities for the year conducted in Q1, led to a positive balance in the first quarter of the year.



We start from the baseline scenario where liquidity in the banking system is in balance. An increase in government deposits with the Reserve Bank results in a withdrawal of liquidity from the banking system and creates a liquidity deficit situation. Banks bridge this liquidity deficit by recourse to funding under LAF repo of the same amount (Table 5). In this case, reserve money and money supply remain unchanged. This is so as the increase in the Reserve Bank's holding of government securities is offset by the increase in government's deposits. Hence, there is no change in the net Reserve Bank credit to the centre, which is a source of reserve money. Money supply too does not change as the funding under LAF results only in a change in ownership of government securities from commercial banks to the Reserve Bank so that the net bank credit to the government remains unchanged. If, however, central bank funding in the form of LAF was not available to offset the liquidity deficit caused by the increase in government balance, reserve money and money supply would have contracted as net Reserve Bank credit to the centre would have declined.

Table 5: An increase in government deposits increases demand for liquidity (₹ billion)				
Liabilities			Assets	
Currency	400		Government Securities <i>of which</i> LAF	250 50
Required reserves	100		Forex	300
Government Deposits	50			
Total	550		Total	550

While the above example deals with changes in government cash balances, it may be noted that the volatility in any of the autonomous components of liquidity similarly gets transmitted to LAF. Thus, LAF is akin to a ‘safety valve’ in offsetting the liquidity impact of the autonomous flows and operates as a first line of defence in maintaining orderly condition in the financial markets.

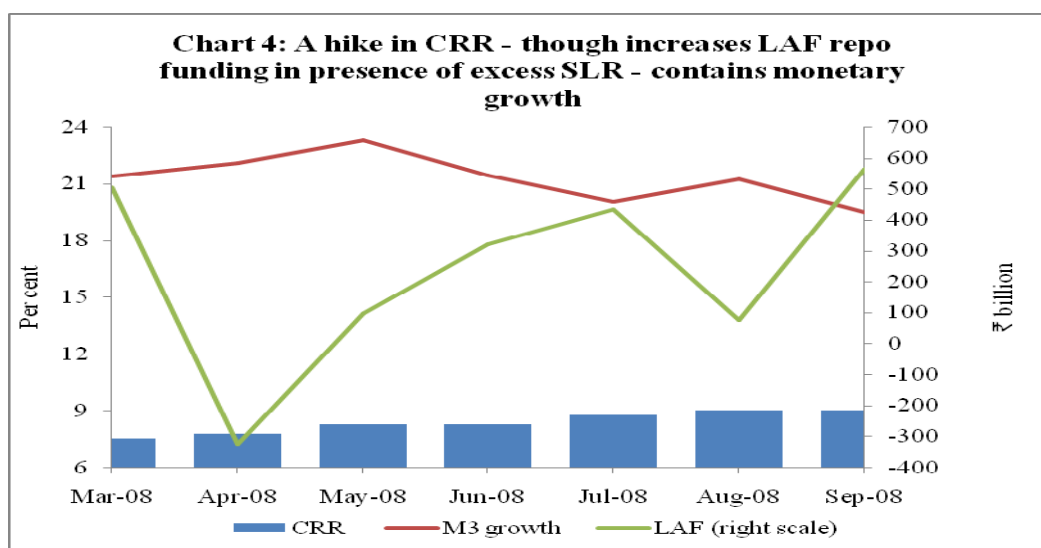
4. Impact of CRR hike in the presence of excess SLR with banks

Starting from the baseline scenario, suppose faced with large scale autonomous inflows, the central bank imposes CRR raising required reserves by ₹70 billion (Table 6).

Table 6: Imposition of CRR impounds liquidity and increases reserve money but not money supply (₹ billion)				
Liabilities			Assets	
Currency	400		Government Securities <i>of which</i> LAF	270 70
Reserves (=Required reserves)	170		Forex	300
Total	570		Total	570

Banks could fund this demand for reserves through availing liquidity under LAF. Since the entire increase in reserve money comprises reserves required for the maintenance of additional CRR, and therefore, there is no increase in excess reserves with banks, money supply remains unchanged at the first instance. Since banks access LAF to meet additional CRR commitment, the funding liquidity potential of the SLR securities used as collateral gets

impounded. In practice, all banks may not have the requisite excess SLR to access LAF. Further, while banks do not earn any return on CRR balance, banks obtain liquidity at a cost – equal to the LAF repo rate. Accordingly, over a period of time, it is expected that banks would unwind their asset position to substitute for additional CRR balances. This process of deleveraging can have its counterpart on the liabilities position of banks. As the balance sheet contracts, or the pace of expansion declines, imposition of CRR has a contractionary impact on money supply. For example, with a view to neutralising the liquidity impact of its forex market intervention when faced with large scale capital inflows, the Reserve Bank had raised CRR from 7.5 per cent in March 2008 to 9.0 per cent in August 2008 which had put a brake on the speed of money creation process during the immediate pre-crisis period (Chart 4).



5. Faced with large scale capital flows, the Reserve Bank intervenes in the forex market and subsequently, neutralises the monetary impact of the capital flows using liquidity management tools at its discretion

a) Capital inflows

Starting from the baseline scenario, a purchase of foreign currency assets of ₹50 billion results in excess reserves of ₹50 billion (Table 7a).

Table 7a: Capital inflows generate excess reserves			
(₹ billion)			
Liabilities		Assets	
Currency	400	Government Securities	200
Required Reserves	100	Forex	350
Excess Reserves	50		
Total	550	Total	550

Initially, we assume that banks park the surplus liquidity (excess reserves) under reverse repo with the Reserve Bank (Table 7b).

Table 7b: Excess reserves are invested in LAF reverse repo			
(₹ billion)			
Liabilities		Assets	
Currency	400	Government Securities	150
Required Reserves	100	Forex	350
Total	500	Total	500

A largely bank-based growing economy needs a steady increase in liquidity to finance economic activity. Capital inflows are one of the sources of liquidity. If, however, the surplus liquidity is perceived to be excessive and durable with potential inflationary consequences, the Reserve Bank can use various monetary policy instruments to drain it out. Accordingly, the Reserve Bank conducts OMO (outright sale) amounting to ₹10 billion and imposes CRR (₹30 billion) while the government issues MSS securities (₹15 billion). The following results (Table 7c).

Table 7c: OMO, MSS and CRR drain out excess liquidity and liquidity under LAF transits to a deficit mode			
(₹ billion)			
Liabilities		Assets	
Currency	400	Government Securities <i>of which, LAF</i>	195 5
Required Reserves	130	Forex	350
Government deposits under MSS	15		
Total	545	Total	545

The imposition of CRR transforms a portion of excess reserves to 'required reserves' which increase by ₹30 billion. OMO sales reduce the

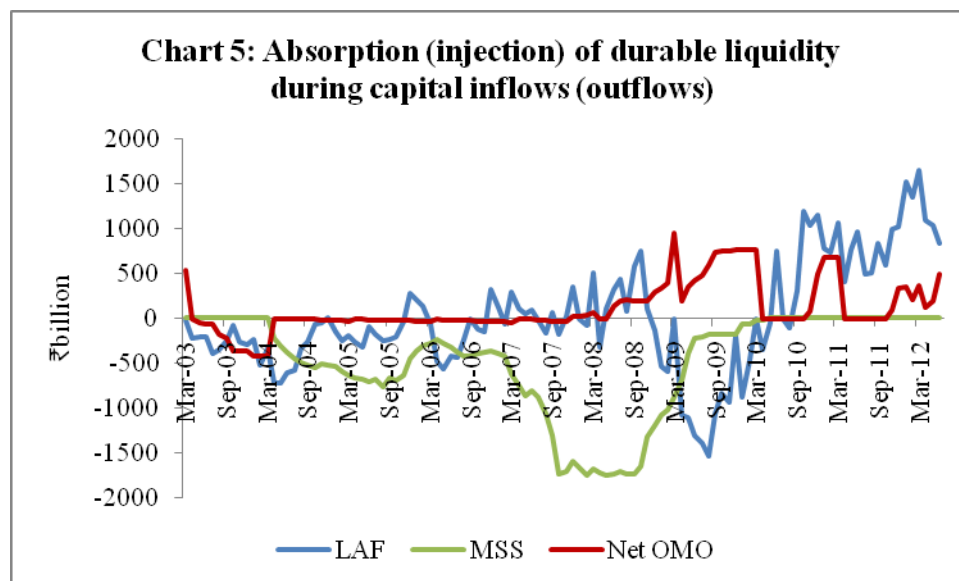
outstanding stock of government securities with the Reserve Bank by ₹10 billion (and correspondingly increase government securities with commercial banks by the same amount). Issuances under MSS increase the government security holding of commercial banks by ₹15 billion. The government parks the cash receipts under MSS with the Reserve Bank as government deposits (which cannot be used for any purpose other than redemption or buy-back of MSS securities by the government).¹⁵ As a result of OMO, CRR and MSS, the excess reserves of commercial banks turn into deficit of ₹5 billion, which is funded by borrowings under LAF. Hence, government security holdings for the commercial banks increase by ₹20 [*i.e.*, 10 (OMO) + 15 (MSS) – 5 (LAF)] billion while required reserves increase by ₹30 billion. The Reserve Bank's balance sheet size declines by ₹5 billion to ₹.545 billion. On the assets side, government securities decline by ₹5 billion [*i.e.*, (-) 10 (OMO) + 5 (LAF)].

Although a part of the securities (₹5 billion) purchased under OMO/MSS was transferred to the central bank under LAF repos to meet the demand for reserves, the remaining securities (₹20 billion) reflect potential funding liquidity with commercial banks for accessing LAF repos if and when need arises.

As an illustration, during 2002-03 to mid-2008-09, the Reserve Bank used OMO and MSS (along with CRR) actively to neutralise the monetary impact of the Reserve Bank's intervention in the forex market (Chart 5). This is borne out from the correlation coefficient of 0.64 between MSS/OMO and intervention in the foreign exchange market during the period. Liquidity absorption under MSS/OMO/CRR could only partly absorb excessive autonomous liquidity during 2002-03 to 2006-07 as LAF remained in surplus mode. Subsequently, notwithstanding large scale capital inflows, the Reserve Bank could steer systemic liquidity as measured by LAF balances to a deficit mode during a greater part of H2:2007-08 to H1:2008-09 by resorting to the discretionary

¹⁵ In the wake of the financial crisis induced capital outflows and with a view to meeting government's fiscal requirements, the revised MoU permitted the government to 'de-sequester' the MSS proceeds worth ₹450 billion during 2008-09 (₹120 billion) and 2009-10 (₹330 billion).

tools of liquidity management, thereby creating a conducive environment for a more effective transmission of monetary policy signals.



b) Capital Outflows

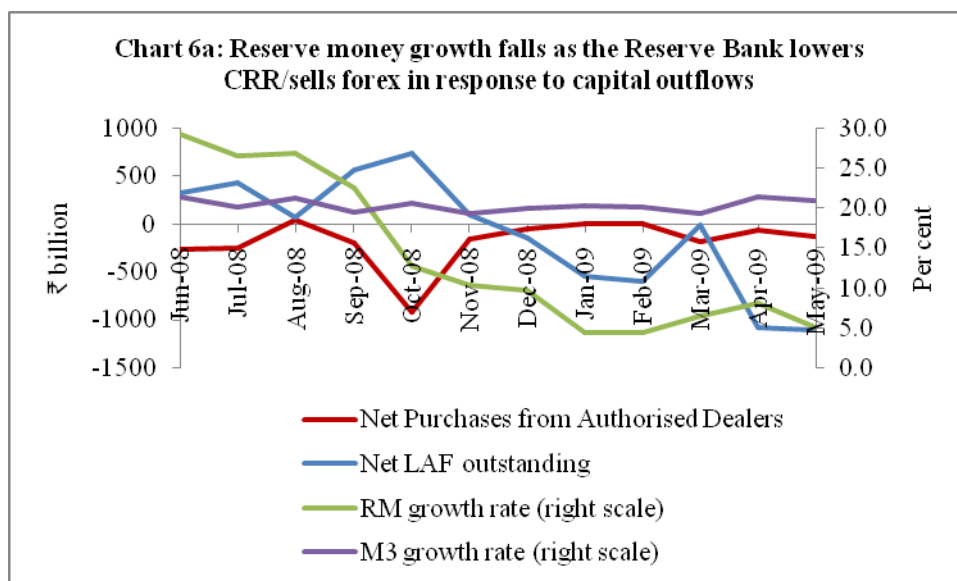
The implications of capital outflows on overall liquidity conditions are directionally opposite to those of capital inflows. Thus, in the presence of destabilising capital outflows, the intervention by the Reserve Bank in the forex market drains rupee liquidity and thereby creates tightness in domestic liquidity conditions. The Reserve Bank’s liquidity management operations, therefore, aim at injecting durable liquidity to offset capital outflows, in addition to the funding of the banks’ demand for reserves.

As an illustration, the onset of the global financial crisis was marked by large scale FII outflows reflecting a mix of margin calls in home countries, profit booking to offset losses elsewhere and flight to safety. The Reserve Bank sold foreign exchange to prevent excessive volatility in the forex market, which however, drained rupee liquidity, *i.e.*, reserves with commercial banks. The Reserve Bank responded with a number of measures which included cut in the CRR by 4 percentage points between September 2008 and January 2009, injecting ₹1.6 trillion of primary liquidity (*i.e.*, involving conversion of required reserves into excess reserves) into the system. Effective fiscal-monetary co-ordination was noted as the buyback of existing MSS securities

and OMO purchases were dovetailed with the market borrowing programme. Moreover, MSS balances amounting to ₹450 billion was de-sequestered by the government during 2008-09 and 2009-10. MSS and CRR balances thus operated as counter-cyclical ‘monetary stabilisation funds’ that were built up during phases of capital inflows and drawn down during phases of capital outflows. The total amount of primary rupee liquidity potentially made available to the financial system was over ₹5.6 trillion, *i.e.*, over 10 per cent of GDP.

Measures aimed at liquidity injection resulted in a compositional shift in the balance sheet of the Reserve Bank from net foreign assets (NFA) to net domestic assets (NDA). In addition, the Reserve Bank’s balance sheet contracted – with reduction in CRR and MSS balances on the liabilities side and in NFA on the assets side. As non-food credit demand decelerated sharply from 26.4 per cent in mid-September 2008 to 10.3 per cent in October 2009 amidst an uncertain global environment, banks parked their excess reserves in LAF reverse repo which also reduced the Reserve Bank’s balance sheet size. Reserve money registered minimal expansion during 2008-09.

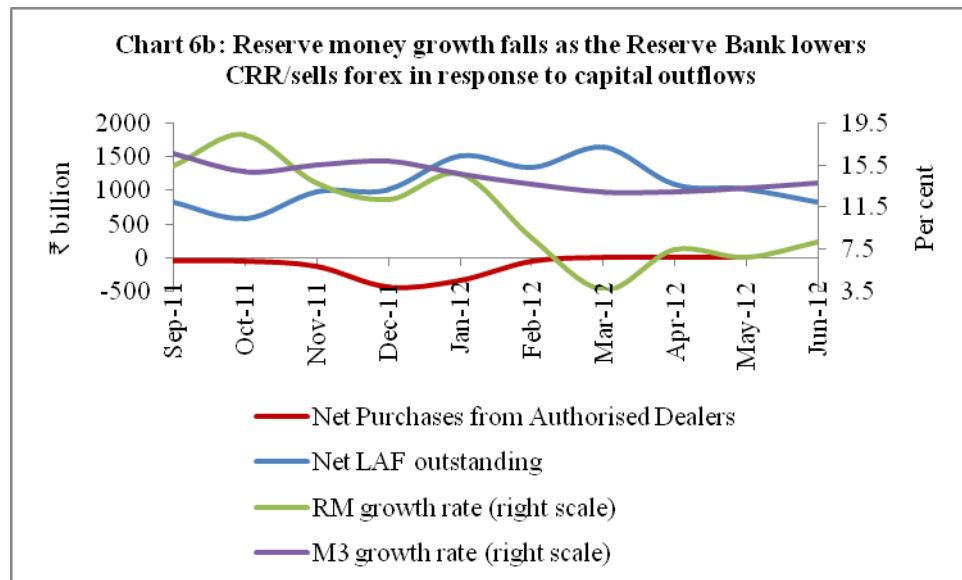
While a sharp rise in CRR operating from the supply side succeeded in tempering monetary growth pre-crisis (Section III.5a), the counter-cyclical reduction in CRR could not stimulate monetary growth during the crisis period, reflecting tepid demand conditions (Chart 6a). This example illustrates the limitations of monetary policy during the cyclical phases of deceleration in economic activity.



Note: CRR was reduced by 4 percentage points between October 2008 and January 2009. The estimated first round impact of the change in CRR (in four steps) was release of ₹.1.6 trillion.

Another episode of capital outflows began in September 2011. After the earlier episode, capital flows had ceased to be an important driver of liquidity during 2009-10 to H1:2011-12 as net capital inflows were in line with the country's absorptive capacity. Accordingly, the Reserve Bank rarely intervened in the forex market during this period. Since September 2011, however, the exchange rate movements became excessively volatile. The resumption of the intervention by the Reserve Bank in the forex market to contain the volatility led to the tightness in liquidity. In order to offset the drain in rupee liquidity as also to meet the demand for reserves, the Reserve Bank initiated liquidity management measures which included 125 bps CRR cut in two phases during January and March 2012 and large scale OMO purchases. Liquidity deficit, however, continued to remain excessive till April 2012 reflecting, *inter alia*, the sharp build-up in government cash balances towards the end of Q4: 2011-12. Money supply decelerated during H2:2011-12 partly reflecting tight liquidity conditions and partly, deceleration in economic activity (Chart 6b). In the more recent period, however, the secondary impact of the durable primary liquidity creation during H2:2011-12 (CRR cuts and OMO) and Q1:2012-13 (OMO) appear to be easing liquidity towards the comfort zone. In addition,

aided by the easing of monetary policy stance in the Annual Policy Statement of 2012-13, monetary aggregates seem to be gradually reversing the downward trajectory during Q1:2012-13.

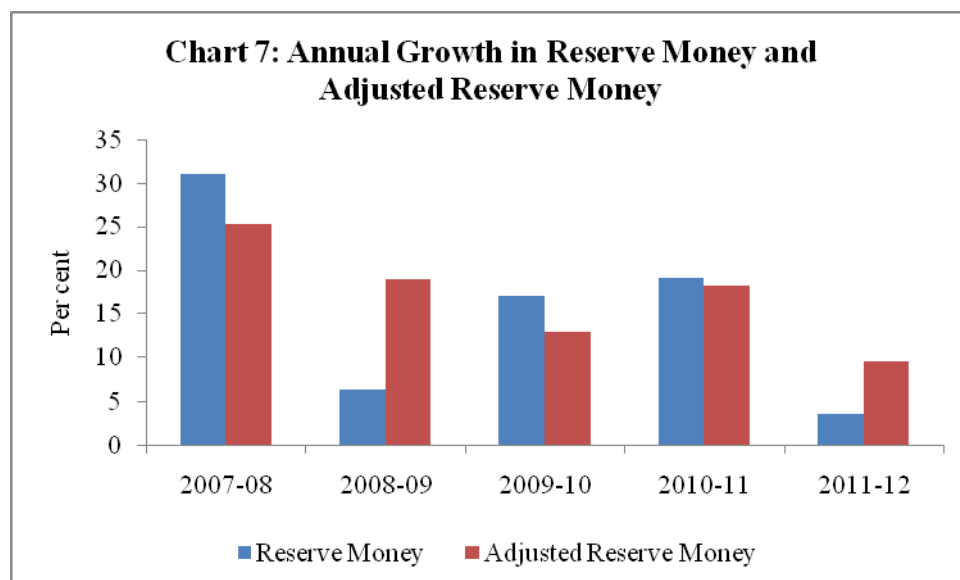


6. Difference between Reserve Money and Adjusted Reserve Money

In Section III.5b, we saw that a cut in CRR leads to a reduction in the deposits that banks need to maintain with the Reserve Bank. In other words, there is a reduction in the demand for reserves. Reserve money, therefore, declines following a CRR cut. The size of the central bank balance sheet shrinks. In contrast, liquidity injection by way of OMO purchases leads to an increase in the size of the central bank balance sheet. Depending on the instrument chosen – CRR cut or OMO purchase – the impact on reserve money and the size of the central bank balance sheet is different. This difference arises because in case of CRR, the demand for (required) reserves declines whereas in case of OMO, the supply of reserves increases. In both cases, banks have higher deposits with the central bank than they need – called excess reserves -, which they can draw down to fund economic activity through credit expansion.

In this connection, it would be useful here to draw a distinction between reserve money and adjusted reserve money (*i.e.*, reserve money adjusted for

change in CRR). While a change in banks' deposits (*i.e.*, the sum of required reserves and excess reserves) with the Reserve Bank determines the size of reserve money, it is, however, the change in excess reserves alone that contributes to the expansion of commercial bank balance sheet and thus money supply. Thus, when CRR is reduced, there is a reduction in the impounded/required reserves which reflects easing of liquidity conditions as required reserves at the first instance become excess reserves which forms the basis for credit creation process. As the required reserves – now transformed into excess reserves – get used up in the credit creation process (or are utilised by banks to repay borrowings under LAF), growth in money supply increases through the (higher) multiplier effect of primary liquidity creation.¹⁶ Thus, when we deal with adjusted reserves, we recognise the availability of excess reserves with banks that can fund credit growth. The growth in reserve money - adjusted for the policy-induced cut in CRR - would be higher than reserve money growth. Thus, while reserve money recorded a low order of growth on account of CRR cuts in 2008-09, the adjusted reserve money growth during the year was high at nearly 19 per cent¹⁷ (Chart 7).



¹⁶ The expansion of money supply, however, presumes the existence of demand for credit which, in fact, had fallen sharply in the immediate aftermath of the crisis period. Thus, a reduction in CRR is not a sufficient condition for generating demand for credit and causing monetary expansion.

¹⁷ Similarly, growth in adjusted reserve money in 2011-12 was 2.6 times higher than the growth in reserve money.

7. Liquidity, Money Multiplier, Velocity and Money

In a monetary framework, the three factors that are related to nominal income are reserve money, money multiplier and the velocity of circulation of money. First, the link from reserve money to money supply is through the money multiplier. Second, the link from money supply to nominal income is through the velocity of circulation of money.

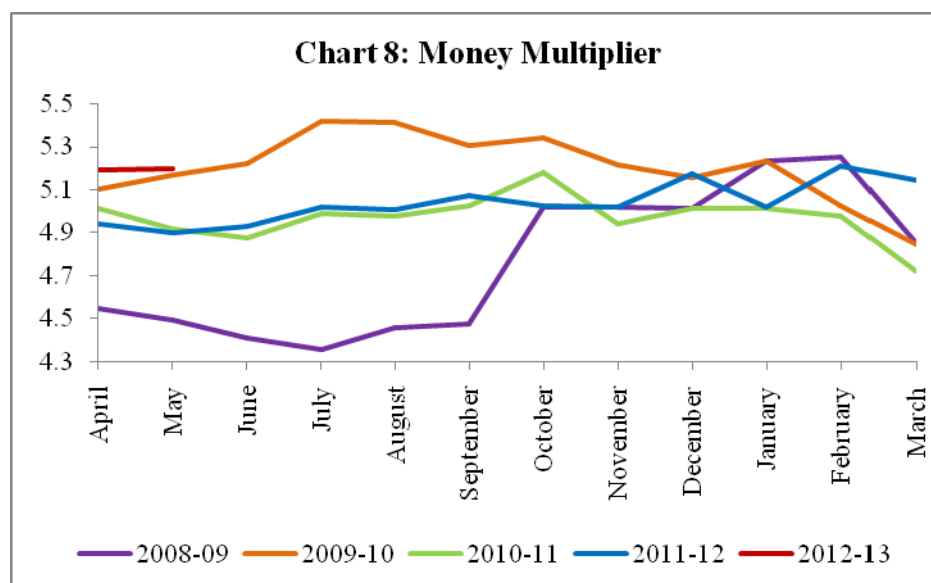
An increase in liquidity injected by the central bank does not necessarily lead to an increase in money supply. The factor linking the additional reserves to additional money supply is the money multiplier. The value of the money multiplier depends on two behavioural variables: the currency-deposit ratio and the reserves-deposit ratio. While currency demand depends on the behaviour of the public, the demand for reserves mainly depends on the central bank prescribed CRR and the balances necessary to meet settlement obligations. When reserves are held exclusively to meet the central bank prescribed CRR and the balances necessary to meet settlement obligations, the demand for reserves could be extremely inelastic with respect to the repo rate (which is the price of reserves). Banks try to minimise their holdings of excess reserves as these balances with the Reserve Bank do not earn any interest

If, however, banks borrow reserves under LAF repo to fund credit requirements, the demand for reserves could be more interest elastic: *i.e.*, rise (fall) as the repo rate falls (rises). The use of borrowed reserves to fund credit growth leads to an increase in the money supply through the multiplier process.

During the global economic crisis of 2007-09, liquidity injected into the banking system in the US by way of large scale OMO purchases found its way back into the Fed balance sheet in the form of holdings of excess reserves, indicating interest inelasticity. Reflecting the excess supply of reserves, the money multiplier fell. Thus, the M_1 multiplier fell from 1.59 in August 2008 to 0.74 in June 2011 (but had increased marginally to 0.86 by May 2012, possibly reflecting some improvement in the macroeconomic environment). While QE1 led to an increase in money supply growth in the immediate post-Lehman

period reflecting the heightened demand for holding liquid assets, the demand for money soon decelerated sharply as economic activity failed to revive.¹⁸ It can be inferred that for the multiplier process to work, there must be first, a demand for credit from the banks' customers and secondly, banks must be able to ascertain their credit worthiness. These conditions do not appear to have been met during the crisis.

In contrast to the experience in the US, there was an increase in the money multiplier in India during the crisis period (from 4.46 in August 2008 to 5.41 in August 2009) with the monetary stimulus largely emanating from the CRR cut (Chart 8). The consequent reduction in the required reserves drove down the growth in reserve money. Faced with slack credit demand, banks, however, parked the excess reserves under LAF reverse repos, neutralising the impact of the CRR cut. Consequently, M₃ decelerated from 21.2 per cent in August 2008 to 17.0 per cent in February 2010.



The change in the money multiplier need not necessarily be policy induced. It can also reflect an endogenous change in the behaviour of the holders of the components of broad money. For example, in H1:2011-12, the

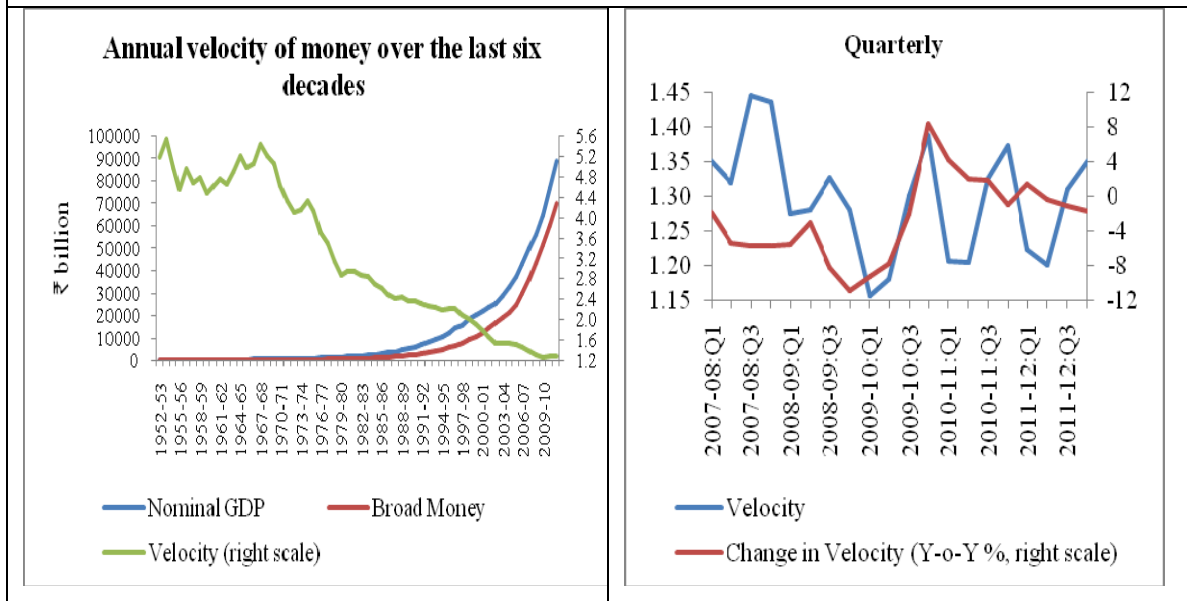
¹⁸ In the US, M₂ growth accelerated from 5.4 per cent in August 2008 to 10.3 per cent in January 2009 before decelerating sharply to 1.7 per cent in March 2010.

rise in the money multiplier reflected a switch from currency to time deposits, as banks faced with tight liquidity conditions, offered high rates of interest on their time deposits to meet demand for domestic credit from the corporates and the government. As a result, monetary growth remained higher than that during a year ago notwithstanding the maintenance of a tight liquidity stance.

During H2:2011-12, however, the increase in the money multiplier was policy induced brought about by 125 bps reduction in the CRR. As we saw in the previous Section, the growth in M_3 decelerated contemporaneous to the CRR cut but improved subsequently reflecting, *inter alia*, the lagged effects of CRR cuts.

Even though we assume that the income velocity of money – the number of times a given stock of money changes hands to finance transactions of final goods and services – is stable in the short run, the recent financial crisis showed that the velocity could be time variant even in the short run. In the US, for example, there was a veritable “velocity crowding out of quantitative easing” during the crisis as economic activity decelerated more sharply than monetary expansion. In the US, therefore, the monetary stimulus provided by an expansion in reserve money was neutralised by a decline in both the velocity and the money multiplier as economic activity decelerated. In India, there has been a secular decline in the velocity in the post-independence era reflecting monetisation and commercialisation of the economy. The decline in velocity accelerated in the aftermath of the global economic crisis reflecting the weakness in credit demand and preference for liquidity (Pattanaik and Subhadhra, 2011) (Chart 9). The decline in the velocity could also reflect the monetisation effects of redistributive social schemes such as NREGA.

Chart 9: Velocity of Circulation of Money

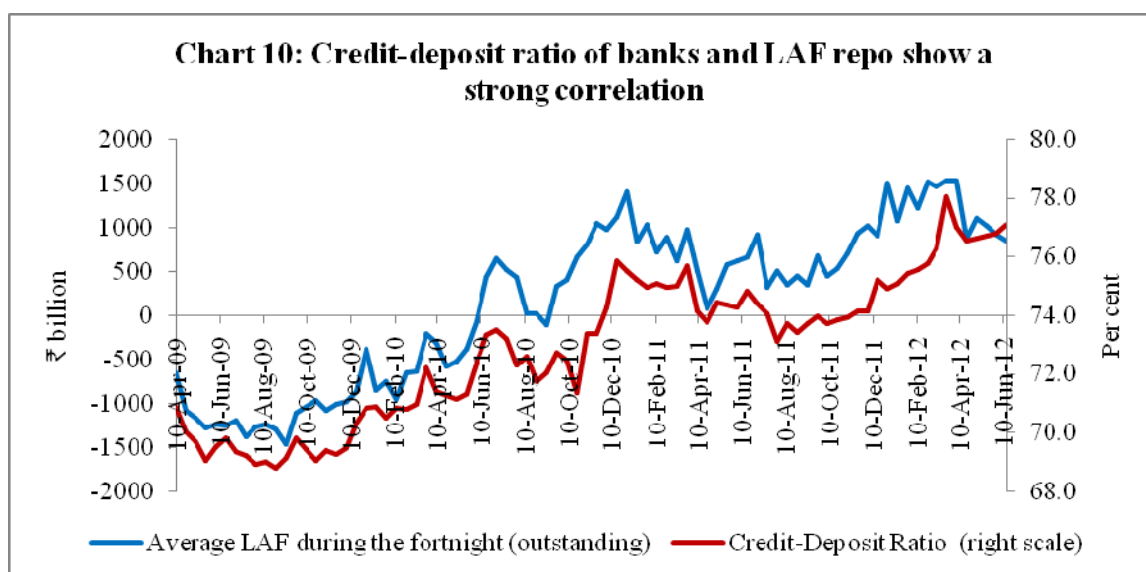


As economic growth gained traction in 2010-11 and the liquidity transited to a deficit mode, the velocity of circulation of money increased which partly neutralised the expected outcome of the maintenance of a tight monetary policy stance. In the past, liquidity used to remain largely in surplus mode (except for H2:2007-08 and H1:2008-09) and it is for the first time that liquidity deficit has persisted for 24 months. It is not implausible that the persistent liquidity deficit condition can induce a directional change in the velocity as an offset to the deceleration in monetary growth. From the available data, however, it cannot be concluded that velocity has reversed its trend decline.

8. Commercial banks meet credit demand by borrowings under LAF and in the process create central bank and commercial bank money

Banks extend lines of credit to their customers, which may not always be backed by their deposit base or excess reserves holdings with the central bank. If the customers demand credit at a time when banks do not have excess reserves, banks can dip into their required reserves balances to meet the

demand.¹⁹ Banks can thereafter resort to borrowings under LAF to bridge the gap in the fortnightly reserve requirements. That banks resorted to this option seems to be borne from the high correlation between the borrowings under the LAF and the credit-deposit (C-D) ratio during April 2009 to June 2012 with the correlation coefficient between the fortnightly average volume of daily net LAF repos and the fortnightly C-D ratio of banks being 0.94 (Chart 10). As long as banks have excess SLR securities, they can fund their credit growth by accessing LAF (Table 8a). Thus the LAF window appears to be a source of funds for on-lending. The correlation between average LAF volumes and the gap between rates of growth of credit and deposit was also high at 0.77 for the aforesaid period implying that LAF can substitute for deposits as a source of funding. The correlation worked out to be even stronger at 0.91 for the period up to October 2011 (Chart 11).



¹⁹ In India, this is possible as banks are required to maintain on any day during the reporting fortnight a minimum 70 per cent of CRR (as long as on an average, they maintain 100 per cent of their required reserves over the fortnight.)

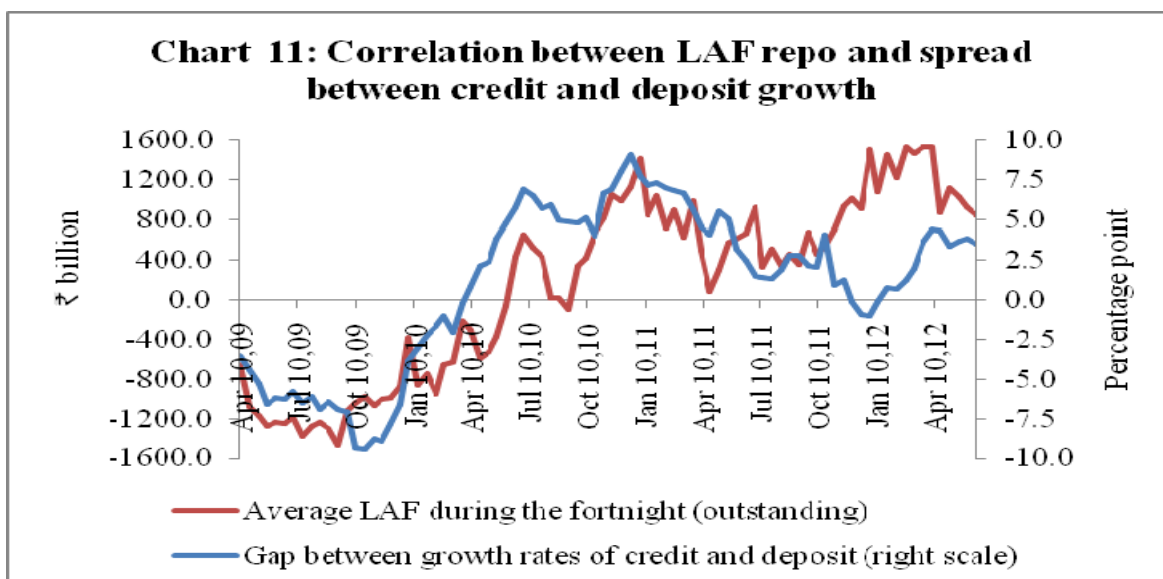


Table 8a: Borrowings under LAF generate excess reserves
(₹ billion)

	Liabilities		Assets	
Currency		400	Government Securities <i>of which</i> LAF repo	210 10
Required Reserves		100	Forex	300
Excess reserves		10		
Total		510	Total	510

We assume under the baseline scenario, that statutory CRR is 0.1. Hence, the required reserves at ₹100 billion imply a deposit base of ₹1,000 billion. Since currency is ₹400 billion, currency-deposit ratio is 0.4. Hence, money supply (= currency + deposits) would be ₹1,400 billion. The money multiplier is, therefore, 2.8²⁰. Banks' borrowings amounting to ₹10 billion under LAF generate equivalent excess reserves of the same amount that banks can lend in the first round of credit creation process. Following infinite rounds of credit creation, the excess reserves of ₹10 billion would lead to an increase in money supply by ₹28 billion with currency and deposits increasing by ₹8 billion and ₹20 billion, respectively.²¹ Since CRR is 0.1, required reserves will increase by ₹2 billion.

²⁰ Money multiplier = $(1+c)/(c+r) = (1+0.4) / (0.4+0.1) = 1.4/0.5 = 2.8$, where 'c' is the currency-deposit ratio and 'r' is the reserves-deposit ratio.

²¹ This is obtained by solving two equations: (i) money = currency + deposits; and (ii) currency-deposit ratio = 0.4.

In this example, while money supply increases by ₹28 billion, central bank money increases by ₹10 billion (*i.e.*, currency by ₹8 billion and required reserves by ₹2 billion) and commercial bank money (*i.e.*, deposits) increases by ₹20 billion. The multiplier process operates as long as banks have excess reserves. In this example, excess reserves were ₹10 billion and required reserves were ₹100 billion. The process ends with required reserves being ₹102 billion (Table 8b).

Table 8b: Credit creation process generates central bank money (₹ billion)			
Liabilities		Assets	
Currency	408	Government Securities	210
Required Reserves	102	Forex	300
Total	510	Total	510

It is also seen in the above example that the credit creation process itself generates the deposits that fund the credit demand. Up to 90 per cent of the deposits (*i.e.*, ₹18 billion) can be deployed to fund the credit demand for the commercial sector. Banks can alternately decide to invest in SLR-eligible securities. If such investment amounts to ₹6 billion, credit would expand by ₹12 billion. In this example, the incremental credit deposit ratio is 0.67. It may be noted that the SLR securities (over and above the statutory prescription) imply embedded ('balance sheet' and 'funding') liquidity in that these securities can be deployed as collateral for availing central bank reserves in the event of fresh credit demand.

It may be further noted that in times of financial duress, required reserves can become a source of liquidity generation. A reduction in the central bank prescribed CRR immediately converts required reserves into excess reserves which can be deployed to meet credit requirements.

9. Does the money multiplier process operate in the absence of excess reserves?

In textbook economics, the operation of the money multiplier presumes the availability of excess reserves. What if the LAF is in repo mode and even injection of large scale durable liquidity does not generate excess reserves? For example, if liquidity deficit under LAF is excessive, it is possible that a reduction in CRR /OMO purchases may only ease the extent of liquidity deficit without eliminating it / shifting LAF into a surplus (reverse repo) mode²². When the LAF is in repo mode, the opportunity cost of holding excess reserves that earn no return is the interest rate on LAF borrowings, *i.e.* the LAF repo rate. Under such circumstances, banks would expectedly try to improve their treasury management practices and attempt to keep excess reserves to the minimum, *viz.*, only the amount required for meeting the settlement requirements.

In the absence of lendable excess reserves, does it imply that the multiplier process does not operate any longer? As seen in Section III.7, the money multiplier process continues to operate when banks re-deploy the government securities earlier freed from LAF to access fresh funding from LAF, the extent of which would depend on the incremental demand for credit. The cost of borrowed reserves, *i.e.*, the interest rate on LAF, becomes an important determinant of the value of the money multiplier. This is important for the monetary authority as it can modulate the repo rate to influence liquidity conditions keeping in view the growth-inflation dynamics.

10. OMO vs. CRR – are these complementary or substitute instruments of liquidity management?

While the impact of OMO purchases and CRR cuts on demand for liquidity under LAF repos are directionally similar, their respective impact on the balance sheets differs. OMO substitutes for LAF leaving both central and

²² As was the case during the fourth quarter of 2011-12.

commercial bank balance sheet size unchanged initially. On the other hand, the CRR cut reduces the central bank's balance sheet size but does not alter commercial banks' balance sheet size in the first round.

CRR is a tax on the banking system. While CRR balances do not yield any return, the opportunity cost of holding CRR balances is the LAF repo rate in a deficit liquidity mode as banks fund the demand for statutory reserves by borrowings from the LAF window. A CRR cut, therefore, instantaneously improves bank profitability/cost of funding. Banks can pass on the lower cost on their liabilities to their customers by lowering their lending rates (base rate or spread over base rate or both). The higher the prevailing LAF repo rate, higher is the beneficial effect of a CRR cut on bank balance sheets and thus, their ability to reduce lending rates and stimulate credit demand. Even if the LAF continues to remain in a deficit mode following the CRR cut, the government securities freed from LAF can be re-used for accessing liquidity under LAF giving a kick-start to the credit creation process. CRR may also be the preferred instrument when a sizeable amount of liquidity needs to be injected at one go.

Being a blunt instrument, however, the CRR cut equally applies to all banks – depending on their NDTL size – and is independent of the demand for credit. CRR is, therefore, a passive tool and a reduction in CRR while creating the enabling environment for an increase in credit is not a sufficient condition. The success of CRR cut, therefore, depends on the existence of a pent-up demand for credit. If liquidity is already in a surplus mode in the absence of credit demand as was witnessed during the immediate post-crisis period, a cut in CRR would merely cause the freed reserves to be invested in the LAF reverse repo with the Reserve Bank and would not push into motion the money multiplier process.

The participation in OMO by banks usually implies a revealed preference for liquidity to lend and generate a higher risk-adjusted rate of return *vis-a-vis* the yield-to-maturity on securities sold to the Reserve Bank under OMO. OMO is, therefore, a more efficient tool of liquidity injection. The extant accounting

principles for classification of investment portfolio of banks, and the availability of excess SLR with individual banks can, however, constrain OMO participation of some banks. From the banks' perspective, the difference between availing liquidity through OMO and LAF is mainly in terms of the duration of liquidity that becomes available; thus, OMO frees the banks from refinancing risks in a rising interest rate environment. OMO also enables banks to improve the liquidity of their bond portfolio as they can substitute illiquid off-the-run securities in OMO with liquid on-the-run securities in primary market issuances by the government. In a falling interest rate environment, however, the incentive of banks for OMO may be somewhat less as banks may miss out on future capital gains; banks can also fund credit by accessing LAF repo at an increasingly lower rate. In the presence of an uncertain interest rate cycle, however, accessing funds through LAF can have financial stability implications.

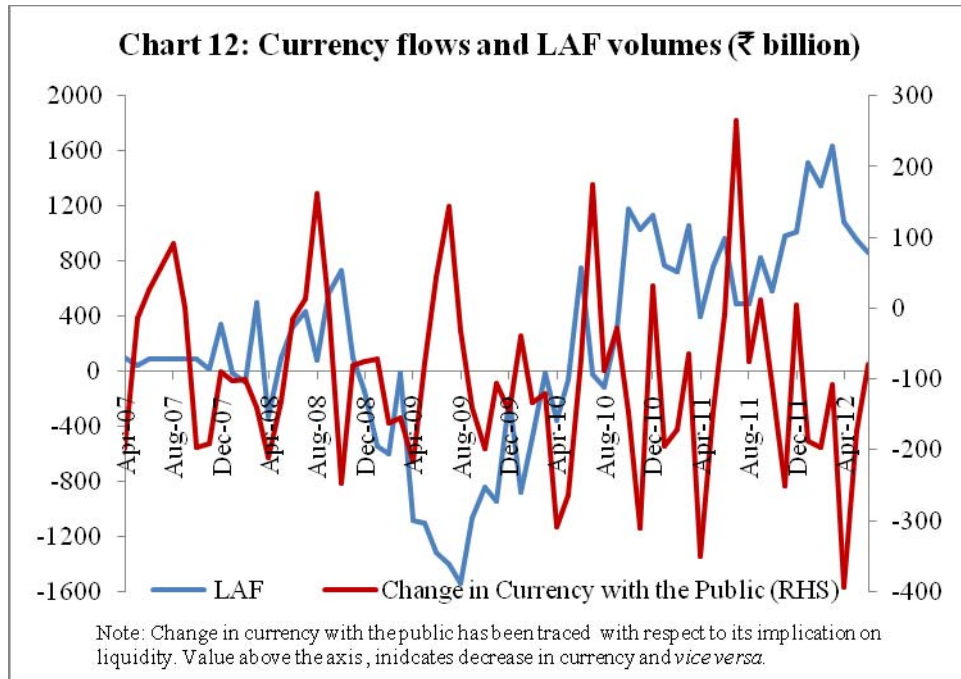
Hence, keeping in view the state of the economy, the market micro-structure and the regulatory environment, both CRR and OMO are complementary tools of durable primary liquidity injection.

11. An increase in currency demand drains liquidity

An increase in demand for currency with the public, other things remaining unchanged, results in an increase in the demand for reserves by banks. Banks may draw down their excess reserves holdings, if any, with the central bank. The drawdown of excess reserves reduces the credit creating potential of the banks. Thus, an increase in demand for currency leads to deceleration in growth of money supply due to a fall in the money multiplier.

In India, the Reserve Bank accommodates commercial banks in meeting the public demand for currency by provision of liquidity under the LAF. In the Reserve Bank's balance sheet, the increase in currency on the liabilities side is offset by an increase in government securities on the asset side (through repo operations) (Chart 12). The correlation between currency demand and LAF

repo is, however, numerically not very strong (0.16) between April 2007 and June 2012, as currency is only one among a number of factors weighing on liquidity. While the increase in currency demand increases reserve money, the fall in the money multiplier has a dampening impact on money supply.



An exceptional and a rather hypothetical case arises, if banks do not have excess reserves to begin with and at the same time are constrained from either availing refinance from the central bank or accessing the LAF window. When there is a sudden increase in the demand for currency and banks find it costly to liquidate the assets instantaneously to meet that demand, banks could be compelled to draw down their statutory reserves for CRR maintenance even at the cost of payment of penal interest on the shortfall in CRR. However, to avoid penal action for an extended period of time, banks would need to offload their assets which would cause deposits to decline – the process would go on till such time that the lower amount of deposits attracts lower CRR and the shortfall in reserve maintenance gets eliminated. Thus, the increase in demand for currency reduces money supply due to a dip in the multiplier as we saw in the earlier example. Unlike in the earlier example, however, there would be no

change in reserve money as the rise in currency is exactly offset by the fall in reserves.

12. Transfer of surplus and impact on reserve money and broad money

The Reserve Bank's surplus (profits) is accounted for under the head "other liabilities" of the balance sheet. After June 30 of every year (*i.e.*, the end of the financial year of the Reserve Bank), a part of "other liabilities" is earmarked separately as "Reserve Bank's profit". Till the approval by the Central Board in the second week of August each year and subsequent actual transfer to the government, the profit figures remain a part of "other liabilities".

When the profits are transferred to the government in August, the "other liabilities" decline and correspondingly government's deposits with the Reserve Bank increase. There is no instantaneous change in reserve money as the entire adjustment takes place in the non-monetary liabilities. Subsequently, as the government begins to draw down its deposits with the Reserve Bank, the funds flow to the banking system and the banks' cash balances with the Reserve Bank increase. Thus, reserve money increases (Table 9).

Table 9: Surplus Transfer by the Reserve Bank to the Government		
Year	Amount in ₹ billion	Surplus as per cent of Reserve Money during the week of transfer
2008-09	250.0	2.7
2009-10	187.6	1.6
2010-11	150.1	1.1

IV. Abandonment of monetary targeting notwithstanding, money supply serves as an information variable

Economists and practitioners of monetary policy have yet to come to a firm conclusion about exogenous or endogenous money supply. Some believe that with central banks setting overnight policy rates and targeting overnight

money market rates, “Money – both narrow and broad – is largely endogenous” (Tucker, 2004).²³ Woodford (2008) observed that “Nowadays monetary aggregates play little role in monetary policy deliberations at most central banks.”

In the Indian context, Section III.7 provided an example of endogenous money supply where credit precedes deposits mobilised by commercial banks as banks meet their liquidity requirements from LAF. A second example of endogeneity in money supply is the episode of sharp deceleration in credit demand during the global financial crisis pulling down the growth of monetary aggregates, despite the liquidity augmenting monetary policy measures, including *inter alia*, a reduction in the CRR (Chart 7a). This was reflected in the fall in velocity and in the money multiplier, which almost negated the primary liquidity creation. The excess reserves surged as reflected in LAF reverse repos although the reverse repo rates were reduced to an all-time low of 3.25 per cent. A third example of endogeneity of money is the substitution between monetary assets (*i.e.*, from currency to deposits or *vice versa*) that can bring about a change in the money multiplier and thus in money supply (refer to III.6 above).

In sharp contrast, the proponents of the exogenous supply of money theory – the monetarists – argue in favour of causality running in the reverse direction, *i.e.*, from Δ reserves - Δ deposits - Δ credit, where Δ denotes change.

²⁴ In this literature, given the stability of the demand function for money, the central bank projects a desirable rate of growth of money demand consistent with the desirable rate of growth of real GDP and the level of inflation. As money supply is exogenous and the money multiplier is stable, the central bank controls the growth of monetary aggregate(s) to equate the desirable demand

²³ In literature, the endogeneity of money is defined as money supply being determined by the behavior of commercial banks and public. Banks create money in response to the demand for credit from the public, which, in turn, is affected by the macroeconomic conditions.

²⁴ Thus, if the targeted rates of growth of real GDP and inflation are, say, 9 per cent and 5 per cent, respectively and the income and inflation elasticities of money demand are 1.2 and 1 respectively, assuming a stable demand for money yields demand for money at $9 \times 1.2 + 5 = 15.8$ per cent. If money multiplier is stable and is at 5, central bank money (currency + reserves) should increase by 3.16 per cent.

for money by setting a reserves target. If the current level of reserves is less than that desired, the creation of excess reserves by the central bank (say, through open market purchase or a reduction in CRR) sets into motion a process of credit creation operating through the money multiplier.

The monetarists had their heydays during the mid-1970s to mid-1990s. Influenced by the monetarist arguments, many countries had resorted to intermediate monetary targeting with reserves as an operating target during that period. But within a decade or thereabout, central banks abandoned monetary targeting. The abandonment of monetary targeting in many countries, including India, was not related to the exogeneity or otherwise of money supply. For example, since the Reserve Bank used to practise monetary targeting ‘with a feedback’ (where the primary causality operated from money to income while the secondary causality ran from income to money), it was evident that money supply was not perceived to be completely exogenous.

Countries that had practised monetary targeting soon discovered that strict monetary targeting could increase volatility in money market rates and had to depart from strict monetary targeting. Thus, Germany reconciled the imperative of smoothening of temporary fluctuations in short-term interest rates with the control of monetary aggregates over somewhat longer horizons during the 1990s (Borio, 1997). Similarly, when using non-borrowed reserves as an operational target of monetary policy in the US (1979-82), the Fed could not control the stock of money as it would have led to a “*Much larger short-run fluctuations in the federal funds rate*” (Poole, 2000). Second, in many countries, financial innovations in the form of alternative non-money substitutes, such as the money market mutual funds in the US caused instability in the demand for money function and rendered monetary targeting hazardous. Third, the money supply function became unstable as financial intermediaries attempted to overcome reserve restrictions and shifted to non-reservable assets. In Switzerland, this behaviour of financial intermediaries resulted in an unintended tightening stance during the 1990s (Borio, 1997). Fourth, the definition and the measurement of money posed problems in some countries

(Poole, 2000 and Yueh-Yun C. O'Brien, 2002). Fifth, in some emerging market economies, the abandonment of monetary targeting primarily reflected the inability to neutralise the impact of autonomous liquidity flows. In India, for example, large scale capital flows and monetisation of the government's fiscal deficit were responsible for the deviation of the monetary aggregates from the announced target (Mohanty and Mitra, 1999). The impact of such autonomous flows could only be partially offset by the policy variables – OMO, CRR, SLR, etc., – during the monetary targeting era (1985-98). It was felt that *“In such a milieu, it needs to be pondered whether monetary targeting approach could ensure internal and external stability when the avowed objective of policy is to move away from a classical reserve money based monetary policy operating procedure by de-emphasising reserve requirements as active instruments of policy”*.

In the context of the U.S., Poole (2000), however, believes that *“The Fed can control money growth with acceptable accuracy over horizons that matter”* and that *“FOMC ignores money growth at its peril”*. Bank of Canada, which is an inflation targeting central bank, accords importance to money supply (Longworth, 2007): *“In normal times, central bankers tend to place more emphasis on interest rates than on monetary and credit measures. Nevertheless, the growth rates of monetary and credit aggregates do appear to have some explanatory power regarding the future evolution of spending and inflation, and are thus useful additional indicators of liquidity.”*

Goodhart (2007) questioned the practice of ignoring the developments in the monetary aggregates in the conduct of monetary policy. Citing McCallum (2001), Goodhart noted that in models without money that are used for monetary policy analysis, where expectations play a leading role, the models are of limited usefulness during turbulent periods of deflationary pressures as interest rates reach zero and expectations become unanchored and subject to potentially rapid and sharp revision. Goodhart argues that under these circumstances, *“Monetary aggregates may well be a better guide to the effects of monetary policy on the economy than either nominal, or an estimate of real,*

interest rates.” Thus, whether the zero real interest rate policy in many advanced economies rekindles the animal instincts of investors or whether the uncertain macroeconomic environment remains overbearing can, perhaps, be better gauged from the study of interrelationship among the various quantity aggregates – excess reserves, reserve money and money supply – as also the trajectory of the behavioural variables, *i.e.*, money multiplier and money velocity.

Since money is predominantly in the form of deposits with commercial banks, money supply may become subject to shocks, reflecting commercial bank behaviour that can vary over time, cyclically and more permanently, depending on the capital base, risk appetite, *etc.* For example, in times of financial crises, banks may be unwilling to lend to the small and medium scale industries who may become credit constrained facing a higher risk premia on their borrowings. The rising interest rates on bank credit to the commercial sector reflecting higher risk premia can co-exist with the lowering of policy rates by the central bank. The lower credit demand can lead to a sharp deceleration in monetary growth at a time when the central bank pursues an easy monetary policy. In the presence of credit constraints, income constraints, risks and uncertainties when interest rates need not be market clearing and monetary transmission does not work efficiently, monetary aggregates provide significant information about the state of the macroeconomic activity. Even under normal circumstances, as noted by Longworth (2007), monetary and credit aggregates reflect the future evolution of spending and inflation, and are thus useful additional indicators of liquidity.

Thus, above, we saw strong theoretical arguments and counter-arguments on the subject of exogeneity or endogeneity of money supply. Money matters for those who believe money to be exogenous. Those who believe in endogenous money supply are also those who do not accord importance to monetary aggregates for their information content. Operationally, we saw that the interest rate targeting operating framework under LAF tends to make money supply demand-determined. On the other hand, monetary instruments

such as changes in CRR are operationalised on the presumption of exogenous money supply. In that sense, our interest targeting operational framework appears to be eclectic just as was the earlier intermediate monetary targeting framework with a feedback.

In the remainder of this Section, we study empirically using Granger causality whether money supply can be viewed to be exogenous or endogenous during the post-monetary targeting period in India. The first set of tests is done to ascertain whether changes in money supply have an influence on bank credit to commercial sector. The test is done based on monthly data for the period April 2000 to June 2012. The SIC criterion suggested a lag length of 2. The causality test shows that changes in bank credit to the commercial sector do not Granger cause changes in money supply (Table 10)

Table 10: Causal Relationship between Bank Credit to Commercial Sector and M_3		
Null Hypothesis	F-Statistic	Prob.
Δ Bank Credit does not Granger Cause Δ Money Supply	0.6034	0.5484
Δ Money Supply does not Granger Cause Δ Bank Credit	3.37195	0.0372

The main rudimentary test to establish endogeneity or otherwise of money supply would be to investigate the causality between changes in bank reserves, aggregate deposits and credit to the commercial sector. Pair-wise Granger causality test shows that change in bank reserves Granger cause change in bank deposits (Table 11). Also, change in bank deposits Granger cause change in bank credit. Thus, money supply does not appear to be endogenous over the time horizon.

Table 11: Causal Relationship between Change in Bank Reserves, Aggregate Deposits and Bank Credit to Commercial Sector		
Null Hypothesis	F-Statistic	Prob.
Δ Bank Reserves does not Granger Cause Δ Aggregate Deposits	7.18907	0.0002
Δ Aggregate Deposits does not Granger Cause Δ Bank Reserves	0.99663	0.3965
Δ Aggregate Deposits does not Granger Cause Δ Bank Credit	4.67958	0.0108
Δ Bank Credit does not Granger Cause Δ Aggregate Deposits	1.27797	0.2819

One reason why money supply is not seen to be endogenous is that the exogenous autonomous flows – capital flows and government balance – continue to play a very significant role in influencing liquidity conditions and in money supply. CRR and OMO continue to provide durable liquidity. Bank deposits continue to have a dominant role in the credit creation process. The LAF framework, under such circumstances, only serves to equilibrate liquidity at the margin. The restriction imposed on the amount of liquidity that can be availed under the LAF repo and the uneven distribution of excess SLR with banks also affects the extent of liquidity that is made available on demand. As of mid-June 2012, at about 4.0 per cent of NDTL of commercial banks amounting to around ₹2,685 billion, the maximum potential injection of liquidity under LAF is equivalent to about 5.7 per cent of the outstanding bank credit and about 38 per cent of the incremental credit extended on a year-on-year basis²⁵. As against the potential, banks have, till date, accessed a peak liquidity of ₹2,028 billion under LAF (including MSF).

V. Concluding Observations

Notwithstanding the abandonment of the monetary targeting framework in 1998, money and credit continue to be key indicators of economic activity under the multiple indicator approach of monetary policy as borne out from the Reserve Bank's continued guidance on the trajectory for money and credit for the year under consideration taking into account the projections for real GDP growth and the headline inflation in its quarterly Statements of monetary policy.²⁶

The preference towards an interest rate targeting operating framework for monetary policy and liquidity management is predicated upon development

²⁵ Taking account of MSF, the ability to borrow in mid-June 2012 was ₹4,023 billion or roughly 8.5 per cent of the outstanding credit and 56.4 per cent of the incremental credit on a year-on-year basis.

²⁶ "In India, under the forward looking multiple indicators approach, the Reserve Bank also gives the projection for broad money growth, which serves as an important information variable, so as to make the resource balance in the economy consistent with the credit needs of the government and the private sector." Mohanty (2011)

of financial markets, absence of severe shocks to autonomous liquidity flows and the maintenance of liquidity in the deficit mode.

The same factors, *viz.*, the major autonomous sources of liquidity – government balance and net forex intervention – that were responsible for the significant deviation from the intermediate monetary target resulting ultimately in the abandonment of the target can also potentially render liquidity management difficult under the LAF framework. During the recent period, however, the Reserve Bank has been able to exercise greater ‘control’ over the sources of liquidity that were deemed autonomous. The fiscal dominance on monetary policy has been considerably attenuated with the FRBM Act prohibiting the Reserve Bank’s participation in the primary market for government securities, effective April 1, 2006 except under exceptional circumstances. The continued volatility in the cash balances of the government, however, necessitates a more active use of the government’s cash management tools aimed at maintenance of a targeted daily positive balance at the central bank through CMBs and auction of surplus cash balances. The absence of large scale intervention by the Reserve Bank in the forex market also imparts greater stability in the autonomous liquidity flows as was evident during the recent years. The Reserve Bank, however, may need to intervene in the forex market to manage excessive volatility in the market as was observed during H2:2011-12 and Q1:2012-13.

Effective control over autonomous flows coupled with the availability of government securities over and above the statutorily prescribed limits with banks is expected to enable the LAF framework to stabilise money market rates at the desired level and facilitate an effective monetary transmission under normal circumstances. In the presence of significant volatility emanating from autonomous flows, however, the LAF framework would need to be ably supported by OMO, MSS and CRR to maintain a deficit condition in the money market so as to steer call rates towards the middle of the corridor and facilitate effective monetary transmission. Given the current stage of financial development, and largely exogenous money supply, money would continue to

play an important role as one of the multiple indicators of macroeconomic activity and the movements in the monetary and credit aggregates would continue to provide inputs for policy making, while influencing public expectations on policy outcomes.

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Annex: Drivers of Liquidity and Impact on Monetary Aggregates				
Operation/ Instrument/ Variable	Change in (1)	Change in Reserve Bank Balance Sheet Item/Reserve Money (M₀)	Impact on Excess Reserves/Liquidity	Impact on Money Supply (M₃)
1	2	3	4	5
<i>Autonomous Factors</i>				
Transactions with Authorised Dealers	Purchase	Increase in Foreign Currency Assets/M ₀	Increase	Potential to increase M ₃
	Sale	Decrease in Foreign Currency Assets/M ₀	Decrease	Potential to decrease M ₃
Government's cash balances with the RBI	Increase	Decrease in Reserve Bank Credit to Centre/M ₀	Decrease	Potential to decrease M ₃
	Decrease	Increase in Reserve Bank Credit to Centre/M ₀	Increase	Potential to increase M ₃
Demand for Currency	Increase	Increase in Currency/ M ₀	Decrease	Rise in M ₀ but decline in M ₃ due to fall in money multiplier
	Decrease	Decrease in Currency/ M ₀	Increase	Fall in M ₀ but rise in M ₃ due to a rise in money multiplier
<i>Discretionary Factors</i>				
Repo	Increase	Increase in Reserve Bank Credit to Centre/M ₀	Increase	Potential to increase M ₃
	Decrease	Decrease in Reserve Bank Credit to Centre/M ₀	Decrease	Potential to decrease M ₃
Reverse Repo	Increase	Decrease in Reserve Bank Credit to Centre/M ₀	Decrease	Potential to decrease M ₃
	Decrease	Increase in Reserve Bank Credit to Centre/M ₀	Increase	Potential to increase M ₃
Open Market Operations (Purchase)	Increase	Increase in Reserve Bank Credit to Centre/M ₀	Increase	Potential to increase M ₃
	Decrease	Decrease in Reserve Bank Credit to Centre/M ₀	Decrease	Potential to decrease M ₃
MSS Operations	Increase	Decrease in Reserve Bank Credit to Centre/M ₀	Decrease	Potential to decrease M ₃
	Decrease	Increase in Reserve Bank Credit to Centre/M ₀	Increase	Potential to increase M ₃
Cash Reserve Ratio	Increase	Increase in Bankers' Deposits with the Reserve Bank/M ₀	Decrease	Rise in M ₀ but decline in M ₃ due to fall in money multiplier
	Decrease	Decrease in Bankers' Deposits with the Reserve Bank/M ₀	Increase	Initial decrease in M ₃ due to decrease in M ₀ but eventual rise due to increase in multiplier