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The Reserve Bank of India's Balance Sheet: Analytics and Dynamics of Evolution

Narendra Jadhav, Partha Ray, Dhritidyuti Bose and Indranil Sen Gupta*

The present paper attempts to contribute to the growing literature on central bank balance sheets drawing on a case-study of the Indian experience. The analytical commentary on the evolution of the Reserve Bank of India Balance Sheet in relation to the post-Independence national macroeconomic experience is partitioned into three phases on the basis of shifts in the conduct of monetary policy. Interestingly, structural breaks in the time path of the Reserve Bank's rate of surplus transferred to the Government are able to mirror these regime changes reasonably well. We conclude with some emerging issues.

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Introduction

Central banks, the world over, are products of history. They are characterised, typically, by an evolutionary development rather than being programmed to undertake from the beginning what they subsequently did. Almost universally, central banks have transmigrated from mere issuers of the national currency to wardens of its value. Needless to say, central banking functions generally emanate from the context of evolving linkages and relationships within an economic system. Since this evolution of macro-linkages is reflected invariably in their balance sheets, there is a growing

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interest from economists, accountants and policy makers, in analysing the books of central banks. The balance sheet of a monetary authority is unique in its importance, derived not only as the source of money creation but also as a description of its relationships with the government on the one hand and the banking and financial system on the other. Not surprisingly, the information content and health of central bank balance sheets are thus engaging attention the world over in an effort to unravel the mystique surrounding the temples of money. What *is* surprising is the fact that such an analysis has not been done comprehensively in the context of the Reserve Bank of India, despite its existence for nearly 70 years.

This is, of course, not to say that the importance of the Reserve Bank Balance Sheet has not been recognised. The multiple linkages between the Reserve Bank Balance Sheet and the Indian economy are succinctly summarised by Reddy (1997): "… Recently, one of my friends read the RBI Annual Report for the first time. He wondered why it is a thick volume referring to a whole range of economic issues - rather than a simple Annual Report with a balance sheet. Well, I had to explain to him that … the balance sheet of the RBI reflects and in a way, influences the development in the economy - the external sector, the fiscal and, of course, the monetary areas …".

The Reserve Bank, set up in April 1935, is enjoined "…to regulate the issue of Bank notes and the keeping of reserves with a view to securing monetary stability in India and generally to operate the currency and credit system of the country to its advantage…" by the Preamble to the Reserve Bank of India Act, 1934. Its balance sheet, naturally, chronicles the causes and consequences of monetary policy in the backdrop of the many vicissitudes of the Indian economic experience. What are the broad contours of these transformations? How do they capture the macro-economic relationships between the monetary authority, the Central Government and the financial system in India? The present paper looks into some such questions, analysing the evolution of the Reserve Bank's balance sheet in the 70 years of its functioning.

We begin with an analytical framework to examine central bank balance sheets drawing on cross-country central banking experiences in Section I. Section II examines the anatomy of the Reserve Bank Balance Sheet in terms of structure, accounting practices and the impact of central banking operations. Section III provides an analytical chronicle of the evolution of the Reserve Bank's balance sheet in the backdrop of India's macroeconomic experience. Finally, Section IV concludes with a few emerging issues.

Section I

Analytics of Central Bank Balance Sheets

A Stylised Central Bank Balance Sheet

A central bank balance sheet typically centres around the three traditional central banking functions of (a) issuer of currency, (b) banker to government and (c) banker to banks. A stylised central bank balance sheet is presented in Table 1.

Table 1: A Stylised Central Bank Balance Sheet

Liability	**Asset**
1	2
Currency	Gold
Deposits, of	Loans and advances, to
Government	Government
Banks	Banks
Loans (including securities)	Investments, in
Other Liabilities	Government securities
Capital Account	Foreign Assets
Paid-up Capital	
Reserves	Other Assets
Total Liabilities	Total Assets

Source : IMF (2001).

One needs to go beyond this relatively mechanistic functional classification to understand the structure of central bank balance sheets. In this context, it is important to understand the multiple linkages between the state and the monetary authority (Pringle and Courtis, 1999). First, most governments fully own their central banks

- even otherwise, there are restrictions on public shareholding (and dividend payout to non-government shareholders), although the equity of some central banks are traded on the exchanges. Secondly, central banks derive their right of note issue - easily their largest operation - from the state, which is thus entitled to the profits of currency issuance as *seignorage.* The Bank of England (BoE), for example, passes the entire profits of issuance to the Treasury. Thirdly, central banks usually act as sole bankers to the government. Finally, most central banks act as managers of public debt for a commission, though the degree of underwriting varies from country to country[1]. It is to prevent an avaricious state from simply printing money and devaluing the currency that issuance is often linked to the central bank's holdings of monetary gold - a legacy of the Gold Standard - and foreign paper (Fry, 1993; Hawkins, 2003). In particular, central banks often maintain a high ratio of net foreign assets to currency to ensure the wherewithal to meet any domestic demand for foreign currency (with currency boards, such as Argentina earlier, as an extreme case). Besides, fiscal responsibility legislation in most countries, supported by the large literature on the virtues of central bank independence, now limit central bank primary subscriptions in government securities auctions. In some cases, such as, the BoE, Peoples' Bank of China (PBC), Bank of Russia (BoR) and the US Federal Reserve (Fed), the central bank's primary subscription in government securities auctions is actually barred. Most central banks now have the statutory right to buffet their balance sheets with adequate reserves before passing their profits to the government.

A central bank balance sheet is usually analysed from the twin angles of the ability to issue currency and the ability to achieve the monetary policy objectives of price stability and growth. In order to track the channel of transmission of monetary policy, most monetary authorities redraw the assets and liabilities from their balance sheet to compile the following two macroeconomic liquidity aggregates by classifying liabilities according to their "moneyness" and by classifying assets and liabilities by sector of origin rather than the type of the financial instrument:

- reserve money, comprising currency and bank balances, which generates money supply through the process of credit creation; and
- excess bank reserves, *i.e.*, the balances banks maintain with the central bank over and above their reserve requirements and settlement balances (now christened voluntary reserves), which in turn, serve as a measure of bank liquidity. For analytical purposes, excess reserves can be decomposed into i) borrowed and non-borrowed reserves, depending on commercial banks' automatic access to primary liquidity, as conceptualised by the Fed and ii) autonomous factors and discretionary factors, depending on the central bank control over its balance sheet, following the European Central Bank (ECB), in terms of sources of funds.

Most central banks conduct monetary operations through a mix of instruments, such as, open market operations (and occasionally, changes in reserve requirements and standing facilities), which adjust the quantum of primary liquidity and changes in policy rates, which impact the price of base money (Borio, 1997; Van't dack, 1999; Tucker, 2004). The ripple effects of each monetary instrument throughout the central bank balance sheet are very situation-specific (Schaechter, 2001).

As to the composition of central bank balance sheets, by and large, there appear to be three stylised patterns in terms of assets and liabilities. On the asset side, at the one extreme, lie central banks, like the Fed, which support the high-powered money primarily by government paper of such different maturities that their assets and liabilities are relatively close substitutes (Table 2). At the other extreme, are the BoJ and ECB (and certain pseudo-currency boards in Hong Kong and Singapore), which maintain a diversified asset base, which does not match their monetary liabilities in terms of either the return distribution or the maturity structure. The scale of repo operations varies widely - from nearly half the balance sheet in case of the BoE or Reserve Bank of New Zealand (RBNZ) to less than a tenth in case of the Fed (Zelmer, 2001). Although most central banks prefer to transact in gilts in view of their high liquidity and minimal

Table 2: Composition of Central Bank Assets : Cross-Country Experience

(per cent of balance sheet size)

Central Bank	Domestic Assets				Foreign Assets	*Memo:* Balance sheet size as per cent of GDP, 2002
	Government	Financial Institutions	Private sector	Others		
1	2	3	4	5	6	7
Euro System	10.0	48.0	1.0	2.0	39.0	14.7
Japan	60.0	20.0	12.0	4.0	4.0	28.5
Malaysia	0.0	1.8	4.9	12.3	81.0	45.3
Mexico	0.0	16.5	1.5	21.0	61.0	13.3
South Africa	10.2	8.6	0.0	34.4	46.9	12.9
U.K.	5.0	55.0	2.0	39.0	0.0	2.2
U.S.	88.0	7.0	0.0	0.0	5.0	6.5
India #	41.7	4.2	0.0	7.2	46.9	21.0

Source : Zelmer (2001) and Hawkins (2003). # Relates to 2001.

credit risk, the Bank of Canada (BoC), central banks in the Euro system and BoJ do accept private sector securities as collateral if they satisfy some predetermined minimum external credit rating. A third group of central banks, especially in emerging market economies, hold large foreign exchange reserves.

On the liability side, true to the textbook, currency is usually the dominant component of the monetary base in case of most central banks, such as the BoE, BoJ and the Fed, especially, following cuts in reserve requirements (Table 3). There are exceptions though - the Bank of Denmark has a diversified mix of liabilities while that of the Norges Bank is dominated by government deposits. While central banks usually prefer government securities to their own securities for liquidity management to avoid market fragmentation, many central banks in emerging market economies including the PBC, the Banks of Chile, Korea (BoK) and Thailand, the National Bank of Poland and Bank Negara Malaysia (BNM) - and Denmark among developed countries - do issue their own bills - often with limits in terms of central bank net worth (*e.g.*, BNM) or money supply (*e.g.*, BoK) - especially as instruments of sterilisation.

Table 3: Composition of Central Bank Liabilities@: Cross-Country Expereince

(per cent of balance sheet size)

Central Bank	Currency	Deposits of		Central Bank Securities
		Financial Institutions	Government	
1	2	3	4	5
Euro System	43.0	30.0	6.0	0.0
Japan	60.0	6.0	23.0	5.0
Malaysia	16.7	43.1	8.6	7.5
Mexico	34.1	19.8	11.1	29.4
South Africa	27.9	37.9	0.8	5.4
U.K.	78.0	6.0	1.0	0.0
U.S.	95.0	3.0	1.0	0.0
India #	55.6	19.1	0.0	0.0

@ Excludes other liabilities. # Relates to 2001.

Source : Zelmer (2001) and Hawkins (2003).

The size of the central bank balance sheet depends on the particular macroeconomic circumstance of the economy in question. There is, in general, a clear relationship with the level of financial development. A major factor is the degree of financial deepening of the economy, which determines the relative reliance on cash. Another determinant is the particular operating procedure of monetary policy. Yet another determinant is the requirement of settlement balances, especially for inter-bank transactions which, in turn, depends on the parallel sophistication of payment and settlement systems. It is for this reason that the process of e-monetisation gives rise to concerns that the central bank might eventually shrink to a size which is too small to conduct effective monetary operations (Goodhart, 2000).

Accounting Policies of Central Banks

Central bank accounting practices assume importance not only because of the usual concerns about balance sheet health *per se*, but also because of their monetary and fiscal implications. Most central banks usually follow conservative accounting norms (Foster, 2000; Kurtzig and Mander, 2003). A look at the accounting norms of select central banks allows us to discern the following stylised facts evident from Table 4:

- Incomes are recognised on an accrual basis.
- Asset portfolios are periodically revalued on prudential norms, adjusting losses against income while ignoring unrealised gains.
- Foreign currency assets are periodically revalued for exchange rate changes, with revaluation transferred to an adjustment account.

Table 4: Accounting Norms of Select Central Banks

Central Bank	Basic Accounting Practices			Periodicity of Audited Accounts	External Audit
	Income Recognition	Investment Revaluation			
		Price effects	Exchange rate effects		
1	2	3	4	5	6
Japan	Generally accepted corporate accounting.	Lower of cost, determined by moving average method or market value.	Unrealised gains parked in reserves; loss adjusted against income.	Annual	Yes
U.K.		At cost, with amortisation of revaluation on straight-line basis.	Unrealised gains parked in reserves; loss adjusted against income if investment.	Annual	Yes
U.S.A.	Accrual basis.	At cost, with amortisation of revaluation on straight-line basis.	Reported separately.	Annual	Yes
South Africa	Accrual basis.	Fair value on balance sheet date.	Booked in an adjustment account.	Annual	Yes
India	Accrual basis.	Lower of book or market value; depreciation adjusted against income.	Booked in an adjustment account.	Annual	Yes

Source : Kurtzig and Mander (2003) and various central bank websites.

- Contingency reserves are maintained to meet unforeseen circumstances.
- Accounts are audited externally, at least on an annual basis.

There is a persuasive view that central bank accounting practices are *sui generis* because the monetary authority is itself unique. An alternate argument is that the adoption of the international best practices would, by their very nature, strengthen the conduct of monetary policy, especially since the sensitivity of central bank

balance sheets to market fluctuations heighten with the process of financial liberalisation. It is in this context that the International Monetary Fund (IMF) has introduced a safeguard assessments standard, based on five areas: External audit mechanism, Legal structure and independence, financial Reporting, Internal audit mechanism and system of internal Controls, acronymed ELRIC (Catsambas and Hemus, 2003). There are now three basic accounting standards, *viz.*, the International Accounting Standards (IAS), adopted by the ELRIC, US Generally Accepted Accounting Principles (US GAAP) and the European Central Bank GAAP (ECB GAAP) to which central banks could conceivably benchmark as detailed in Table 5. Many central banks are now beginning to migrate to the IAS, within

Table 5: Accounting Standards

Standard	**IFRS**	**US GAAP**	**ECB GAAP**	***Memo*: Reserve Bank of India**
1	2	3	4	5
Financial Statements	Balance sheet, income statement, cash flows, statements of recognised gains and losses and accounting policies.	Similar to IFRS	Balance sheet and profit and loss account.	Balance sheet, profit and loss account, notes to accounts. Realised gains/ losses available in accompanying commentary.
Revenue Recognition	Based on four criteria, *viz.*, measurement of revenue, whether economic benefits will flow to the enterprise, identification of date at which transaction effected and costs measured.	Based on four criteria, *viz.*, vendor's price determinable, evidence of arrangement, occurrence of delivery and collectability assurance.	Realised gains/losses taken to profit and loss account.	Realised gains/ losses taken to profit and loss account. Besides, unrealised losses also adjusted against income.
Measurement of Financial Assets	Depends on classification. If held to maturity, at amortised cost, otherwise fair value, against income orequity.	Similar, but unrealised gains and losses recognised against income.	Market price.	Lower of book or market value. Unrealised losses adjusted against income.

Note : International Financial Reporting Standards (IFRS), issued by the International Accounting Standards Board, include all existing International Accounting Standards (IAS).
Source : Thornton (2003).

the structure of their national priorities, while the European Central Bank system of central banks (ESCBs) are adopting the ECB GAAP as expected.

A related set of issues revolve around central bank reserves. First, there is the question whether central banks require reserves at all, given that the owner in most cases, is the sovereign itself. A line of argument is that 'tax-based' monetary systems, such as the Fed, which have some form of fiscal guarantee, are relatively more effective as their monetary policy action are less fettered by balance sheet concerns, than 'reserve-based' monetary systems, such as the ESCB, which must pay for the greater degree of central bank independence by ensuring their own solvency (Zhu, 2003). There now appears to be an emerging consensus that central bank reserves act as a cushion in the sense that well-capitalised central banks are relatively more credible in a market economy because they can bear larger *quasi*-fiscal costs of market stabilisation, especially in case of large fiscal deficits (Stella, 1997, 2002 and 2003; Dalton and Dziobek, 1999; Sullivan, 2003; Martinez-Resano, 2004; Jeanne and Svensson, 2004; Bindseil, Manzanares and Weller, 2004). The determination of central bank reserves varies widely depending on the national circumstance as revealed by Table 6. Irrespective of the professed government commitment, central banks in emerging market economies tend to maintain large reserves, especially as their fiscal positions are often not strong enough to protect their balance sheets.[2] Secondly, there is a question of the form of reserves in terms of its three constituents, *viz.*, paid-up capital, contingency reserves and revaluation accounts. Most central banks appear to prefer to build up reserves by transfer from their annual profits rather than augmenting paid-up capital, while revaluation accounts adjust to prevailing market trends. Finally, there is the question of determining the share of the central bank (*i.e.*, in the form of reserves), the Government and non-Government owners in central bank income. In most cases, central banks have the first charge on annual income. Although governments typically appropriate the dominant share

Table 6: Rules of Central Bank Reserves: Cross-Country Experience

(Per cent of profits)

Central Bank	Appropriation of Central Bank Surplus				Deciding Authority	First Charge	Capital to total assets in per cent #
	Government		Central Bank	Others			
	Rule	Share to GDP, 2001 (per cent)					
1	2	3	4	5	6	7	8
Japan	Balance	0.0	At least 5 per cent to reserve fund.	Up to 5 per cent.	Government.	Central bank.	3.7
Mexico	Balance	0.0	Provisions to reserves aimed at maintaining real value in line with GDP.		Government and central bank.	Central bank.	-0.9
Poland	Balance	0.4	At least 2 per cent to reserve capital.		Central bank.	Central bank.	2.2
South Africa	Balance after appro-priations.	0.0	10 per cent to reserve fund.		Statutory.	Central bank.	3.4
U.K.	At least profits of issue dapartment.	0.0	Allocations from banking department, if any.		Government and central bank.		3.0
U.S.A.	Occasional receipts.		Remainder to surplus fund.	6 per cent of capital	Central bank.	Share-holders.	2.3
India	Balance	0.4	Contingency reserves of 12 per cent of balance sheet by 2005.		Central bank, in consultation with government.	Central bank.	4.8

Source : Pringle and Courtis (1999), Hawkins (2003) and Ueda (2003#).

(often up to 90 per cent), especially given the right of *seignorage* for having farmed out the right of issue, it must be recognised that this is counter-balanced by parallel restrictions on the monetisation of the fiscal deficit. Central bank legislations often statutorily link the size of reserves to the size of the balance sheet, paid-up capital, annual surplus, or some macroeconomic variable, such as GDP or money supply. In any event, transfers to the Government seldom cross 0.5 per cent of GDP, barring exceptions such as Hong Kong SAR and Singapore.

There is a widespread feeling that central banks should slowly and gradually graduate to international accounting standards. Central bank accounting, nevertheless, raises several issues beyond the standard accounting standards. For example, although there is very little doubt that the basic thrust of the IAS in determining the fair value of the investment portfolio is welcome, the allied principle that all gains and losses, realised and unrealised, have to pass through the income statement opens the possibility of draining off the "hidden" reserves emanating from, say, unrealised exchange rate revaluation gains by the fisc. In any case, the net worth of a central bank is difficult to establish, especially as the 'franchise' value of currency issuance is almost impossible to measure (Fry, 1993; Stella, 1997). The identification and valuation of contingent liabilities is another area of concern (Blejer and Schumacher, 2000). It is, of course, possible to write fair values for contingent liabilities for the explicit contracts entered into, such as, repurchase agreements and swaps - and this is already done by most central banks. The trouble is that the principal contingent liability of central banking is implicit in the great unknown of its lender-of-the-last-resort function, which is very difficult to evaluate. While some central banks do tend to build cushions for systemic financial instability, it is almost impossible to determine the scale of such requirements.

Against this chronicle of central bank balance sheets, we now turn to the structure and dynamics of the balance sheet of the Reserve Bank of India.

Section II

Balance Sheet of the Reserve Bank of India: Structure and Dynamics

(a) Balance sheet structure

The structure of assets and liabilities of the Reserve Bank are, more or less, in line with the stylised balance sheet followed by most central banks. The accounts of the Reserve Bank are, however, bifurcated into the Issue department, reflecting the currency issue function and the Banking department, accounting for all other central banking functions (such as banker to the Government and banks) in terms of Section 23(1) of the Reserve Bank of India Act, 1934, following the recommendations of the Hilton Young Commission (RBI, 1970; RBI, 1983).[3] This was primarily to ensure the sanctity of the currency issue function of the Reserve Bank, in line with the then existing practice at the Bank of England.[4] We take a quick rundown through the balance sheets of the Issue and Banking departments as a prelude to the discussion on balance sheet dynamics.

Issue Department

A stylised account of the assets and liabilities of the Issue department is presented in Table 7. The liabilities of the Issue department, under Section 34(1), comprise the vault cash in the Banking department and the notes issued to the public, banks and treasuries under Section 22, which accords the Reserve Bank the sole right to issue bank notes. The assets eligible to back the issuance of notes, under Section 33, include gold coin and bullion (15 per cent of which can be shipped abroad), eligible foreign securities, Government of India Rupee securities, Rupee coins and eligible internal bills of exchange and other commercial paper (not yet held).[5] The sum of foreign securities and gold is stipulated at a minimum of Rs.200 crore, with at least Rs.115 crore in gold. As the Reserve Bank acts as the agent of the Central Government in the issue, distribution and handling of Rupee and small coins under Section 38, inventories are held in the Issue department (with a minor amount held as vault cash in the Banking department).

Table 7: Assets and Liabilities of the Issue Department of the Reserve Bank

Liability	Asset
1	2
Notes held in the Banking Department Notes in circulation	Gold Coin and Bullion (a) Held in India (b) Held outside India Foreign Securities Rupee Coin Government of India Rupee Securities Internal Bills of Exchange and other Commercial Paper
Total Liabilities (= Total Notes issued)	Total Assets

Source : RBI (1983).

Banking Department

The balance sheet of the Banking department reflects the Reserve Bank's functions as banker to the Government and banks as can be seen from Table 8. The balance sheet effects of monetary policy action, in terms of changes in investments in Government paper and foreign assets, span the Issue and Banking departments. Encumbered securities, such as Government securities acquired under reverse repurchase agreements (rechristened repurchase agreements in October 2004) or foreign currencies held under swaps can, however, be accounted only in the investment portfolio of the Banking department as they are not eligible for backing note issuance.

The liabilities of the Banking department, comprising the capital account, national funds, deposit liabilities and other liabilities, can be analytically partitioned on the basis of their "moneyness". Non-monetary liabilities essentially comprise the Reserve Bank's dues to its owner (paid-up capital) and to itself (reserves), balances parked abroad (such as IMF Account No.1) and illiquid provisions such as employees' provident funds. Government balances with the Reserve Bank, in line with international best practices, are considered non-monetary because the State is treated as a part of the money issuing sector along with the central bank because of its ability to create money by *fiat*. The bulk of the deposit liabilities, along with currency issued by the Reserve Bank, are 'monetary' in that they provide the base for credit creation as components of reserve money.

Table 8: Assets and Liabilities of the Banking Department of the Reserve Bank

Liability	**Asset**
1	2
Capital paid-up	Notes
	Rupee Coin
Reserve Fund	Small Coin
	Bills Purchased and Discounted:
	(a) Internal
	(b) External
	(c) Government Treasury Bills
National Industrial Credit (Long Term Operations) Fund	Balances Held Abroad
National Housing Credit (Long Term Operations) Fund	Investments
Deposits	Loans and Advances to:
(a) Government	(i) Central Government
(i) Central Government	(ii) State Governments
(ii) State Governments	Loans and Advances to:
(b) Banks	(i) Scheduled Commercial Banks
(i) Scheduled Commercial Banks	(ii) Scheduled State Co-operative Banks
(ii) Scheduled State Co-operative Banks	(iii) Other Scheduled Co-operative Banks
(iii) Other Scheduled Co-operative Banks	(iv) Non-Scheduled State Co-operative Banks
(iv) Non-scheduled State Co-operative Banks	(vi) Others
(v) Other Banks	Loans, Advances and Investments from National Industrial Credit (Long Term Operations) Fund
(c) Others	(a) Loans and Advances to:
Bills Payable	(i) Industrial Development Bank of India
Other Liabilities	(ii) Export Import Bank of India
	(iii) Industrial Investment Bank of India Ltd.
	(iv) Others
	(b) Investments in bonds/debentures issued by
	(i) Industrial Development Bank of India
	(ii) Export Import Bank of India
	(iii) Industrial Investment Bank of India Ltd.
	(iv) Others
	Loans, Advances and Investments from National Housing Credit (Long Term Operations) Fund
	(a) Loans and Advances to National Housing Bank
	(b) Investments in bonds/debentures issued by National Housing Bank
	Other Assets
Total Liabilities	Total Assets

Source : RBI (1983).

The capital account, in the strict sense of the term, comprises the paid-up capital of Rs.5 crore, fully subscribed by the Government of India since January 1, 1949 under Section 4 and reserves, comprising the initial contribution of Rs.5 crore by the Central Government in terms of Government securities under Section 46 and transfers following gold revaluation up to October 1990. Other reserves, including the Contingency Reserve and Asset Development Reserve, under Section 47 and revaluation accounts, including the Currency and Gold Revaluation Account (CGRA) and the Exchange Equalisation Account, are parked in Other Liabilities.

National funds, the second set of liabilities, were constituted from time to time out of contributions from the Reserve Bank's disposable surplus under Section 46 to provide agricultural credit (1956-82, when monies were transferred to the then newly-constituted National Bank for Agriculture and Rural Development), industrial credit (1964) and housing credit (1987).

The third set of liabilities include deposit balances maintained by the Government, banks and other eligible parties. The Central Government deposits all its cash balances with the Reserve Bank, free of interest, subject to a mutually agreed minimum under Sections 20 and 21 of the Reserve Bank of India Act, 1934. Minimum cash balances of the State Governments are linked to the volume of budgetary transactions in accordance with mutual agreements. Scheduled bank deposits with the Reserve Bank include their required reserves, as prescribed under the Section 42(1), settlement balances and excess reserves. Non-scheduled banks are required to maintain a minimum of three per cent of their net demand and time liabilities in various eligible forms, including in current account with the Reserve Bank under Section 18 of the Banking Regulation Act, 1949. Other deposits comprise, mainly, i) deposits of *quasi*-Government and other financial institutions including primary dealers, ii) accounts of foreign central banks and governments, iii) accounts of international agencies such as the International Monetary Fund (IMF), *etc.*, iv) provident, gratuity and guarantee funds of the Reserve Bank staff and v) some temporary accounts.

The final set of liabilities include a broad head of other liabilities and bills payable, including mainly outstanding drafts, telegraphic and mail transfers and payment orders drawn up by the Reserve Bank's offices. Besides the reserves and revaluation accounts, other liabilities include a number of current income and suspense accounts, other sundry liabilities and special deposit accounts, such as the Resurgent India Bond (RIB) / India Millennium Deposit (IMD) Maintenance of Value accounts.

The assets of the Banking department comprise financial assets, such as, claims on the Government, banks and other eligible financial institutions and other assets in the form of loans and bonds and non-financial assets, such as immovable property. The loan portfolio includes advances to the Government, banks and financial institutions under Section 17 of the Reserve Bank of India Act, 1934. Ways and means advances (WMA) to the Central Government, under Section 17(5), are repayable within three months from the date of the advance, in accordance with the agreement with the Government in respect of the maximum amount and rate of interest. The WMA to States encompass "normal" WMA, linked to the three-year average of revenue receipts *plus* capital expenditures, "special" WMA provided against holding of Government securities and overdrafts up to ten consecutive days within limits linked to normal WMA limits. Credit to banks and financial institutions, including primary dealers, is typically in the nature of refinance against government securities - besides, the NABARD enjoys two lines of support, General Line of Credit (GLC I), against loans to commercial and state co-operative banks for seasonal agricultural operations and GLC II, for various other approved short-term purposes. The investment portfolio of the Banking department comprises investments in the share capital of the State Bank of India and other financial institutions,[6] Government paper held in the form of Treasury Bills and dated securities, including reverse repos, special securities issued by the Government in favour of the Reserve Bank for various purposes, including revaluation of RIBs and IMDs, gold bonds and foreign securities, including swaps.

The other assets of the Banking department include till money in form of rupees (which is a claim on the Issue department) and coin (which is a claim on the Central Government), and "other" assets, including the

value of gold held in Banking department, premises, furniture and fittings, debit balances under various heads of expenditure pending transfer to the Profit and Loss Account and loans and advances granted to members of the staff towards housing and purchase of motor vehicles. The Reserve Bank has now discontinued schemes of discounting various bills.

Analytical Approaches to Analysing the Reserve Bank Balance Sheet

The methodology of analysing the Reserve Bank Balance Sheet has evolved over time along with the particular monetary policy framework in vogue. The Reserve Bank traditionally followed the so-called balance sheet approach (also known as the structural or credit-counterparts approach) of examining the variations in money stock (RBI, 1961, 1977; Jadhav, 1994; Jalan, 2002). A focused analysis of the Reserve Bank Balance Sheet began with the Reserve Bank's first Working Group on Money Supply (1961) which introduced a parallel construct of the monetary base, called 'government money', deemed useful for forecasting money supply. Although the case for compiling reserve money was revived by Gupta (1976), a number of Reserve Bank economists were critical of the underlying money multiplier theory terming it as unduly 'mechanistic' and unsuitable for 'operational' significance as it did not take the relationship between the monetary and real sectors into account (Shetty *et al*, 1976; Mujumdar, 1976; Chona, 1976; Madhur, 1976; RBI, 1977; Khatkhate, 1980). The monetary targeting framework, recommended by the Committee to Review the Working of the Monetary system (Chairman : Sukhamoy Chakravarty) transformed monetary analysis at the Reserve Bank by embracing the very same money multiplier approach, given the reasonable degree of association between reserve money and money supply (Rangarajan and Singh, 1984; RBI, 1985; Rangarajan, 1987).

While the two approaches are useful for tracking money supply, a third and more recent paradigm of monetary policy links the movements in the central bank balance sheet to the determination of interest rates through bank reserves. One methodology is to dissect excess bank reserves into 'autonomous' and 'discretionary' liquidity, by partitioning the Reserve Bank Balance Sheet flows on the basis of policy interventions

(RBI, 2000; Sen Gupta *et al*, 2000). A second related methodology is to decompose excess reserves drivers into exogenous factors and forecastable factors, on the degree of predictability and policy position (RBI, 2002). To the extent that excess reserves are essentially an *ex ante* concept, the Reserve Bank has recently experimented with an *ex poste* measure of the "liquidity overhang", crystallised as the sum of the balances under net repos under the Liquidity Adjustment Facility and the Market Stabilisation Scheme (RBI, 2004b).

Accounting Practices

The Reserve Bank has traditionally followed the most conservative canons of central bank accounting in its accounting practices (Table 4). It satisfies, by and large, the Code on Transparency of Monetary and Financial Policies framed by the International Monetary Fund (IMF), in terms of the following three criteria, *viz.*, i) releasing data in consonance with the IMF's SDDS standards, ii) disclosing balance sheet on a pre-announced schedule and iii) after a pre-determined interval, disseminating selected information on its aggregate market transactions. This is testified to by the Advisory Group on Transparency in Monetary and Financial Policies (Chairman: M. Narasimham), set up by the Standing Committee on International Financial Standards and Codes (Chairman: Y.V. Reddy).

The Reserve Bank central board submits annual audited accounts, together with a report on its working to the Central Government, after due approval in its August meeting, within two months of the end of the accounting year (*i.e.*, June 30) under Section 53(2) of the Reserve Bank of India Act, 1934. The formats of the profit and loss and reserve fund accounts are prescribed in the Reserve Bank General Regulations, 1949 in pursuance of Section 58. Besides the annual accounts, a *Weekly Statement of Affairs* (WSA) of the Issue and Banking departments, as at close of business on Friday, is transmitted to the Central Government under Section 53(1) after due approval of the weekly meeting of a committee of the central board, which usually meets on the following Wednesdays. A consolidated statement on the assets and liabilities of the Reserve Bank is published in the *Weekly Statistical Supplement* (WSS)

to the monthly *Reserve Bank Bulletin* (along with reserve money), which is released the following Saturday while accounts of the Issue and Banking departments are published in the *Reserve Bank Bulletin* by the beginning of the following month. In terms of monetary impact, there is very little difference between the audited balance sheet and the weekly accounts because the non-monetary suspense accounts net the surplus from the day-to-day operations pending appropriation.

In view of the growing importance of the strength of the central bank balance sheet with financial liberalisation, accounting practices have been further tightened in the 1990s as shown in Table 9 (Tarapore, 1997). This has been accompanied by greater transparency in terms of balance sheet disclosures, including prior commitment to certain balance sheet allocations, such as, the transfers to the central bank reserves (Table 10). This is reinforced by data on forward assets/liabilities, money market operations and now, daily bank reserves. Although there is no explicit provision for maintaining reserves, the Reserve Bank has created a number of reserves under the enabling provisions of Section 47 of the Reserve Bank of India Act, 1934. Contingency reserves, in particular, are targeted at 12 per cent of the balance sheet by June 2005.[7]

Table 9: Reserve Bank's Accounting Policies - Recent Changes

Item	Standing Practice	Changes
1	2	3
Gold	Periodic revaluation	Valued at 90 per cent of average London price monthly since October 1990.
Foreign securities	Valuation at lower of book value or market price at prevailing exchange rates.	Foreign exchange contracts are evaluated half- yearly since 1995-96.
Foreign currency transaction	Valued at prevailing exchange rates annually.	Frequency changed to weekly since 1996-97.
Government securities	Lower of book value or rates based on yield curve, with depreciation charged against current income.	At market rate, if available, since 1996-97.
Profit/loss on sale of securities	Profit/loss booked only on redemption or when accumulated sales proceeds exceed book value of the entire lot in that category.	Accounted for each transaction since 1997-98.

Source : RBI Annual Report, various issues.

Table 10: Balance Sheet Disclosures by the Reserve Bank

Item	Year Introduced
1	2
Notes to Accounts	1992
Details of	
Sources of Income	1991
Domestic Income	1995
Income from Open Market Operations	1999
Foreign Income	1995
Interest Payments	1991
Other Assets/Liabilities	1996
Contingency Reserves	1995
Investments in shares of Subsidiaries/Associate Institutions	1996
Unrealised gains in foreign currency assets	1995

Source : RBI Annual Report, various issues.

(b) Balance Sheet Dynamics

The flows in the Reserve Bank's balance sheet emanate from its regular central banking functions and the consequent monetary operations undertaken to steer monetary conditions to their desired objectives. We now turn to the impact of central bank operations on the central bank balance sheet using the Reserve Bank as a case study. For the sake of expository convenience, we divide the operations of the Reserve Bank into two broad categories: regular operations and monetary operations.

Regular Operations

Issuer of Currency

The impact of cash demand on the Reserve Bank Balance Sheet essentially depends on the form in which it is financed. For instance, cash demand could be set off by public expenditure which is funded by monetisation - the increase in currency on the liability side would, thus, be matched by the Reserve Bank's

primary support to the Centre on the asset side without any change in bank liquidity *per se*. Alternately, the banking system would have to fund cash flows as currency is a leakage from the banking system to the extent it is held by the public as a direct claim on the central bank. If cash drawals are accommodated by changes in bank reserves, there is no change in the size of the balance sheet (and reserve money) although a decline in excess reserves could put pressure on interest rates. If the banking system has to take recourse to the Reserve Bank either through standing facilities or repo operations, there would be a similar expansion in the balance sheet (and reserve money) without any change in bank liquidity or interest rates.

Banker to Government

The impact of the public finances upon the Reserve Bank Balance Sheet depends not only on the fiscal position but also on the form of financing the fiscal deficit. If the fiscal gap is met by resource mobilisation from the banking system, liquidity conditions change because funds would have to be diverted from competing uses to the Government. In case the Government takes direct recourse to the Reserve Bank, the impact of the Government deficit on liquidity conditions depends on the end-use of Government spending. Illustratively, if the money is utilised to fund redemption of past public debt, which is largely held by banks, there would actually be an increase in bank liquidity, which would ease monetary conditions. Similarly, if the money is spent on public works, there could be a significant increase in currency, without impinging on bank liquidity.

Besides, the accommodation available from the central bank in pursuance of its banker - to - Government and development functions, the Government's claims on the Reserve Bank stems from its entitlement to *seignorage,* reinforced by its position as sole owner. The critical difference is that direct support requires deliberate asset creation and is, therefore, monetary, while the profit transfer is out of income created out of past asset creation and hence, is non-monetary.

Banker to Banks

The sources and uses of the commercial banking system directly impact the Reserve Bank Balance Sheet through their current accounts at the central bank. If banks utilise their balances with the central bank to match fluctuations in cash demand, there would be a change in the composition of the liabilities of the Reserve Bank Balance Sheet (and reserve money) without affecting the size. If changes in bank reserves mirror changes in banks' investments in Government paper and foreign currency or availment of standing facilities, there is a corresponding change in the size of the Reserve Bank Balance Sheet as well as a change in the composition of its assets and liabilities.

Management of Foreign Exchange Reserves

The flows in the net foreign assets of the Reserve Bank reflect the interplay of three sets of factors: i) foreign currency operations, essentially with a view to building up foreign exchange reserves and stabilising the foreign exchange market, ii) aid receipts by the Government, and iii) income generated by foreign currency investments.

The purchase or sale of foreign currencies from authorised dealers (essentially, banks) result, as a first step, in a change in the foreign currency portfolio of the Reserve Bank with a corresponding change in bank reserves. On the other hand, since the Reserve Bank routes the Rupee equivalent of aid receipts to the Government while adding the foreign currency to the foreign exchange reserves, there is no direct monetary effect. The income on foreign currency assets also add to foreign exchange reserves but do not have a monetary impact as they are appropriated into the income from foreign sources sub-account in the non-monetary Other Liabilities account which are a claim of the Reserve Bank on itself.

The revaluation effect of net foreign exchange assets depends on the change in prices as well as the changes in the exchange rate. The revaluation in foreign currency assets arising out of changes in exchange rates are money-neutral by transfer to the Currency and Gold Reserve Account (CGRA) (which is a constituent of the non-monetary Other Liabilities). There is, thus, no monetary or profitability impact although the size of the balance sheet changes with implications for the rate of surplus because of concomitant higher contingency reserve requirements. The revaluation of foreign securities arising out of changes in market prices is adjusted against current income in case of depreciation, while appreciation is not provided for. There is, thus, no monetary impact although the size of the balance sheet is altered. In case of gold, the entire change in value, because of either price or exchange rate changes, is transferred to the CGRA, affecting the size of the balance sheet without impacting either reserve money or profitability.

Monetary Policy Operations

Changes in Reserve Requirements

Changes in reserve requirements alter the composition and profitability of the Reserve Bank Balance Sheet (and reserve money) as well as bank liquidity as summarised in Table 11. A change in the cash reserve ratio (CRR) alters the ratio of currency and reserves on the liability side. The impact on the asset side depends on the particular monetary environment. For example, if the CRR is raised to sterilise the impact of capital inflows, there would be a shift in favour of foreign assets. Second, if the CRR is raised in order to tighten monetary conditions to stem capital outflows, the market liquidity gap generated by the mix of higher reserve requirements and drawdown of foreign currency assets is likely to be funded by an increase in domestic assets either through reverse repos or higher recourse to standing facilities. Finally, a reduction in the CRR is almost always associated with a reduction in domestic assets as banks either invest the release of resources in repos or redeem standing facilities.

Table 11: Impact of Cash Reserve Ratio Changes on the Reserve Bank Balance Sheet : Possible Scenarios

Action	Liquidity Impact			Monetary Conditions		Balance Sheet Impact				
	NDA	NFA	RM	Interest Rate	Exchange Rate	Payout on CRR balances	Income from			NFA
							NDA		NFA	
							Direct	Valuation	Direct	Valuation
1	2	3	4	5	6	7	8	9	10	11
Hike										
Contain monetary effect of capital inflows	n	h	h	h	i	h	n	i	h	h
Tighten monetary policy with capital outflows	h	i	h	h	h	h	h	i	i	i
Cut										
Ease monetary policy	i	n	i	i	n	i	i	n	n	n

NDA : Net Domestic Assets. NFA : Net Foreign Assets.

h: Increase. i Decrease. n No change.

The impact of reserve requirements on central bank profitability also depends on the monetary circumstance. The payout in the form of interest on CRR balances is a charge on income. Besides, a change in the ratio of domestic to foreign assets affects central bank income to the extent of a differential between domestic and international interest rates.

Open Market Operations

The impact of open market operations on the Reserve Bank Balance Sheet (and reserve money) is essentially situation-specific as summarised in Table 12. When open market operations, especially repo/reverse repos under the Liquidity Adjustment Facility (LAF), is necessitated by changes in demand for either currency or bank reserves, there would be a corresponding change in the size of the balance sheet (and reserve money). In case, open market operations are driven by capital flows, there is no impact on the balance sheet

Table 12: Impact of Open Market Operations on the Reserve Bank Balance Sheet : Possible Scenarios

Action	Liquidity Impact			Monetary Conditions		Balance Sheet Impact				
	NDA	NFA	RM	Interest Rate	Exchange Rate	Payout on CRR balances	Income from			NFA
							NDA		NFA	
							Direct	Valuation	Direct	Valuation
1	2	3	4	5	6	7	8	9	10	11
Absorption of Liquidity										
Contain monetary effect of capital inflows	i	h	n	h	i	n	i	i	h	h
Tighten monetary policy with capital outflows	i	i	i	h	h	n	i	i	i	i
Injection of Liquidity										
Currency expansion	h	n	h	n	n	n	h	n	n	n

size (and reserve money) although monetary conditions in terms of money market rates and exchange rates could be affected. In each case, the composition of the balance sheet (and reserve money) in terms of domestic and foreign assets would undergo a change depending on the operations involved.

In terms of profitability, there are two effects: direct and indirect. In case Government securities purchased (sold) outright, the Reserve Bank earns (foregoes) interest income from the Government. It also incurs profits/losses in the conduct of outright open market sales. In case of LAF operations, the Reserve Bank earns (pays) interest from (to) the counterparties, *viz.*, commercial banks and primary dealers, in case of reverse repos (repos). Besides, tightening monetary conditions results in a depreciation of the Government securities portfolio, which would have to be accounted for against current income.

The scope of open market operations is circumscribed by the provisions of the Reserve Bank of India Act, 1934. The Reserve Bank cannot pay interest on Government balances or on bank balances, in excess of CRR stipulations, borrow clean beyond the paid-up capital of Rs.5 crore or issue paper in its name. Since the Reserve Bank cannot pay interest on bank balances, over and above CRR stipulations or borrow more than its paid-up capital, repo (reverse repo) operations, which are essentially collateralised borrowing (lending) to absorb (inject) market liquidity have to be camouflaged as two-leg sell-buy (buy-sell) outright transactions in the underlying Government securities. There is, thus, an asymmetry in the scope of repos (limited to the Reserve Bank's holding of Government securities) and reverse repos (limited, technically, only by the stock of non-monetised public debt). Besides, since the Government cannot receive interest on surplus balances with the Reserve Bank, it typically 'buys back' Government paper from the central bank (up to Rs.10,000 crore) for the period of surplus and saves the interest payment. This means if capital flows do not follow the seasonality of the Government expenditure and the Centre runs a surplus, the Reserve Bank needs to have a sufficient stock of Government paper to transfer to the Government.

It is in this context that following the recommendation of the Reserve Bank's Working Group on Instruments of Sterilisation (Chairperson: Usha Thorat), a Market Stabilisation Scheme (MSS) has been instituted. The Government issues paper to mop up liquidity generated by capital flows and parks the proceeds with the Reserve Bank (RBI, 2004a,b). The monetary impact of the accretion to the Reserve Bank's foreign assets, arising out of the absorption of surplus capital flows is thus nullified by the decline in the Reserve Bank's net credit to the Centre, because of the accretion to the Centre's cash balances with the Reserve Bank. Although it is money-neutral, the MSS enlarges the Reserve Bank Balance Sheet because the proceeds are immobilised in a separate identified account within the head of the Centre's balances with the Reserve Bank, unlike in the case of traditional open market operations which is balance sheet-neutral. While the impact of the MSS on the Reserve Bank's surplus is limited

in terms of income, the central bank's rate of surplus declines because the consequent increase in the size of the balance sheet requires higher allocations to be made in terms of Contingency Reserves.

Refinance Facilities

An increase (reduction) in standing facilities in order to match either currency expansion (contraction) or excess demand (supply) of bank reserves results in a change in the size of reserve money.

Bank Rate/ Repo Rate

Changes in the policy rates, *viz.*, the Bank Rate and the repo rate, impact central bank income in terms of i) receipts from the WMA and standing facilities, and ii) outgo on account of interest payable on CRR balances (in case of the Bank Rate till recently) and net repos under the LAF (in case of the repo rate) as summarised in Table 13. The impact of interest rate signals from the Reserve Bank on the interest rate structure feed back into the balance sheet (and profitability) through revaluation of investments in Government paper.

Table 13: Impact of Bank Rate/Repo Rate Changes on the Reserve Bank Balance Sheet : Possible Scenarios

Action	Liquidity Impact			Monetary Conditions		Balance Sheet Impact				
	NDA	NFA	RM	Interest Rate	Exchange Rate	Payout on CRR balances	Income from			NFA
							NDA #		NFA	
							Direct	Valuation	Direct	Valuation
1	2	3	4	5	6	7	8	9	10	11
Cut										
Contain monetary effect of capital inflows	n	n	n	i	i	i	n	n	n	h
Ease monetary policy	n	n	n	i	n	i	n	n	n	n
Hike										
Tighten monetary policy with capital outflows	n	n	n	h	h	h	n	i	n	i

Excludes loans and advances and LAF operations.

Having discussed the structure and dynamics of the Reserve Bank Balance Sheet, let us now turn to an analytical chronicle of its evolution, insofar as it reflects the macroeconomic developments in India.

Section III

The Reserve Bank Balance Sheet and the Macroeconomy

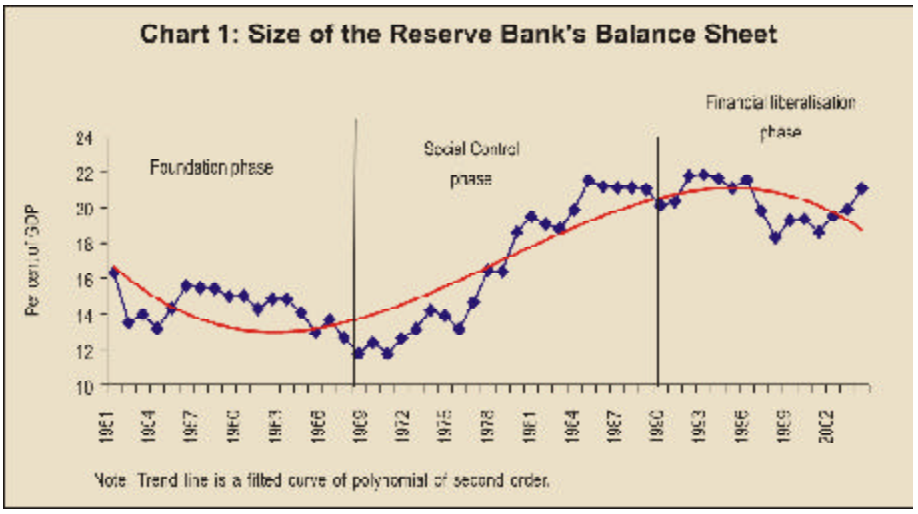
Periodisation Scheme

It is appropriate to track the transformation in the Reserve Bank Balance Sheet in terms of phases chalked by the regime shifts in the conduct of monetary policy. Clubbing the formative years of central banking till the inception of the planning process (*i.e.*, 1935-50), an analysis of the vicissitudes of the monetary strategy allows us to discern three logical phases over the post-Independence period:[8]

- Foundation Phase (1951-69),
- Phase of Social Control (1970-90),[9] and
- Phase of Financial Liberalisation (1991 onwards).

The foundation phase saw the Reserve Bank play a key supportive role in the nation-building process adopted by the Five Year Plans. The entire financial system came to be geared to funding the fisc in the phase of social control in the 1970s and 1980s, beginning with the nationalisation of 14 banks in July 1969. The late 1980s, on the other hand, saw a process of financial liberalisation, which gathered momentum after the balance of payments crisis of 1991.

This periodisation is roughly borne out by the data. A logical indicator of the changing course of central banking in the Indian context is the size of the Reserve Bank Balance Sheet, scaled by the GDP at market prices (Chart 1 and Annexes 1 and 2). Another reasonably good indicator turns out to be the rate of surplus transferred to the Central Government of the Reserve Bank Balance Sheet (Chart 2 and Annex 3). As the share of establishment and other expenditure in the Reserve Bank operations remain



a negligible fraction of the balance sheet, the governing explanation of the Reserve Bank's rate of surplus emanates from the changing macroeconomic environment (Table 14). While the conduct of monetary policy most certainly did not consciously target central bank profitability, the movements in the Reserve Bank's rate of surplus do appear to reflect the turns in monetary policy in the Indian economy over the years.

We have subjected the notion of these *a priori* breaks to formal statistical testing. When we concentrated on the trend rate of surplus and estimated a linear trend equation, the multiple Chow's test

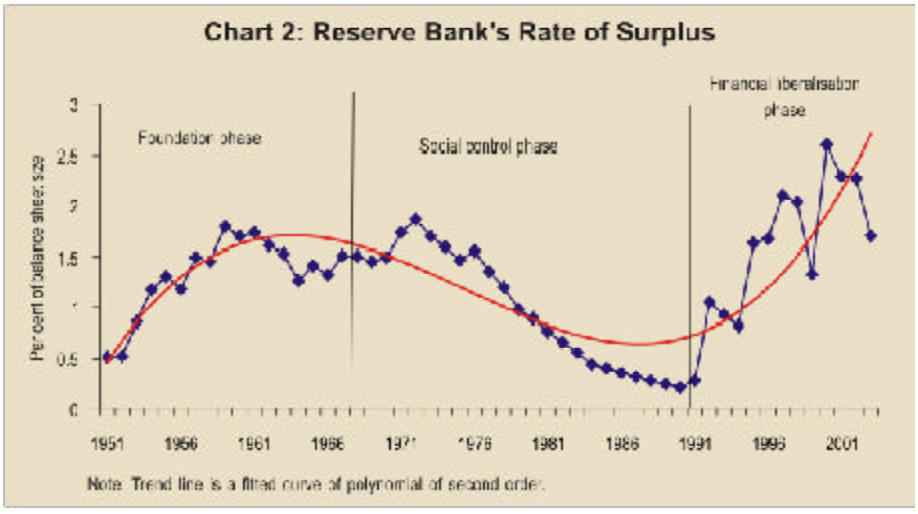


Table 14: Select Establishment and Other Expenditure

(per cent of balance sheet size)

Item	1935-50	1951-70	1971-90	1991-2004
1	2	3	4	5
Establishment	0.1	0.2	0.3	0.2
Agency Charges	0.1	0.1	0.2	0.2
Security Printing (Cheque, Note forms *etc.*)	0.0	0.1	0.1	0.2
Total Establishment and Other Expenditure	0.2	0.4	0.6	0.8

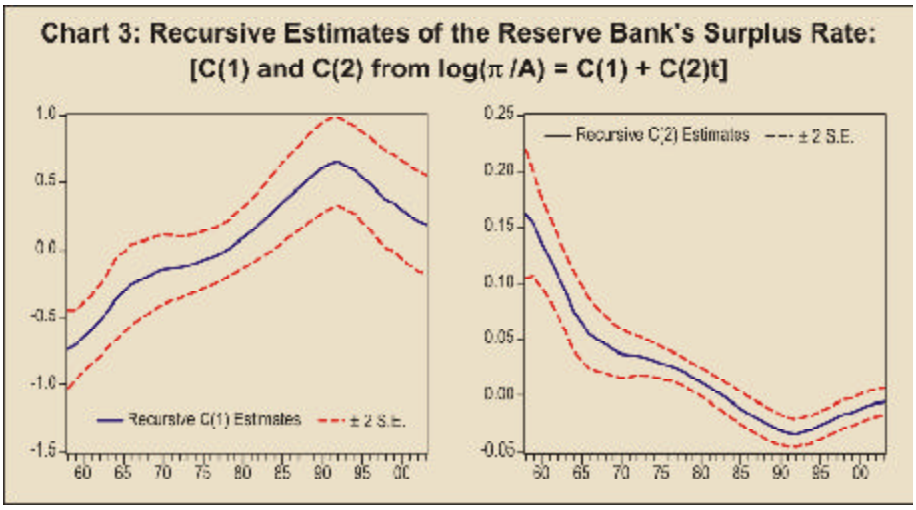
Source : RBI Annual Report, various issues.

confirms a break in the data on the Reserve Bank's rate of surplus the first time in 1971, close to our partition of 1969 between the first and second phases (Table 15).

Table 15: Break in the Trends in the Rate of Surplus of the Reserve Bank - Results from Multiple Chow's Test

Break at	Chow's F	p-values
1	2	3
1955	2.21	0.12
1956	2.20	0.12
1957	2.12	0.13
1958	2.11	0.13
1959	2.04	0.14
1960	2.14	0.13
1961	2.18	0.12
1962	2.26	0.12
1963	2.23	0.12
1964	2.15	0.13
1965	1.82	0.17
1966	1.74	0.19
1967	1.61	0.21
1968	1.75	0.19
1969	1.94	0.15
1970	2.15	0.13
1971	2.48	0.09
1972	3.29	0.05
1973	4.61	0.02
1974	6.08	0.00
1975	7.82	0.00
1976	9.83	0.00
1977	13.25	0.00
1978	17.18	0.00

Note : The basic equation, viz., log $\rho/A = a + bt$, is estimated over the interval [1950, 2002] with the sub-samples spanning over [1955, 1990], where ρ is the RBI's surplus and A is RBI's assets.



A second test is recursive estimation, which traces the evolution of estimates for any coefficient as more and more of the sample data are used in the estimation. Chart 3 presents a plot of selected coefficients in the equation for all feasible recursive estimations, along with two standard error bands around the estimated coefficients. Since the coefficients display significant variations as more data is added to the estimating equation, there is a strong indication of instability in the trend of the rate of surplus. This confirms a break in 1991, which is again the point of departure between the second and third phases.

Having confirmed the periodisation scheme, let us now move to a chronicle of the Indian economy to relate the macroeconomic outcome to specific features of the Reserve Bank Balance Sheet.[10]

Formative Years

The Reserve Bank was tried and tested at birth (Deshmukh, 1948; RBI, 1970; Goldsmith, 1983). A cheap money policy in the wake of the Depression, followed by a large build-up of sterling balances with the Reserve Bank as a result of war expenditures by the American and British forces in the Indian sub-continent began to feed inflation by the mid-1940s (Table 16). The latter half of the 1940s also saw a

Table 16: Inflation: 1930s and 1940s

(Per cent)

Period	Growth Rates			Ratio of RBI's Foreign Assets to Domestic Assets	Currency to GDP
	Real GDP	WPI	Money		
1	2	3	4	5	6
1936-40	1.3	4.3	9.6	39.1	8.0
1941-45	1.0	18.1	37.8	95.4	12.5

Source : RBI (1954) and Sivasubhramanium (2000).

number of shocks beginning with the partition of the country in August 1947, followed by the first devaluation of the Rupee in September 1949, in tandem with a devaluation of the sterling and a sudden jump in raw material demand arising out of the Korean War. As a result, a post-war easy money policy in support of reconstruction had to be reversed to rein in inflation.

In tandem, the size of the Reserve Bank Balance Sheet enlarged from 10 per cent of GDP in 1935-36 to over 20 per cent in 1944-45 with the accumulation of sterling balances. The rundown of sterling balances in order to pay for the transfer of power and meet the deficit in hard currency areas was, however, substituted by a higher monetisation of public debt. The Reserve Bank's rate of surplus began to climb in the early 1940s reflecting the war-time hardening of interest rates and the concomitant increase in the share of the Government in the central bank income with the advent of World War II (with the share of dividends declining steadily to about 2 per cent of disposable income by June 1944 from 30 per cent in June 1940). Profitability, however, declined since the late 1940s, with the softening of interest rates, as most central banks eased monetary conditions in order to aid post-war reconstruction.

Foundation Phase

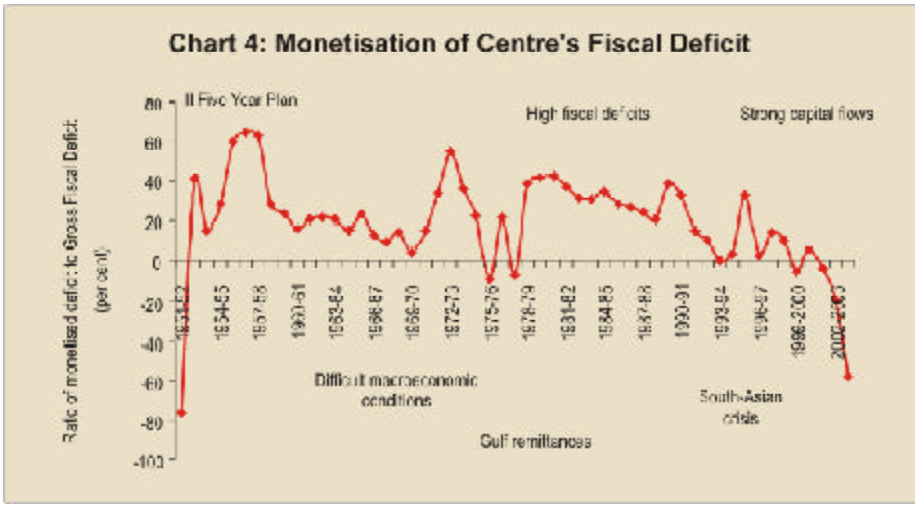
India, like most developing economies, adopted the path of planned economic development in the 1950s and 1960s

(Balachandran, 1998). The role of the Reserve Bank in the planning process was charted out in the First Five-Year Plan (1951): "…Central banking in a planned economy can hardly be confined to the regulation of overall supply of credit or to a somewhat negative regulation of the flow of bank credit. It would have to take on a direct and active role, firstly, in creating or helping to create the machinery needed for financing developmental activities all over the country and secondly, ensuring that the finance available flows in the directions intended…".

The concomitant concept of "development central banking" involved a three-pronged strategy of developing an institutional framework of industrial financing alongside the extension of rural credit and designing concessional financing schemes for economic development (Singh, Shetty and Venkatachalam, 1982). [11] As a result, the Reserve Bank's exposure to the financial system began to enlarge with investments in the equity of the newly-constituted financial institutions and the State Bank of India (1955), higher refinance, especially against rural credit and the institution of national funds, to advance lines of credit to financial institutions.

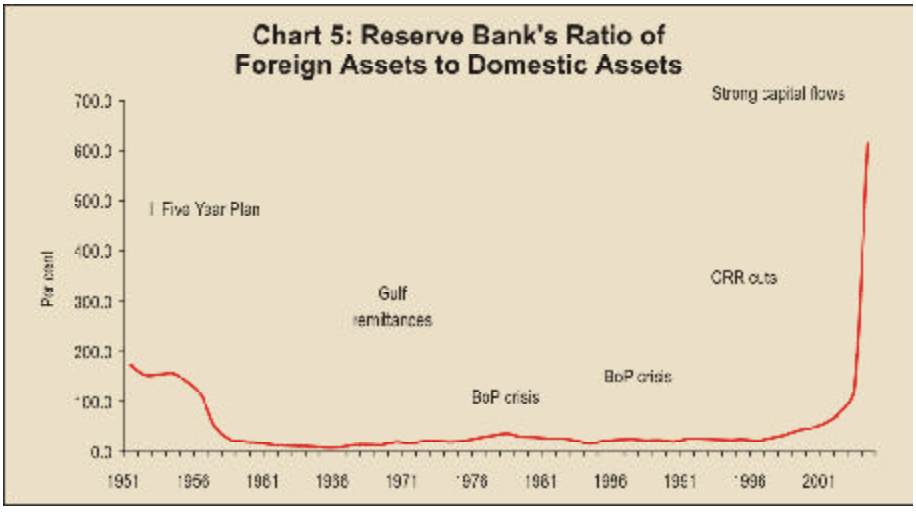
A natural corollary of the process of state-led development was the gradual increase in the Government's demand for funds. Deficit financing, for example, accounted for as much as 25 per cent of the Second Five-Year Plan outlay, almost double of that during the First Five Year Plan, reflecting the widespread consensus that public investment could spur growth - although there were certainly voices of dissent as well (Sen, 1951; Rama Rau, 1960; Chandler, 1962) (Chart 4). The fiscal deficit exacerbated in the 1960s with the levelling-off of foreign aid and the increase in defence expenditure in the wake of conflicts, followed by serious droughts in the mid-1960s, resulting in a second devaluation of the Indian Rupee in June 1966 (Pattnaik *et al*, 1999).

Large-scale imports, necessary for the process of industrialisation envisaged in the Second Five-Year Plan, resulted in a sharp drawdown of foreign exchange reserves from the mid-1950s. The composition of the Reserve Bank Balance Sheet thus changed quite dramatically



by the late 1950s, with foreign assets falling from an average of 150.0 per cent of domestic assets during 1951-56 to about 25.0 per cent during 1957-62 (Chart 5). The proportional reserve system, which required that 40 per cent of the note issue had to be backed by foreign assets (including gold), was gradually replaced by a minimum requirement of Rs.200 crore.[12]

With the Government taking increasing recourse to the Reserve Bank, there emerged a practice of automatically creating *ad hoc* Treasury Bills in favour of the Reserve Bank to the extent of the



shortfall in Government balances.[13] The ceiling on the Reserve Bank's investments in Government paper (and maturities thereof) in the Banking department in terms of capital, reserves and deposit liabilities had already been removed in 1951. In order to avoid problems of roll-over in view of sustained budgetary requirements, the Reserve Bank began to fund *ad hoc*s into marketable securities which could be offloaded to the market in due course by 1959, especially as the Banking Regulation Act, 1949, was amended in 1962 to raise the minimum statutory liquidity requirement to 25 per cent of banks' eligible demand and time liabilities from the original 20 per cent, in order to provide a captive market for Government paper.[14] In case of State Governments, an increase in the limit for clean advances was reinforced by the introduction of another facility of special advances against the pledge of Government securities in April 1953.

Although inflation was still believed to be structural, the central bank was not unaware of the potential for deficit financing to put pressure on prices.[15] Reserve requirements were enlarged from the original levy of a daily minimum of 5 per cent of demand liabilities and 2 per cent of time liabilities to between 5 and 20 per cent of demand liabilities and 2 and 8 per cent of time liabilities on an average basis (1956) and thereafter between 3 and 15 per cent of demand and time liabilities (1962). Additional reserve requirements were, in fact, imposed between March-November 1960, as monetary expansion began to feed inflation.

The size of the Reserve Bank Balance Sheet declined to 13.2 per cent of the GDP at current market prices during the 1960s from 14.8 per cent during the 1950s and 15.4 per cent during 1936-47. This reflected the gradual spread of banking habits with the expansion of the banking network during the foundation phase, inducing a shift from cash to the banking channel.

As the domestic interest rates in relation to the international interest rates were relatively higher during the latter half of the 1950s than during the first half of the 1950s, the switch in favour of domestic assets, boosted the rate of the Reserve Bank's surplus to 1.6 per cent

of the asset base during 1957-62 from 0.9 per cent during 1951-56. Since the national funds were funded out of central bank income, there was a corresponding reduction in the rate of surplus.

Phase of Social Control

Although the foundation phase ended on a sombre note, the strategy of social control continued to be strengthened in the 1970s. The entire monetary and banking system came to carry out the objectives of the Government as the "primary entrepreneur" of the economy through an inter-linked programme of bank nationalisation, directed credit and concessional financing (RBI, 1985).[16] The Reserve Bank continued to provide substantial accommodation to the Government, especially during the first half of the 1970s in view of the difficult macroeconomic challenges fostered by war (1971), drought (1972) and the oil price shock (1973). The brief respite in the latter half of the 1970s following strong inflows, especially from the Gulf, after the launch of the Foreign Currency Non-Resident (Account) [FCNR(A)] scheme in November 1975 with the Reserve Bank's exchange rate guarantee, was dissipated by the early 1980s, when the severe strain on the balance of payments, primarily as a result of the second oil shock, required India to seek a line of credit with the IMF under its Extended Fund Facility. The fiscal gap began to widen further in the 1980s - the gross fiscal deficit averaged 7.7 per cent of GDP in the latter half of the 1980s - searing the macroeconomic balance (RBI, 2003).

The fiscal dominance of monetary policy deepened in the 1980s. Voluntary subscriptions were hard to come by despite the hike in interest rates on government paper during the 1980s. As a result, the Reserve Bank had to fill up the fiscal gap, with its net credit to the Government famously coming to account for 90 per cent of the monetary base in the 1980s, almost doubling the ratio of monetisation to GDP to 2.1 per cent during the 1980s from 1.1 per cent during the 1970s. The Reserve Bank began to lose control of its balance sheet as *ad hoc*s emerged as a mainstay of the Centre's fiscal deficit. By 1982, the Reserve Bank began to fund *ad hoc*s into an instrument

called the 4.6 per cent special securities without any maturity, as it was becoming increasingly difficult to further offload gilts to the market.

By the early 1980s, it was clear that the increasing order of deficit financing, that was a natural result of the increasing scale of government, was beginning to spill over into inflation, especially as the output response was limited by structural constraints (Bhattacharyya and Lodh, 1990; Jadhav, 1994).[17] Monetary expansion emanating from the monetisation of the fiscal deficit was clearly excessive, even accounting for a decline of the M_3 income velocity from 3.7 during the 1970s to 2.6 during the 1980s with the spread of 'banking habits' in the economy. Besides, while the initial objective of creating a large network was achieved, it was apparent that the banking system was not able to allocate resources efficiently because the gradual extension of 'social control' had blunted the process of price discovery. This mood of cautious revisionism was exemplified in the report of the Chakravarty Committee which proposed a degree of financial liberalisation to allow 'controlled' price competition among banks through deregulation of deposit and lending rates and development of financial markets beyond the basic recommendation of money targeting, which in itself made a case for fiscal discipline. Deficit financing was seen to exceed 'safe limits', preventing the Reserve Bank from achieving an acceptable order of inflation, taken at 4 per cent to reflect changes in relative prices necessary to attract resources to growth sectors.

The ability of the Reserve Bank to combat the growing inflation was constrained by the shrinkage in its armory of monetary policy instruments with the gradual withering away of financial markets since the 1960s (Table 17) (Mittra, 1967; RBI, 1985; Khatkhate, 1988). Of the major tools of monetary policy, the efficacy of the Bank Rate was increasingly limited by the extension of the administered interest rate regime - although it is doubtful if it was particularly effective even earlier given the lack of developed money markets - and the scope of open market operations was circumscribed by the narrowness of the

Table 17: Reserve Bank's Principal Monetary Policy Instruments

Instrument/Decade	1950s	1960s	1970s	1980s	1990s	2000-04
1	2	3	4	5	6	7
Cash Reserve Ratio			Ö	Ö	Ö	Ö
Standing Facilities	Ö	Ö	Ö	Ö	Sector-specific refinance de-emphasised.	Mostly absorbed under the LAF.
Credit Control	Ö	Ö	Ö	Ö	Phased out.	
Open Market Operations	Ö	Ö	Ö		Reactivated 1992-93.	Ö
Bank Rate	Ö	Ö	Ö		Reactivated 1997-98.	Ö

Note : Ö denotes the use of the instrument during the decade.

Source : RBI (2003).

government securities markets. The Reserve Bank had to, therefore, repeatedly raise reserve requirements to contain the inflationary effect of deficit financing, pushing the combined statutory pre-emptions (along with statutory liquidity requirements) to over 60 per cent of deposit mobilisation by 1991, constraining banks' portfolio choices (Malhotra, 1990). This could not arrest the upward drift in the money multiplier to 2.7 during the 1970s from 1.9 during the 1960s, as the spread of branch banking in semi-urban and rural areas pulled down the share of currency in broad money to 23.2 per cent as at end-March 1982 from 39.8 per cent as at end-March 1971.

The composition of foreign exchange reserves underwent a transformation after the breakdown of the Bretton Woods agreement in the early 1970s.[18] The Reserve Bank traditionally maintained its foreign exchange reserves in pound sterling.[19] After the fixed exchange rate system collapsed in 1971, the Reserve Bank initially pegged the Rupee to the US dollar, thereafter to pound sterling and finally to a basket of currencies of India's major trading partners (September 1975), with a target band around the base value of Rs.18.3084 per pound. Simultaneously, the Reserve Bank began to deal in other currencies such as the US dollar (since October 1972), the Deutsche mark (since March 1974) and the Japanese yen (since

end-May 1974) although sterling continued to be the intervention currency for another 20 years.

This strategy of neutralising the monetary impact of deficit financing, on the asset side, by the higher reserve requirements, on the liability side, began to inflate the Reserve Bank's balance sheet (as a proportion of GDP) from the mid-1970s. Notwithstanding the acceleration in the process of financial deepening after 1969, this reversed the declining trend in the size of the Reserve Bank Balance Sheet relative to GDP of the previous two decades. In the late 1970s, for example, the higher CRR impounded nearly Rs.2,000 crore of lendable resources from banks, amounting to about 10 per cent of the balance sheet as on end-March 1981. As a result, the ratio of bank balances to cash began to rise sharply in the latter half of the 1970s.

The Reserve Bank's rate of surplus actually recorded a sustained decline during the 1970s and the 1980s, in contrast to the foundation phase. This reflected the impact of three inter-related factors. First, the composition of the Reserve Bank's balance sheet came to be heavily loaded in favour of *ad hoc*s during the 1970s and 1980s - barring a few years of strong reserve accretion in the mid-1970s. This effectively implied that the bulk of the Reserve Bank's interest income was pegged to the interest rate on *ad hoc* Treasury Bills, left unchanged at 4.6 per cent since July 1974, in contrast to the periodic increases in the 1950s and 1960s. Secondly, the Reserve Bank increased its allocations to the national funds, which rose to an average of 10 per cent of the balance sheet during 1975-80 from 7.1 per cent of the balance sheet during 1971-75 in line with societal considerations. Thirdly, the share of the interest-bearing bank reserves component began to increase to 37.0 per cent of reserve money as at end-March 1990 from 4.3 per cent as at end-March 1971, with the sustained hike in reserve requirements. At the same time, the rate of interest on required reserves beyond the mandatory minimum of 3.0 per cent of banks' demand and time liabilities was raised steadily to 10.5 per cent by March 1990 from 4.75 per cent in June 1973, to cushion the impact of the hike in the CRR.

Phase of Financial Sector Liberalisation

The 1990s witnessed a comprehensive programme of financial liberalisation, with the deregulation of interest rates, withdrawal of balance sheet restrictions to allow a greater play of portfolio choice and liberalisation of the external sector, which transformed the Indian financial landscape. Although the twin objectives of monetary policy remain the pursuit of price stability and the provision of adequate credit to the productive sectors of the economy, the growing complexities of macroeconomic management increasingly required that monetary policy formulation be based on multiple macroeconomic indicators rather than being predicated on a single monetary aggregate (RBI, 1998a; 1998b). The monetary policy operating procedure had to be recast comprehensively to hone up an array of indirect instruments to modulate liquidity conditions in consonance with the process of price discovery (Chandavarkar, 1996 Kanagasabapathy, 2001; Vasudevan, 2002). The Reserve Bank is now able to influence the quantum of liquidity through a policy mix of open market (including repo) operations alongside changes in reserve requirements and standing facilities, reinforced by interest rate signals, through changes in the policy rates (Bank/repo rates) which impact the price of primary liquidity (Reddy, 2001 and 2002).

The precise sequencing of changes in the Reserve Bank's monetary policy framework reflected the compulsions of the macroeconomic environment (RBI, 2003). The decade opened with a balance of payments crisis in 1991 requiring swift monetary and credit measures to contain demand, including import compression. With capital flows pouring in after macroeconomic stabilisation, the Reserve Bank had to absorb the excess foreign exchange in its balance sheet in order to maintain the external competitiveness of the economy, especially with the gradual floatation of the Indian Rupee in March 1993, and at the same time, contain the monetary impact to rein in inflation, which was climbing to double digits.[20] Open market (including repo) operations were re-introduced in 1992-93 to sterilise the surplus capital flows. Although the Reserve Bank repeatedly emphasised its desire to reduce reserve

requirements, which effectively acted as an indirect tax on the banking system, the CRR, nevertheless, had to be raised to impound surplus liquidity. It was only once inflation was reined by mid-1990s, that the Reserve Bank was free to pursue its medium-term goal of cutting the CRR to the statutory minimum, abetted by the fact that the onset of the domestic slowdown simultaneously required the easing of monetary conditions. This was further facilitated by the gradual phasing out of the automatic monetisation of the fiscal deficit.[21] The parallel liberalisation of the interest rate structure enabled the Reserve Bank to re-activate the Bank Rate as a signaling device in 1997-98.

The composition of the Reserve Bank Balance Sheet changed dramatically during the 1990s reflecting the impact of financial liberalisation (RBI, 2004b). The ratio of net foreign assets to reserve money climbed to 111 per cent as at end-March 2004 from 7.8 per cent as at end-March 1990, reflecting both the scale effect of the sustained cut in reserve requirements as well as the substitution effect of sterilisation operations (RBI, 2003). The composition of the Reserve Bank's domestic assets has also changed with the phasing out of sector-specific facilities and the concessional finance available to development financial institutions out of the national funds in tune with the increasing market orientation of central banking. This effectively means that the Reserve Bank's domestic claims are increasingly sovereign in character, imparting an intrinsic strength to its balance sheet. As a result of the shift to indirect instruments of monetary control, the share of bank reserves in the overall liabilities has been coming down in the latter half of the 1990s to 13.1 per cent of overall liabilities as at end-June 2004 from 30 per cent of overall liabilities as at end-June1995. Reflecting the changes in reserve requirements, the size of the Banking department relative to the Issue department has followed an inverted U curve in the last 30-odd years.

The process of financial liberalisation began to transform the behavioural relations between the various components of the Reserve Bank Balance Sheet. The intimate correlation between cash demand and the monetised deficit fostered by the deficit financing of public

expenditure in the 1970s and the 1980s, for example, began to weaken as the fisc came to be increasingly funded by bank liquidity generated by capital flows.

The impact of monetary reforms on the rhythm in the Reserve Bank Balance Sheet has varied from time to time as is natural in a time of transition. Banks are allowed, for instance, to maintain required reserves on an average basis to facilitate the management of their portfolio. Since inter-bank liabilities were subject to reserve requirements, cash surplus banks began to switch from the inter-bank market to tap Treasury bills and repos, which would not attract CRR, on reporting Fridays, artificially compressing the Reserve Bank Balance Sheet and killing the inter-bank market. The decision to withdraw CRR on inter-bank liabilities, on the recommendation of the Sodhani Committee to facilitate the pricing of 14-day money, rekindled the inter-bank market on reporting Fridays and imparted a greater degree of stability to the Reserve Bank Balance Sheet. Secondly, Indian banks had long followed the Scottish practice of offering lines of credit to their *clientele*, thus taking on themselves the onus of cash management, which could be conveniently passed onto the central bank balance sheet through purchase (and discounting) of tap Treasury bills, with a discounting facility. The restrictions on cash credit in favour of term loans in the early 1990s and the phasing out of tap Treasury Bills in April 1997, buttressed by limits on banks' call money transactions, easing out of non-bank intermediaries from the inter-bank call money market and the simultaneous development of the non-Reserve Bank repo market, now provide an incentive for banks and their borrowers to frame their individual liquidity management strategies and insulates the central bank from day-to-day fluctuations in funds flows. Finally, the prescription of capital to risk-weighted assets (CRAR) requirements in 1992-93 often induces banks to switch to 'risk-free' bank reserves and/or Reserve Bank repos. As a result, the size of the Reserve Bank Balance Sheet (and reserve money) on March 31 is heavily influenced by banks' portfolio preferences, expanding on March 31, 2004 (in the event of a switch to excess reserves) and contracting on March 31, 2003 (because of large-scale repos).

The relationship between the central bank balance sheet and fluctuations in financial prices was driven home during the balance of payments crisis of 1991. As the Exchange Fluctuation Reserve (EFR) was drawn down to meet the mounting exchange losses under the FCNR(A) scheme after the devaluation of the Rupee in July 1991, it had to be replenished from the Contingency Reserve, which, in turn, was eroded to a nominal amount of Rs.859.1 crore as at end-June 1993. As a result, the Contingency Reserve itself had to be rebuilt in the mid-1990s, taking advantage of a sharp increase in foreign income arising from the firming up of short-term interest rates in overseas markets (Table 18). This was backed by the institution of an Asset Development Reserve in 1997-98, in order to meet the internal capital expenditure, and investments in its subsidiaries and associated institutions. The need for adequate reserves is reinforced by the experience of 2003-04 when the upswing in the interest rate cycle cost the Reserve Bank as much as Rs.6,000 crore in terms of the associated depreciation of domestic and foreign securities.

Table 18: Reserve Bank's Capital Account

Per cent to total assets

End-June	Capital Account	Reserves	Contingency Reserves (including Asset Development Reserve)	Exchange Fluctuation Reserve	Exchange Equalisation Account	Capital Account	*Memo:* National Funds
1	2	3	4	5	6	7=1+2+3+4+5+6	8
1935	2.1	2.1				4.2	
1951	0.3	0.3				0.6	
1971	0.1	2.6				2.7	6.3
1991	0.0	5.2	4.5	2.9	4.4	17.0	4.7
2004	0.0	1.1	10.2	10.2	0.0	21.5 $	0.0

$ Includes previous balances under the National Industrial Credit (Long-Term Operations) Fund.

Note : The Working Group on Money Supply : Analytics and Methodology of Compilation (Chairman: Y.V. Reddy) expanded the definition of the Reserve Bank's capital account to include capital paid-up, reserves, national funds, contingency reserves, exchange fluctuation reserves (now called Currency and Gold Revaluation Account) and exchange equalisation account.

Source : RBI Annual Report, various issues.

The size of the Reserve Bank Balance Sheet continued to expand in the first half of the 1990s as the monetary impact of the accretion to the Reserve Bank's foreign assets on the asset side was sought to be neutralised by the increase in reserve requirements, more or less, in line with the earlier strategy of neutralising the monetised deficit. The ability of the Reserve Bank to trade the surpluses on the external account and the deficit on the Government account with the re-introduction of open market operations began to insulate its balance sheet from the switches in capital flows by the mid-1990s. The size of the balance sheet began to shrink in the latter half of the 1990s with the sustained reduction in reserve requirements to ease liquidity conditions in response to the domestic slowdown. This trend was, however, reversed in 2003-04 with the institution of the Market Stabilisation Scheme which pumps up the balance sheet by the amount of the proceeds parked by the Government with the Reserve Bank.

The profitability of the Reserve Bank during the 1990s has fluctuated in response to the various structural shifts in the operating procedure of monetary policy (Chart 6). The share of income from foreign sources in the Reserve Bank's total income is now substantial - although the interest differential between the domestic and international interest rates ensures that the ratio of foreign income to domestic income tends to be lower than the ratio of foreign assets to domestic assets (Table 19). The Reserve

Chart 6: Reserve Bank's Rate of Surplus, 1991-2004

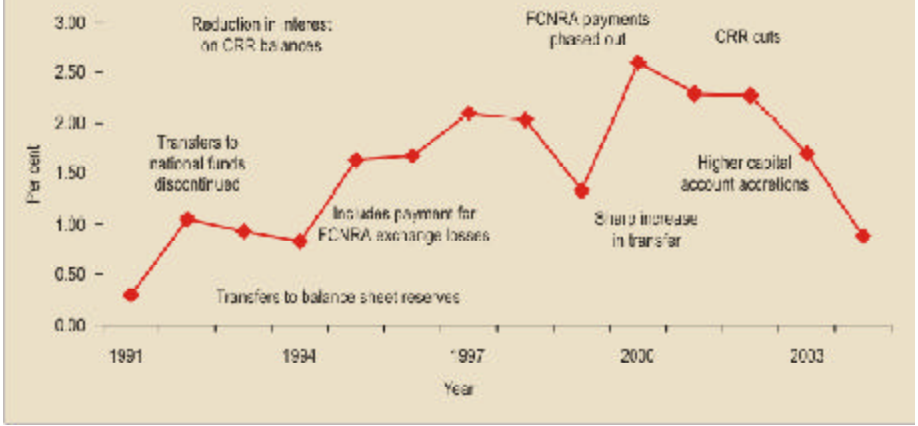


Table 19: Composition of Reserve Bank's Income

Per cent to total

End-June	Domestic Income		Foreign Income	*Memo* : Interest Rates on Government Borrowing (per cent)
	Total	OMO Profits		
1	2	3	4	5
1997-98	59.5	3.8	40.4	12.01
1998-99	67.1	6.0	32.8	11.86
1999-2000	70.3	14.9	29.7	11.77
2000-01	53.7	0.4	46.2	10.95
2001-02	59.5	12.4	40.4	9.44
2002-03	57.6	20.7	42.4	7.34
2003-04	36.4	16.2	63.6	5.71

Source: RBI Annual Report, various issues.

Bank's income from domestic sources is increasingly growing sensitive to fluctuations in financial prices. The resultant volatility in the income from open market operations imparts a greater degree of volatility to the Reserve Bank's profitability.

The impact of monetary reforms on the Reserve Bank's rate of surplus has been non-linear primarily because the programme of financial liberalisation is essentially about removing the cross-subsidies which obfuscated the process of price discovery. What is important to appreciate is that the various drivers, irrespective of their diverse impact, have in common, an organic link with monetary reforms. On balance, the rate of surplus climbed in the first half of the 1990s reflecting three factors:

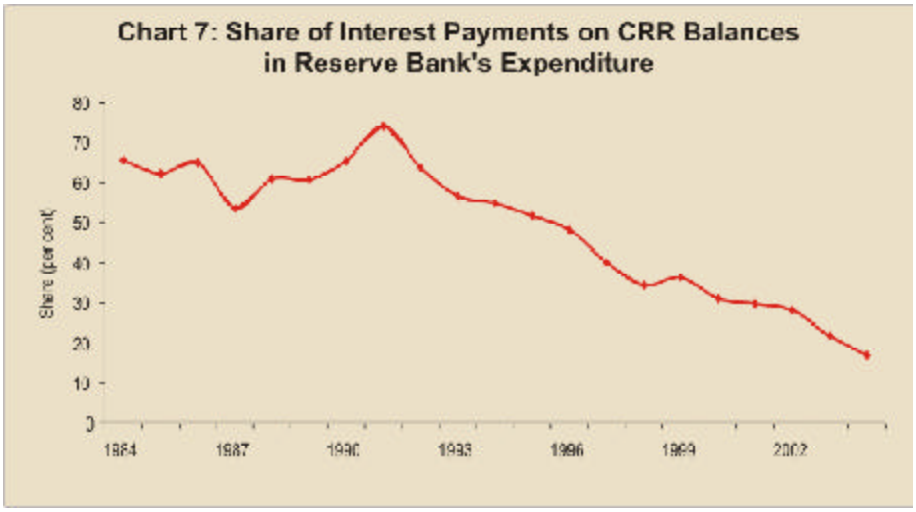
- Discontinuation of allocations to national funds (apart from a token contribution of Rs. one crore for each fund every year pending the amendment of the Reserve Bank of India Act, 1934), effective June 1992, in order to cut back on concessional finance;
- Acquisition of government paper at market-related rates, far higher than the interest rate of 4.6 per cent earned on *ad hoc* Treasury Bills, especially as the weighted average interest rate on government borrowing rose to 13.75 per cent by 1995-96; and,

- Transfer of the *quasi*-fiscal costs of the exchange rate guarantee for FCNR(A) deposits, in terms of liabilities relating to the exchange loss to the Government effective July 1, 1993, with the Reserve Bank transferring the correspondingly larger surplus to avoid fiscal implications between July 1993-August 1997.[22] Although the Reserve Bank continued to promote mobilisation of foreign currency deposits through bullet Resurgent India Bonds (1998-2003) and India Millennium Deposits (2000-), it no longer provides an exchange rate guarantee.[23]

Similarly, the decline in the Reserve Bank's rate of surplus since the latter half of the 1990s was driven by four market-related factors:

- Interest rates on Government paper declined in the latter half of the 1990s.
- Depreciation of the investment portfolio, following the turn in the interest rate cycle during the first quarter of fiscal 2004-05.
- Ratio of foreign currency assets in overall assets increased, reinforcing the differential between domestic and international interest rates.
- Higher allocations were made to Contingency Reserves (and the Asset Development Reserve) in order to strengthen the balance sheet.

This was partly moderated by the increase in domestic income with the conversion of 4.5 per cent special securities created out of *ad hoc* and tap Treasury Bills into marketable paper at market-related interest rates and a decline in interest payments on CRR balances as a result of the sustained cut in reserve requirements - although the rate of interest was briefly hiked to the Bank Rate (Chart 7).



Section IV

Some Emerging Issues

It is difficult to present the distinct conclusions from an analytical documentation of this nature. At the same time, a survey of the Reserve Bank Balance Sheet raises several issues, with which we conclude our paper. To begin at the very beginning, there is the issue of adoption of international best practices in central bank accounting. It is recognised that the Reserve Bank already fulfils most of the material international accounting standards. There is, in fact, a tendency to err on the side of the caution - investments are marked at the least market valuation rather than the more conventional lower of market value and purchase price, which incidentally already applies for commercial banks.

A key point of the contemporary debate in accounting standards is the treatment of the "hidden" reserves in the central bank balance sheet. While income recognition of unrealised gains is useful for quantifying such reserves - and it is necessary to note that the Reserve Bank already discloses unrealised gains in foreign securities - it is not easy to discount central bank fears of fiscal pressures of sharing such resources with the Government offhand. It is, therefore, necessary to simultaneously promulgate restrictions on fiscal access to such reserves along with their valuation.

There is very little disagreement that greater transparency in monetary operations, in itself, strengthens the credibility of the monetary authority. Although the Reserve Bank's balance sheet is relatively opaque - the bulk of contingency reserves are parked under the head of other liabilities than reserves - transparency in terms of supplementary balance sheet disclosures, buttressed by the allied release of data on monetary operations and the capital account at various frequencies, is now, more or less, in alignment with international best practices. At the same time, transparency is an on-going process - certain central banks already provide much more information regarding risk management (such as the BoE or the RBNZ which publishes value at risk data) and cost of operations by function (such as the Bank of Canada, BoE and RBNZ).

A final issue in this regard is the merger of the Issue and Banking departments into a single balance sheet, as is the case of practically every central bank, except for stray cases such as the original BoE model.[24] While there is some merit in the argument that delineation of the issue function as a separate accounting unit does impart a greater solidity to the Rupee, such restrictions could be very well imposed in a consolidated balance sheet as well (and are imposed in case of certain central banks). There is, thus, at the end of the day, very little material difference between the choices of carrying on with the weight of tradition or modernising to contemporary cross-central bank practices. It is interesting to note that for the Indian national accounts, while the Issue department is classified under 'public administration', the Banking department is taken under 'financing and insurance'.

The second set of issues revolve around the fiscal dominance of monetary policy, especially as the yardstick over the functional autonomy of the central bank in the Indian context is essentially measured in terms of its control over the balance sheet. The quest for limiting the automatic monetisation of the fiscal deficit is reaching its logical conclusion with the Fiscal Responsibility and Budget Management Act, 2003 which prohibits the Reserve Bank from primary subscription to Government paper after March 2006.[25]

There is little doubt that the Reserve Bank is already able to control the form and timing of its accommodation to the Central Government. A critical question, however, is whether monetary policy can ever really be independent either of the fiscal impact on liquidity conditions or for that matter, the liquidity impact on the interest cost of public debt. It needs to be emphasised that monetary management, however adroit, and monetary-fiscal co-ordination, however seamless, is no substitute for fiscal discipline at the end of the day.

A related issue is the claim of the Government on the Reserve Bank's disposable income as its sole owner, which was so far overshadowed by the large-scale money financing of the fiscal deficit. Although the Reserve Bank of India Act, 1934, unlike most central bank legislation, does not mandate central bank reserves, the Reserve Bank has prudently built up a *corpus* to meet unforeseen contingencies. In view of the emerging consensus regarding the need to build up central bank reserves, there is a need to ensure that the Reserve Bank Balance Sheet remains sufficiently strong to enable it to undertake monetary policy action without being hamstrung by balance sheet concerns. There is, therefore, a need to work out a medium-term rule of apportionment of the Reserve Bank's surplus between its own reserves and the Government - if possible with a statutory backing.

The monetary management of the sustained capital flows since November 2000 pose a challenge, especially as the Reserve Bank is beginning to run out of government paper for countervailing open market operations. The choice between the three standard solutions, *viz.,* raising reserve requirements, issuing central bank securities or assuming the central bank is credible enough, conducting uncollateralised repo operations, is often critical, especially as the degree of market orientation and the associated incidence of the dead-weight loss of sterilistion on the monetary authority and the banking system varies a great deal. An intermediate solution between central bank bills (which concentrate the cost on the former) and reserve requirements (which impose a tax on the latter) is to conduct a

continuum of relatively short-term uncollateralised repo operations. While the Market Stabilisation Scheme provides the Reserve Bank the headroom for maneuver, the proposal of the Reserve Bank's Internal Group on Liquidity Adjustment Facility to amend the Reserve Bank of India Act, 1934 in order to enable the institution of a standing deposit-type facility merits attention.

Development central banking remains another contentious point of debate. Although most central banks, including the Reserve Bank, did monetise public investment in the 1950s and 1960s, in the hope of stepping up the process of economic development, the lack of a matching supply response, in most cases, resulted in the excessive monetary expansion feeding inflation. It is in this context that the Reserve Bank, like many other central banks, is gradually withdrawing from directly funding development activities or supporting financial institutions which provide development financing. This not only helps to focus monetary authorities on their primary objective of managing monetary conditions but is also in line with the ethics of corporate governance which requires a firewall between the interests of the regulator and the regulated. This is not to say that the Reserve Bank has abandoned its role in economic development. It is necessary to appreciate that the concept of development central banking itself shifts, as financial systems mature, to introducing financial innovations, building markets, improving payment and settlement systems and providing the appropriate safeguards. There is no gainsaying that the Reserve Bank stands at the very vanguard of the thrust towards financial development.[26]

A final issue is the provision of lender of last resort function, for which the Reserve Bank has a very broad mandate under Section 18 of the Reserve Bank of India Act. The Reserve Bank, like most central banks, already recognises the importance of enhancing financial stability, which in the broadest sense of the term, is now elevated from a "policy concern" to a "key consideration" of monetary policy. Unlike some central banks, especially in emerging market economies,

which have had to fund bank restructuring, it is a proud record that the Reserve Bank has so far been able to eschew any major direct financial involvement. It is desirable that the central bank should use the lender of last resort function very sparingly and truly as the very last resort.

In sum, we find that the report card of the Reserve Bank as a monetary authority for the past 70 years is reasonably strong. There is very little doubt that the central bank has been able to secure the safety of its balance sheet, in line with the international best practices, through the many vicissitudes of monetary conditions. Going forward, this past experience itself provides the Reserve Bank an added instrument of high public credibility and goodwill, for which, again in conservative central bank accounting, there is no reflection in the balance sheet.

Notes

[1] The Bank of England's public debt office has now been segregated.

[2] Hawkins (2003), however, shows that the median size of central bank capital, as proportion to total assets, at 8.8 per cent in emerging market economies, still lags that of advanced economies, at 15.3 per cent, as of May 2003.

[3] On the issue of bifurcation of the Issue and Banking departments in the Reserve Bank balance sheet, the Hilton Young Commission (1926) noted that "…(If) such a separation is proposed, it is because we have been impressed by the view put forward by many witnesses that the accounts of the Reserve Bank should be presented in the simplest possible form, and that it is essential from this point of view to set out in a separate statement the assets and liabilities in respect of the note issue. We think that such a separation would inspire greater confidence in the new note. Although this is a novel way of dealing with the matter, there would seem to be no strong reason why it should not be adopted…".

[4] The Bank Charter Act 1844 requires that the Bank of England's note issue function should be separated from its other activities for accounting purposes.

[5] Foreign securities include: i) balances with the bank which is the principal foreign currency authority of the foreign country and other balances or securities maintained with or issued by the IMF, IBRD, IDA, IFC, ADB, BIS and any other banking or financial institution notified by the Central Government in this behalf which is repayable within a period of ten years, ii) bills of exchange bearing two or more good signatures and drawn on or payable at any place in a foreign country which is a member of the IMF and having a maturity not exceeding 90 days and iii) Government securities of such a foreign country maturing within 10 years.

[6] These include the Deposit Insurance and Credit Guarantee Corporation, National Bank for Agriculture and Rural Development, Discount and Finance House of India, Securities Trading Corporation of India, National Housing Bank, Bharatiya Reserve Bank Note Mudran (Private) Limited and Infrastructure Development Finance Company.

[7] This is in line with the recommendations of the Reserve Bank's Informal Group (Chairman: V. Subrahmanyam) which proposed a cover of 5 per cent of balance sheet, for risks of a 10 per cent volatility in prices of domestic assets and foreign securities because of monetary /exchange rate policy compulsions; 5 per cent, for revaluation of foreign assets and gold; and 2 per cent, for systemic risks and requirements relating to central bank development functions, internal frauds, unforseen losses, *etc* (Reddy, 1997).

[8] The Reserve Bank began to gradually assume the standard central banking functions in the mid-1930s. The Reserve Bank took over the management of currency from the Controller of Currency in April 1935 and began to issue notes in January 1938. An agreement with the Secretary of State for India in Council on April 5, 1935 determined the terms and conditions of services as banker to the Government. After the emergence of Provincial Autonomy in April 1937, the central bank entered into similar agreements with the Provincial Governments (RBI, 1983).

[9] Our periodisation is largely in line with Malhotra (1990) and Jadhav (2003), with the difference that our phase of social control covers the phases of expansion and consolidation and diversification. Our decision to club the two phases is guided by the fact that incipient attempts at financial sector reforms during the 1980s do not seem to have significantly affected the macroeconomic outcome.

[10] For a detailed commentary on the Indian macroeconomy, see Joshi and Little (1992).

[11] Including the Industrial Finance Corporation of India (1948), for medium- and long-term finance, Refinance Corporation of India (1958), to provide banks refinance against industrial loans, Industrial Development Bank of India (1964), the apex term-lending institution (which also took over the Refinance Corporation) and the Industrial Reconstruction Corporation of India (1971), to fund the revival of sick industries. The Reserve Bank also played an active role in setting up a network of State Financial Corporations to meet the term credit needs of local medium- and small-scale industries and funding land development banks. The Reserve Bank also subscribed 50 per cent of the initial capital of the Unit Trust of India.

[12] The Reserve Bank of India (Amendment) Act, 1956 required note issuance to be backed by Rs.400 crore in foreign securities and Rs.115 crore in gold and bullion. The value of gold was revalued from Rs.40 crore to Rs.118 crore at the price agreed by the IMF at the time of the September 1949 rupee devaluation. The Reserve Bank of India (Amendment) Act, 1957 diluted the minimum holding of gold, bullion and foreign securities to Rs.200 crore (with at least Rs.115 crore in gold) with the Central Government empowered to even waive this nominal requirement of foreign securities.

[13] The Reserve Bank is authorised to grant ways and means advances to the Government repayable not later than three months from the date of making the advance under Section 17(5) of the Reserve Bank of India Act. The Reserve Bank and the Ministry of Finance agreed in early 1955, that whenever the cash balances of the Government fell below Rs. 50 crore, *ad hoc* Treasury bills would be created in favour of the central bank to restore the Central Government's cash balances. The then Finance Minister, T.T. Krishnamachari,

did assure the Reserve Bank that it would be the duty of the Finance Ministry to formulate its proposals for borrowing and deficit financing in consultation with the Reserve Bank but as subsequent history shows, a seemingly innocuous operational arrangement opened up the floodgates of automatic creation of *ad hoc*s to finance the Government deficit (Rangarajan, 1993).

[14] This was supported by several measures to tighten the grip of the planning process over the banking system, including the introduction of the Credit Authorisation Scheme in 1965, under which approvals for large-size working capital limits required prior central bank approval, extension of selective credit controls, introduced in 1956, and the regulation of deposit and lending rates under Sections 21 and 35A of the 1949 Banking Regulation Act, which took root in the early 1960s. Another step to contain the interest cost of public debt was to sell Treasury Bills on tap (with a discounting facility) at a fixed price effective July 1965, discontinuing the auctions, introduced as early as 1917.

[15] With a gradual increase in inflation during the second half of the 1960s, there was a relook at the process of deficit financing. In February 1966, Governor Bhattacharyya stressed that, "…The monetary assets of the central bank are both domestic and foreign assets; though in terms of their impact on money creation with the economy there may not be (superficially at least) any distinction, the precise manner in which the expansion is given effect to is clearly important. To the extent to which the expansion takes place as a result of accumulation of foreign assets, there is, in a manner of speaking a built-in adjustment mechanism in the form of the potential created for financing an import surplus at a subsequent stage. But where the expansion in the assets takes the form of domestic assets the responsibility of central banking policy to watch the impact of the monetary expansion is all the greater…There is always the possibility of the monetary expansion itself turning out to be larger than anticipated…- and the safe level of deficit financing being breached…".

[16] The range of sector-specific refinance facilities offered by the Reserve Bank began to expand by the mid-1960s. The method of provision of refinance and its cost varied from slab basis charges, the net liquidity ratio and a basic refinance limit of 1 per cent of banks' total demand and time liabilities. The Reserve Bank offered advances against Government and other authorised securities (a facility which persisted into the mid-1990s); against demand promissory notes executed by banks supported by i) usuance promissory notes of their clients (under the Bill Market Scheme of 1952-70 and the subsequent Bill Rediscounting Scheme); ii) export credit of various forms (since 1963); iii) agricultural credit, which, along with the funds under national funds for agriculture is presently largely routed through NABARD and iv) import financing. The Reserve Bank also administered the Credit Guarantee Scheme, introduced in July 1960, to guarantee advances by banks and other institutions to small-scale industries. While some degree of concessional finance was necessary, it is a moot point if the Reserve Bank should have routed high-powered money through scheduled commercial banks for purchase of foreign exchange by Indian shipping companies for buying ships abroad under the Ships Acquisition From Abroad Under New Scheme (SAFAUNS).

[17] In February 1979, Governor Patel pointed out that: "…I am afraid this country of ours, great and blessed as it is, enjoys no such divine dispensation of immunity from monetary laws – which are after all, only reasonable approximations to the laws of supply and demand which at least business men should not belittle or deride…".

[18] Consequent upon the second amendment of the articles of the International Monetary Fund, the Reserve Bank received a part of the gold (Rs.21.12 crore) and also purchased a further Rs.21.13 crore in a non-competitive bid.

[19] After India, like most of the sterling area countries, began to diversity its portfolio, the British Government entered into a three-year commitment, in September 1968, to compensate for the erosion in the value of the sterling *vis-à-vis* the US dollar, in return for a 'minimum sterling proportion'.

[20] On the recommendations of the Rangarajan Committee (1992), the Reserve Bank initially introduced the Liberalised Exchange Rate Management System (LERMS) in March 1992, in which 40 per cent of the exchange earnings had to be surrendered at an official rate determined by the Reserve Bank, which in turn was obliged to sell the foreign exchange only for essential commodities such as oil, fertiliser and life saving drugs, besides funding the Government's debt servicing obligations while the balance could be converted at market-related rates.

[21] The Union Budget of 1994-95 announced the 'historic' decision to phase out *ad hoc* Treasury Bills over a period of three years. A first supplemental agreement between the Government and the Reserve Bank on September 9, 1994 stipulated that *ad hoc*s would be phased out by fiscal 1997-98, with *intra*-year and year-end limits in the *interregnum*. A second supplemental agreement on March 26, 1997, reintroduced a system of Ways and Means advances (WMA) from the Reserve Bank to the Central Government to enable the latter to tide over temporary mismatches in receipts and payments. The critical distinction between the present WMA scheme provided by the Reserve Bank to the Central Government and the earlier *ad hoc*s is that the former are subject to an absolute mutually agreed limit and therefore, do not take the cumulative character of the latter. If the WMA crosses 75 per cent of the limit, the Reserve Bank could trigger off a fresh floatation of government securities depending on the prevailing monetary conditions.

[22] This correspondingly inflated the rate of profit from 1994-95 onwards. Transfers to the fisc to meet FCNR (A) losses amounted to Rs. 2,058 crore during 1994-95, Rs.2,438 crore during 1995-96, Rs.2,763 crore during 1996-97 and Rs.1,826 crore during 1997-98, besides the provision of Rs.5,587 crore transferred on June 30, 1994.

[23] The State Bank of India, which mobilised the RIBs and IMDs, typically swapped a bulk of the foreign currency with the Reserve Bank in exchange for government paper, thereby altering the central bank's ratio of domestic and foreign assets. At the time of redemption of RIBs, a reverse transaction took place. In case of exchange rate fluctuations, the Reserve Bank revalues the foreign currency on the asset side and parks the gains/losses in its Currency and Gold Revaluation Account on the liability side. The Government issues special securities of due amount in favour of the Reserve Bank and parks the monies received with the Reserve Bank in a maintenance of value account in the broad Other Liabilities account head. The transaction is non-monetary because i) the change in the RBI's NFA as a result of exchange rate fluctuations is offset by the transfer to the CGRA account in the Reserve Bank's net non-monetary liabilities (NNML) and ii) the increase in net RBI credit to the Centre as a result of acquisition of special securities is offset by the equivalent increase in the MoV account in the RBI's NNML.

[24] Even in this case, the Bank of England Act 1988 allows for a single balance sheet as at the last day of the year.

[25] This is all the more important since the upward drift in the money multiplier, arising from the sustained reduction in reserve requirements since the late 1990s, implies that the inflationary impact of every unit of high-powered money is even higher.

[26] A related issue is the use of foreign exchange reserves for social development, especially infrastructure investment. It is necessary to understand that the accumulation of foreign exchange reserves is itself, in a sense, a reflection of the excess supply in the foreign exchange market relative to the absorptive capacity of the economy.

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Annex I : BALANCE SHEET OF THE ISSUE DEPARTMENT OF THE RESERVE BANK OF INDIA

(Rupees crore)

Item	Dec. 31 1935	Dec. 31 1936	Dec. 31 1937	Dec. 31 1938	Dec. 31 1939	Jun. 30 1940	Jun. 30 1941	Jun. 30 1942	Jun. 30 1943	Jun. 30 1944	Jun. 30 1945	Jun. 30 1946	Jun. 30 1947	Jun. 30 1948	Jun. 30 1949	Jun. 30 1950
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
LIABILITIES																
Notes held in the Banking Department																
(a) India Notes	21	12	29	18	18	11	13	14	14	12	14	17	42	31	33	37
(b) Pakistan Notes														0		
Notes in circulation	172	192	186	188	236	248	278	447	732	931	1137	1237	1224	1320	1154	1169
(a) India Notes	172	192	181	180	225	235	260	447	732	931	1137	1237	1224	1269	1154	1169
(b) Pakistan Notes														52		
(c) Legal Tender in Burma only	0	0	5	8	11	13	18	0	0	0	0	0	0	0	0	0
Total Notes issued	193	204	215	206	254	259	291	462	746	943	1152	1254	1265	1351	1186	1205
ASSETS																
A. Gold Coin and Bullion :																
(a) Held in India	42	42	42	42	42	42	44	44	44	44	44	44	44	44	40	40
(b) Held outside India	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
Foreign Securities	66	71	80	60	108	132	119	267	568	828	1034	1135	1135	1135	685	638
Total	111	116	125	104	152	176	163	311	612	872	1079	1180	1180	1180	725	678
B. Rupee Coin (India)	57	65	63	70	64	33	37	28	16	13	15	17	28	40	47	55
Pakistan														3		
Govt. of India Rupee Securities	26	23	27	32	38	50	91	122	118	57	58	58	58	128	414	472
Internal Bills of Exchange and other Commercial Paper																
Total Liabilities/Assets	**193**	**204**	**215**	**206**	**254**	**259**	**291**	**462**	**746**	**943**	**1152**	**1254**	**1265**	**1351**	**1186**	**1205**

Annex I : BALANCE SHEET OF THE ISSUE DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
	18	19	20	21	22	23	24	25	26	27
LIABILITIES										
Notes held in the Banking Department	35	34	38	41	32	28	39	39	38	46
Notes in circulation	1257	1129	1136	1172	1310	1475	1542	1577	1714	1829
Total Notes issued	1292	1164	1175	1213	1342	1503	1582	1616	1752	1876
ASSETS										
Gold Coin and Bullion :										
(a) Held in India	40	40	40	40	40	40	118	118	118	118
(b) Held outside India										
Foreign Securities	678	583	603	653	652	647	413	200	178	143
Total	718	623	643	693	692	687	530	317	296	261
Rupee Coin	58	76	92	99	106	108	127	131	131	128
Government of India Rupee Securities	517	465	440	421	544	709	925	1168	1326	1486
Internal Bills of Exchange and other Commercial Paper										
Total Liabilities/Assets	**1292**	**1164**	**1175**	**1213**	**1342**	**1503**	**1582**	**1616**	**1752**	**1876**

Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	28	29	30	31	32	33	34	35	36	37
LIABILITIES										
Notes held in the Banking Department	45	43	40	31	27	40	34	31	33	14
Notes in circulation	1933	2077	2259	2490	2665	2867	3052	3299	3692	4027
Total Notes issued	1978	2120	2300	2521	2692	2907	3086	3330	3725	4041
ASSETS										
Gold Coin and Bullion :										
(a) Held in India	118	118	118	118	134	116	116	116	183	183
(b) Held outside India										
Foreign Securities	103	92	100	89	68	221	186	206	201	396
Total	221	209	218	207	202	337	302	322	383	579
Rupee Coin	121	116	115	103	95	85	69	75	64	54
Government of India Rupee Securities	1637	1794	1967	2211	2395	2485	2715	2933	3278	3408
Internal Bills of Exchange and other Commercial Paper										
Total Liabilities/Assets	**1978**	**2120**	**2300**	**2521**	**2692**	**2907**	**3086**	**3330**	**3725**	**4041**

Annex I : BALANCE SHEET OF THE ISSUE DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	38	39	40	41	42	43	44	45	46	47
LIABILITIES										
Notes held in the Banking Department	18	29	36	37	15	25	15	13	6	10
Notes in circulation	4435	4878	5699	6473	6585	7150	8200	9348	11138	12412
Total Notes issued	4453	4907	5735	6510	6600	7175	8215	9361	11143	12421
ASSETS										
Gold Coin and Bullion :										
(a) Held in India	183	183	183	183	183	183	188	214	219	225
(b) Held outside India										
Foreign Securities	278	222	177	167	122	547	1072	2145	2769	2564
Total	461	404	360	349	304	729	1260	2360	2989	2789
Rupee Coin	39	28	8	8	6	15	15	21	39	62
Government of India Rupee Securities	3953	4474	5367	6153	6290	6430	6940	6980	8116	9571
Internal Bills of Exchange and other Commercial Paper										
Total Liabilities /Assets	**4453**	**4907**	**5735**	**6510**	**6600**	**7175**	**8215**	**9361**	**11143**	**12421**

Annex I : BALANCE SHEET OF THE ISSUE DEPARTMENT OF THE RESERVE BANK OF INDIA *(Concld.)*

(as at end-June)

(Rupees crore)

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	48	49	50	51	52	53	54	55	56	57	58	59
Total Liabilities/Assets	**14397**	**16065**	**18407**	**21783**	**24795**	**27392**	**30934**	**35736**	**41659**	**50100**	**57870**	**64564**

Item	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	60	61	62	63	64	65	66	67	68	69	70	71
Total Liabilities/Assets	**75084**	**91063**	**110896**	**126916**	**143417**	**156862**	**183730**	**201501**	**226391**	**259084**	**292538**	**332678**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA

(Rupees crore)

Item	Dec. 31 1935	Dec. 31 1936	Dec. 31 1937	Dec. 31 1938	Dec. 31 1939	Jun. 30 1940	Jun. 30 1941	Jun. 30 1942	Jun. 30 1943	Jun. 30 1944	Jun. 30 1945	Jun. 30 1946	Jun. 30 1947	Jun. 30 1948	Jun. 30 1949	Jun. 30 1950
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
LIABILITIES																
Capital paid-up	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Reserve Fund	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Deposits																
(a) Government	6	7	10	11	14	11	22	22	19	82	302	477	409	309	145	156
(i) Central Government of India				5	7	6	15	14	8	65	278	457	391	215	128	141
(ii) Government of Burma (Pakistan for the year1948)				2	2	1	3	0	1	0	1	1	0	69	0	0
(iii) Other Government Accounts Pakistan(for the year1948)				4	5	4	4	8	10	17	23	19	18	19 6	17	15
(b) Banks	28	16	20	12	19	21	30	65	58	94	80	109	89	103	67	52
(c) Others	0	0	1	1	1	1	2	2	3	3	18	6	31	48	61	64
Bills Payable	0	0	0	0	0	0	0	3	2	3	4	3	2	4	3	4
Other Liabilities	1	1	1	1	1	0	2	2	7	8	12	12	8	12	8	12
ASSETS																
Notes																
(a) Legal Tender in India	21	12	29	18	18	11	13	14	14	12	14	17	42	31	33	37
(b) Legal Tender in Burma only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rupee Coin																
(a) India	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(b) Pakistan														0		
Small Coin (subsidiary coins)																
(a) India	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(b) Pakistan														0		
Bills Purchased and Discounted:																
a) Internal	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	1
b) External	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c) Government Treasury Bills	0	0	0	8	10	4	0	0	1	0	0	0	2	2	2	1
Balances Held Abroad	17	15	4	1	7	20	47	80	76	173	388	559	431	401	136	189
Loans and Advances to Governments																
(a) In India	1	0	2	1	1	0	0	0	0	0	1	0	5	0	11	1
(i) Central Government																
(ii) State Governments																
(b) In Pakistan														0		
Other Loans and Advances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	10
Investments	5	6	6	5	6	8	5	8	7	11	21	31	67	51	103	57
Other Assets	0	1	1	1	1	2	1	1	1	1	1	11	1	2	2	2
Total Liabilities/Assets	**45**	**34**	**42**	**35**	**44**	**45**	**67**	**104**	**99**	**202**	**426**	**618**	**548**	**487**	**295**	**298**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
	18	19	20	21	22	23	24	25	26	27
LIABILITIES										
Capital paid-up	5	5	5	5	5	5	5	5	5	5
Reserve Fund	5	5	5	5	5	5	80	80	80	80
National Industrial Credit (LTO) Fund										
National Housing Credit (LTO) Fund										
National Agricultural Credit(LTO) Fund						15	20	25	30	40
National Agricultural Credit(Stabilisation) Fund						1	2	3	4	5
Deposits										
(a) Government										
(i) Central Government	163	117	126	124	56	57	52	53	48	57
(ii) State Governments	17	3	18	26	10	13	8	14	20	19
(b) Banks	59	57	45	50	58	54	82	98	98	113
(i) Scheduled Commercial Banks										
(ii) Scheduled State Co-operative Banks										
(iii) Other Scheduled Co-operative Banks										
(iv) Non-Scheduled State Co-operative Banks										
(v) Other Banks										
(vi) Scheduled Banks										
(vii) State Co-operative Banks										
(c) NABARD Deposits										
(i) National Rural Credit (Long-Term Operations) Fund										
(ii) National Rural Credit (Stabilisation) Fund										
(d) Others	71	64	57	42	23	13	150	143	160	133
Bills Payable	2	3	2	2	7	5	13	14	21	18
Other Liabilities	10	8	15	21	23	24	9	10	12	11
Total Liabilities	**332**	**263**	**274**	**275**	**187**	**193**	**421**	**445**	**478**	**482**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
	18	19	20	21	22	23	24	25	26	27
ASSETS										
Notes	35	34	38	41	32	28	39	39	38	46
Rupee Coin	0	0	0	0	0	0	0	0	0	0
Small Coin	0	0	0	0	0	0	0	0	0	0
Bills Purchased and Discounted:										
(a) Internal	0	2	0	0	1	0	0	0	0	0
(b) External										
(c) Government Treasury Bills	2	9	14	5	11	8	0	1	1	7
Balances Held Abroad*	178	98	112	93	61	39	43	14	13	17
Investments	88	87	80	91	46	37	209	289	319	233
Loans and Advances to Governments	8	2	3	0	1	2	24	27	23	31
Other Loans and Advances	19	28	21	37	28	70	91	61	69	130
Other Assets	2	3	5	6	7	8	14	15	14	18
Total Assets	**332**	**263**	**274**	**275**	**187**	**193**	**421**	**445**	**478**	**482**

* Includes cash and short-term securities

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	28	29	30	31	32	33	34	35	36	37
LIABILITIES										
Capital paid-up	5	5	5	5	5	5	5	5	5	5
Reserve Fund	80	80	80	80	80	80	80	80	150	150
National Industrial Credit (LTO) Fund					15	20	30	55	75	95
National Housing Credit (LTO) Fund										
National Agricultural Credit (LTO) Fund	50	61	73	86	100	115	131	143	155	172
National Agricultural Credit (Stabilisation) Fund	6	7	8	9	10	16	25	33	35	37
Deposits										
(a) Government										
(i) Central Government	60	53	65	80	52	50	51	55	60	58
(ii) State Governments	15	25	14	16	18	23	12	8	13	16
(b) Banks	95	98	101	104	122	148	158	163	209	202
(i) Scheduled Commercial Banks							148	151	192	187
(ii) Scheduled State Co-operative Banks							9	11	16	14
(iii) Other Scheduled Co-operative Banks										
(iv) Non-Scheduled State Co-operative Banks							1	1	1	1
(v) Other Banks			0	0	0	0	0	0	0	0
(vi) Scheduled Banks			94	89	107	134	0	0	0	0
(vii) State Co-operative Banks			7	15	15	14	0	0	0	0
(c) Others	115	193	201	190	228	333	319	390	305	167
Bills Payable	31	34	25	25	15	34	28	17	35	23
Other Liabilities	14	26	32	49	59	48	48	39	41	57
Total Liabilities	**471**	**584**	**604**	**643**	**704**	**873**	**886**	**986**	**1083**	**982**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	28	29	30	31	32	33	34	35	36	37
ASSETS										
Notes	45	43	40	31	27	40	34	31	33	14
Rupee Coin	0	0	0	0	0	0	0	0	0	0
Small Coin	0	0	0	0	0	0	0	0	0	0
Bills Purchased and Discounted :										
(a) Internal										
(b) External										
(c) Government Treasury Bills	36	44	54	43	49	106	266	186	130	13
Balances Held Abroad*	11	6	7	7	3	27	22	108	147	98
Investments	189	279	265	288	270	431	267	253	226	125
Loans, Advances and Investments from National Agricultural Credit (Long Term Operations) Fund										
(a) Loans and Advances to :										
(i) State Governments		0	27	28	30	29	28	32	31	34
(ii) State Co-operative Banks			11	13	14	15	15	16	18	20
(iii) Central Land Mortgage Banks										
(b) Investment in Central Land Mortgage Bank Debentures			3	4	5	6	7	8	9	10
Loans and Advances to Governments	34	35	31	33	42	21	26	23	24	32
o/w State Governments					42	21	26	23	24	32
Loans and Advances to :										
(i) Scheduled Banks			1	2	54	0	12	103	0	0
(ii) Scheduled Commercial Banks									181	308
(iii) State Co-operative Banks			129	152	156	149	142	149	204	224
(iv) Others	130	135	1	2	2	2	2	3	2	3
Loans, Advances and Investments from National Industrial Credit (Long Term Operations) Fund :										
(a) Loans and Advances to :										
(i) Development Bank/Industrial Development Bank of India					2	4	5	6	6	26
(ii) Export Import Bank of India										
(iii) Industrial Reconstruction Bank of India Ltd.										
(iv) Others										
(b) Investments in bonds/debentures issued by :										
(i) Industrial Development Bank of India										
(ii) Export Import Bank of India										
(iii) Industrial Reconstruction Bank of India Ltd.										
(iv) Others										
Loans, Advances and Investments from National Agricultural Credit (Stabilisation) Fund										
Loans, Advances to State Co-operative Banks					5	5	9	6	5	4
Other Assets	26	42	36	40	48	38	51	62	65	71
Total Assets	**471**	**584**	**604**	**643**	**704**	**873**	**886**	**986**	**1083**	**982**

* Includes cash and short-term securities.

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	38	39	40	41	42	43	44	45	46	47
LIABILITIES										
Capital paid-up	5	5	5	5	5	5	5	5	5	5
Reserve Fund	150	150	150	150	150	150	150	150	150	150
National Industrial Credit (Long Term Operations) Fund	135	175	205	265	390	540	715	915	1135	1355
National Housing Credit (Long Term Operations) Fund										
National Agricultural Credit(LTO) Fund	190	209	239	284	334	400	495	610	750	920
National Agricultural Credit(Stabilisation) Fund	39	45	85	95	140	145	165	195	225	290
Deposits										
(a) Government										
(i) Central Government	55	47	57	62	78	63	74	377	1168	1096
(ii) State Governments	87	8	29	26	8	139	87	18	18	86
(b) Banks										
(i) Scheduled Commercial Banks	249	297	538	554	604	759	1589	2138	3245	4124
(ii) Scheduled State Co-operative Banks	19	18	23	26	43	61	41	70	89	72
(iii) Other Scheduled Co-operative Banks										
(iv) Non-Scheduled State Co-operative Banks	1	1	1	1	1	2	2	2	3	3
(v) Other Banks	1	1	3	1	2	4	3	3	5	4
(c) NABARD Deposits										
(i) National Rural Credit (Long-Term Operations) Fund										
(ii) National Rural Credit (Stabilisation) Fund										
(d) Others	163	214	208	513	982	2131	2461	2017	1635	1530
Bills Payable	37	76	54	126	98	80	158	167	140	143
Other Liabilities	194	285	335	484	751	550	587	625	765	1326
Total Liabilities	**1324**	**1531**	**1931**	**2591**	**3586**	**5027**	**6533**	**7293**	**9333**	**11103**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	38	39	40	41	42	43	44	45	46	47
ASSETS										
Notes	18	29	36	37	15	25	15	13	6	10
Rupee Coin	0	0	0	0	0	0	0	0	0	0
Small Coin	0	0	0	0	0	0	0	0	0	0
Bills Purchased and Discounted :										
(a) Internal	10	10	15	274	126	138	112	101	71	71
(b) External	0	0	0	0	0	0	0	0	0	0
(c) Government Treasury Bills	16	311	302	129	332	276	265	1139	2125	4124
Balances Held Abroad	94	195	267	596	411	1196	2181	1688	1931	1933
Investments	424	448	540	217	677	565	651	1093	1081	938
Loans and Advances to										
(i) Central Government										
(ii) State Governments	56	38	40	178	360	130	72	15	27	38
Loans and Advances to										
(i) Scheduled Commercial Banks	266	27	141	421	385	942	962	335	895	658
(ii) State Co-operative Banks	207	169	190	167	287	156	248	321	270	204
(iii) Others	14	11	11	38	60	69	2	4	89	2
Loans, Advances and Investments from National Agricultural Credit(LTO) Fund										
(a) Loans and Advances to										
(i) State Governments	42	53	66	68	70	76	98	111	120	124
(ii) State Co-operative Banks	24	21	18	16	13	13	16	19	23	30
(iii) Central Land Mortgage Banks										
(iv) Agricultural Refinance Corporation	0	5	35	54	88	138	173	217	264	315
(b) Investment in Central Land Mortgage Bank Debentures	10	11	11	11	11	10	8	8	7	7
Loans and Advances from National Agricultral Credit (Stabilisation) Fund										
(a) Loans and Advances to State Co-operative Banks	14	26	41	53	83	79	117	138	91	122
Loans, Advances and Investments from National Industrial Credit (Long Term Operations) Fund :										
(a) Loans and Advances to :										
(i) Industrial Development Bank of India	55	93	129	179	265	388	526	688	885	1084
(ii) Export Import Bank of India										
(iii) Industrial Reconstruction Corporation of India Ltd.										
(iv) Others										
(b) Investments in bonds/debentures issued by :										
(i) Industrial Development Bank of India										
(ii) Export Import Bank of India										
(iii) Industrial Reconstruction Corporation of India Ltd.										
(iv) Others										
Loans, Advances and Investments from National Housing Credit (Long Term Operations) Fund :										
(a) Loans and Advances to National Housing Bank										
(b) Investments in bonds/debentures issued by National Housing Bank										
Other Assets	75	85	89	153	403	827	1087	1404	1448	1443
Total Assets	**1324**	**1531**	**1931**	**2591**	**3586**	**5027**	**6533**	**7293**	**9333**	**11103**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	48	49	50	51	52	53	54	55	56	57	58	59
LIABILITIES												
Capital paid-up	5	5	5	5	5	5	5	5	5	5	5	5
Reserve Fund	150	150	150	150	150	150	150	150	150	150	6500	6500
National Industrial Credit (Long Term Operations) Fund	1625	1915	2230	2545	2895	3295	3725	4175	4625	5150	5675	5675
National Housing Credit (Long Term Operations) Fund									75	125	175	175
National Agricultural Credit (LTO) Fund	1025	1205										
National Agricultural Credit (Stabilisation) Fund	365	440										
Deposits												
(a) Government												
(i) Central Government	214	153	553	2919	60	57	52	68	82	141	106	47
(ii) State Governments	85	247	200	13	15	14	15	34	16	17	16	39
(b) Banks												
(i) Scheduled Commercial Banks	5477	5932	6624	8105	10886	12617	15853	19259	22057	26026	30790	43448
(ii) Scheduled State Co-operative Banks	97	100	141	141	143	172	146	188	482	465	548	250
(iii) Other Scheduled Co-operative Banks									73	122	188	135
(iv) Non-Scheduled State Co-operative Banks	4	4	5	5	5	6	8	7	11	15	11	11
(v) Other Banks	6	8	15	16	25	26	27	43	30	97	58	53
(c) NABARD Deposit												
(i) National Rural Credit (Long Term Operations) Fund			350	250	118							
(ii) National Rural Credit (Stabilisation) Fund			281	281	281	267	135					
(d) Others	1728	2543	4857	6423	6462	5902	4941	3795	2193	2142	5869	7690
Bills Payable	57	83	96	86	22	129	127	112	112	113	185	126
Other Liabilities	2159	2802	3484	4499	6074	8628	9612	10960	13187	14170	15853	13858
Total Liabilities	12997	15588	18990	25438	27141	31266	34796	38796	43098	48738	65978	78012

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	48	49	50	51	52	53	54	55	56	57	58	59
ASSETS												
Notes	14	30	24	6	40	15	16	16	19	18	12	13
Rupee Coin	0	0	0	0	0	0	0	0	0	0	0	0
Small Coin	0	0	0	0	0	0	0	0	0	0	0	0
Bills Purchased and Discounted :												
(a) Internal	4	0	0	0	0	0	0	0	0	0	0	0
(b) External	0	0	0	0	0	0	0	0	0	0	0	0
(c) Government Treasury Bills	4530	6702	7042	9375	8394	15835	3952	4609	3607	1797	399	1828
Balances Held Abroad	1603	1364	2761	3278	3732	3760	3676	2213	2919	2378	2088	14690
Investments	2158	2335	2989	4369	6953	5564	20058	24016	25653	32351	46337	38739
Loans and Advances to :												
(i) Central Government	0	0	0	0	0	0	0	0	0	0	0	0
(ii) State Governments	116	0	213	460	316	18	80	118	54	11	17	171
Loans and Advances to :												
(i) Scheduled Commercial Banks	571	568	545	1769	1863	475	853	504	2174	2467	6104	7472
(ii) Scheduled / State Co-operative Banks	341	631	51	45	22	20	31	24	24	27	19	13
(iii) Other Scheduled Co-operative Banks								0	0	0	0	0
(iv) Non-Scheduled State Co-operative Banks								0	0	0	0	0
(iv) NABARD			904	1039	762	861	950	1417	2278	2858	3322	3582
(v) Others	16	6	12	166	182	136	108	24	42	68	61	1517
Loans, Advances and Investments from National Industrial Credit (Long Term Operations) Fund:												
(a) Loans and Advances to :												
(i) Industrial Development Bank of India	1323	1595	1828	2085	2321	2590	2875	3199	3528	3822	3705	3577
(ii) Export Import Bank of India		25	70	125	180	260	345	435	530	625	745	877
(iii) Industrial Reconstruction Bank of India Ltd.								45	70	95	130	170
(iv) Others								0	0	0	400	840
(b) Investments in bonds/debentures issued by :												
(i) Industrial Development Bank of India	0	0	0	0	0	0	0	0	0	0	0	0
(ii) Export Import Bank of India		0	0	0	0	0	0	0	0	0	0	0
(iii) Industrial Reconstruction Bank of India Ltd.								0	0	0	0	0
(iv) Others								0	0	0	0	0
Loans, Advances and Investments from National Housing Credit (Long Term Operations) Fund:												
(a) Loans and Advances to National Housing Bank									50	75	125	175
(b) Investments in bonds/debentures issued by National Housing Bank									0	0	0	0
Loans, Advances and Investments from National Loans, Advances and Investments from National Agricultural Credit (Long Term Operations) Fund:												
(a) Loans and Advances to :												
(i) State Governments	129	125										
(ii) State Co-operative Banks	31	33										
(iii) Central Land Mortgage Banks	0	0										
(iv) Agricultural Refinance & Development Corp.	366	514										
(b) Investments in Central Land Mortgage Bank Debentures	5	4										
Loans and Advances from National Agricultural Credit (Stabilisation) Fund:												
(a) Loans and Advances to :												
State Co-operative Banks	95	84										
Other Assets	1698	1581	2552	2722	2377	1743	1853	2175	2149	2145	2513	4348
Total Assets	**12997**	**15588**	**18990**	**25438**	**27141**	**31266**	**34796**	**38796**	**43098**	**48738**	**65978**	**78012**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Contd.)*

(as at end-June)

(Rupees crore)

Item	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	60	61	62	63	64	65	66	67	68	69	70	71
LIABILITIES												
Capital paid-up	5	5	5	5	5	5	5	5	5	5	5	5
Reserve Fund	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500
National Industrial Credit (Long Term Operations) Fund	5676	5677	5678	5679	5680	5281	4982	4633	4234	11	12	13
National Housing Credit (Long Term Operations) Fund	176	177	178	179	880	881	882	883	884	185	186	187
Deposits												
(a) Government												
(i) Central Government	53	54	51	52	50	50	101	100	101	101	100	37912
(ii) State Governments	92	61	16	18	5	15	103	41	41	41	41	41
(b) Banks												
(i) Scheduled Commercial Banks	45624	52593	64652	59728	55247	63673	70006	60854	74108	55012	78614	80069
(ii) Scheduled State Co-operative Banks	280	317	422	503	622	718	794	846	926	1688	1643	2035
(iii) Other Scheduled Co-operative Banks	238	273	357	465	678	865	1079	1625	1759	1651	1548	1668
(iv) Non-Scheduled State Co-operative Banks	10	17	10	24	30	56	27	52	48	41	47	82
(v) Other Banks	59	93	100	141	196	180	678	658	1029	1828	2748	3043
(c) Others	12739	11564	13210	9642	11888	12778	12228	16470	16322	18127	17454	15522
Bills Payable	18	322	422	1014	746	1098	806	744	652	53	49	77
Other Liabilities	15265	12477	15663	24592	24353	44349	54556	65069	74488	109244	118356	129929
Total Liabilities	**86736**	**90130**	**107264**	**108541**	**106880**	**136451**	**152746**	**158481**	**181098**	**194487**	**227304**	**277084**

Annex II : BALANCE SHEET OF THE BANKING DEPARTMENT OF THE RESERVE BANK OF INDIA *(Concld.)*

(as at end-June)

(Rupees crore)

	60	61	62	63	64	65	66	67	68	69	70	71
ASSETS												
Notes	6	14	14	24	7	21	27	15	16	11	28	24
Rupee Coin	0	0	0	0	0	0	0	0	0	0	0	0
Small Coin	0	0	0	0	0	0	0	0	0	0	0	2
Bills Purchased and Discounted:												
(a) Internal	0	0	0	0	0	0	0	0	0	0	0	0
(b) External	0	0	0	0	0	0	0	0	0	0	0	0
(c) Government Treasury Bills	2460	2474	1651	354	0	0	0	0	0	0	0	0
Balances Held Abroad	16600	39302	44983	44403	37248	36241	41194	32372	84392	98169	109831	194673
Investments	50506	27967	32622	40595	49544	64617	68155	79729	52805	63037	86514	57668
Loans and Advances to:												
(i) Central Government	0	0	0	0	0	10013	5620	5298	9014	8169	9783	3272
(ii) State Governments	74	72	0	89	154	1847	2972	2387	3603	5168	3059	4160
Loans and Advances to:												
(i) Scheduled Commercial Banks	3110	5138	10009	3499	27	238	6201	8713	3616	336	1	0
(ii) Scheduled State Co-operative Banks	8	0	7	23	2	2	3	0	2	5	7	3
(iii) Other Scheduled Co-operative Banks	23	16	33	0	0	0	99	216	59	3	0	
(iv) Non-Scheduled State Co-operative Banks	0	0	0	0	0	0	0	0	0	0	0	
(iv) NABARD	3225	3217	4177	4380	4120	4255	5073	5105	5826	5665	4476	2732
(v) Others	355	375	1139	205	322	850	4516	5187	3285	1044	1005	40
Loans, Advances and Investments from National Industrial Credit (Long Term Operations) Fund:												
(a) Loans and Advances to:												
(i) Industrial Development Bank of India	3422	3236	3033	2789	2518	2267	2000	1740	1440	0	0	0
(ii) Export Import Bank of India	877	877	877	877	852	807	752	697	617	0	0	0
(iii) Industrial Investment Bank of India Ltd.	170	170	170	170	170	170	170	170	160	0	0	0
(iv) Others	995	1181	1381	1611	1830	2005	2005	2005	2005	0	0	0
(b) Investments in bonds/debentures issued by :												
(i) Industrial Development Bank of India	0	0	0	0	0	0	0	0	0	0	0	0
(ii) Export Import Bank of India	0	0	0	0	0	0	0	0	0	0	0	0
(iii) Industrial Investment Bank of India Ltd.	0	0	0	0	0	0	0	0	0	0	0	0
(iv) Others	0	0	0	0	0	0	0	0	0	0	0	0
Loans, Advances and Investments from National Housing Credit (Long Term Operations) Fund:												
(a) Loans and Advances to National Housing Bank	175	175	175	175	875	875	875	875	875	175	175	50
(b) Investments in bonds/debentures issued by National Housing Bank	0	0	0	0	0	0	0	0	0	0	0	0
Other Assets	4728	5914	6992	9334	9212	12243	13086	13973	13382	12715	12425	14460
Total Assets	**86736**	**90130**	**107264**	**108541**	**106880**	**136451**	**152746**	**158481**	**181098**	**194487**	**227304**	**277084**

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT

(Rupees crore)

Item	Dec. 31 1935	Dec. 31 1936	Dec. 31 1937	Dec. 31 1938	Dec. 31 1939	Jun. 30 1940	Jun. 30 1941	Jun. 30 1942	Jun. 30 1943	Jun. 30 1944	Jun. 30 1945	Jun. 30 1946	Jun. 30 1947	Jun. 30 1948	Jun. 30 1949	Jun. 30 1950
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total	**1.259**	**1.555**	**1.271**	**1.367**	**1.230**	**0.839**	**3.818**	**4.564**	**9.192**	**12.004**	**16.675**	**15.588**	**10.124**	**12.730**	**11.700**	**12.900**
Total	**1.259**	**1.555**	**1.271**	**1.367**	**1.230**	**0.839**	**3.818**	**4.564**	**9.192**	**12.004**	**16.675**	**15.588**	**10.124**	**12.730**	**11.700**	**12.900**
TOTAL	**0.561**	**0.534**	**0.279**	**0.385**	**0.225**	**0.293**	**2.793**	**3.415**	**7.698**	**10.266**	**14.893**	**13.634**	**8.023**	**10.383**	**9.057**	**9.908**

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT *(Contd.)*

(Year ended June)

(Rupees crore)

Item	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
	18	19	20	21	22	23	24	25	26	27
Interest, Discount, Exchange, Commission etc.[1]	11.40	11.11	16.47	21.94	25.01	25.45	36.21	37.09	47.26	47.57
Total	**11.40**	**11.11**	**16.47**	**21.94**	**25.01**	**25.45**	**36.21**	**37.09**	**47.26**	**47.57**
EXPENDITURE										
Interest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Establishment	1.717	2.020	2.142	2.488	2.823	2.982	3.186	3.426	3.781	3.999
Directors' and Local Board Members' Fees and Expenses	0.009	0.007	0.007	0.006	0.008	0.007	0.008	0.009	0.007	0.008
Remittance of Treasure	0.140	0.147	0.170	0.140	0.153	0.195	0.262	0.300	0.462	0.203
Agency Charges	0.314	0.337	0.372	0.454	0.468	0.624	0.661	1.373	1.003	1.011
Security Printing (Cheque, Note forms etc.)	0.514	0.647	0.789	0.906	1.067	1.103	1.385	1.242	1.150	1.198
Contribution to Staff Gratuity & Superannuation Funds	0.006	0.006	0.006	0.005	0.006	0.005	0.004	0.003	0.046	0.073
Printing and Stationery	0.043	0.055	0.049	0.058	0.062	0.060	0.060	0.074	0.081	0.096
Postage and Telecommunication Charges	0.014	0.016	0.017	0.019	0.020	0.022	0.026	0.031	0.032	0.034
Rent, Taxes, Insurance, Lighting etc.	0.058	0.054	0.061	0.113	0.133	0.141	0.166	0.167	0.193	0.215
Auditors' Fees and Expenses	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Law Charges	0.011	0.007	0.005	0.008	0.008	0.007	0.003	0.002	0.011	0.005
Depreciation and Repairs to Bank's Property	0.073	0.099	0.107	0.137	0.153	0.156	0.253	0.235	0.236	0.463
Miscellaneous Expenses	0.161	0.214	0.244	0.100	0.108	0.141	0.188	0.225	0.248	0.261
Net available balance	8.337	7.500	12.501	17.505	20.001	20.001	30.001	30.001	40.002	40.001
Total	**11.40**	**11.11**	**16.47**	**21.94**	**25.01**	**25.45**	**36.21**	**37.09**	**47.26**	**47.57**
LESS: Surplus payable to Central Government	8.34	7.50	12.50	17.50	20.00	20.00	30.00	30.00	40.00	40.00
Total	**8.34**	**7.50**	**12.50**	**17.50**	**20.00**	**20.00**	**30.00**	**30.00**	**40.00**	**40.00**
RESERVE FUND ACCOUNT										
By balance	5.00	5.00	5.00	5.00	5.00	5.00	5.00	80.00	80.00	80.00
By Transfer from Profit and Loss Account	Nil	Nil	Nil	Nil	Nil	Nil	75.00	Nil	Nil	Nil
Total	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**80.00**	**80.00**	**80.00**	**80.00**

1. After making the usual or necessary provisions in terms of Section 47 of the Reserve Bank of India Act, 1934.

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT *(Contd.)*

(Year ended June)

(Rupees crore)

Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	28	29	30	31	32	33	34	35	36	37
INCOME										
Interest, Discount, Exchange, Commission etc.[1]	52.07	53.976	56.051	52.222	62.266	67.525	85.122	92.921	99.349	105.446
Total	**52.07**	**53.98**	**56.05**	**52.22**	**62.27**	**67.53**	**85.12**	**92.92**	**99.35**	**105.45**
EXPENDITURE										
Establishment	4.396	4.664	5.837	6.412	7.510	8.943	10.240	11.745	14.251	14.843
Directors' and Local Board Members' Fees and Expenses	0.008	0.005	0.005	0.005	0.006	0.007	0.007	0.007	0.008	0.008
Remittance of Treasure	0.333	0.384	0.367	0.430	0.414	0.446	0.443	0.422	0.472	0.623
Agency Charges	1.752	1.772	2.020	2.203	2.452	2.607	7.836	8.653	6.662	6.995
Security Printing (Cheque, Note forms etc.)	1.745	2.280	2.126	1.926	2.483	3.942	4.652	5.001	5.090	4.735
Contribution to Staff Gratuity & Superannuation Funds	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Printing and Stationery	0.105	0.111	0.117	0.130	0.140	0.203	0.162	0.160	0.201	0.251
Postage and Telecommunication Charges	0.036	0.045	0.056	0.046	0.054	0.078	0.085	0.096	0.099	0.095
Rent, Taxes, Insurance, Lighting etc.	0.261	0.278	0.273	0.300	0.360	0.405	0.582	0.647	0.838	0.861
Auditors' Fees and Expenses	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004
Law Charges	0.008	0.015	0.001	0.002	0.002	0.005	0.001	0.016	0.028	0.012
Depreciation and Repairs to Bank's Property	0.535	0.512	0.439	0.460	0.479	0.490	0.686	0.691	0.863	1.244
Miscellaneous Expenses	0.314	0.333	0.235	0.231	0.288	0.324	0.351	0.407	0.761	0.703
Net available balance	42.500	43.500	44.500	40.000	48.000	50.000	60.000	65.000	70.000	75.000
Total	**52.07**	**53.98**	**56.05**	**52.22**	**62.27**	**67.53**	**85.12**	**92.92**	**99.35**	**105.45**
LESS: Surplus payable to Central Government	42.50	43.50	44.50	40.00	48.00	50.00	60.00	65.00	70.00	75.00
Total	**42.50**	**43.50**	**44.50**	**40.00**	**48.00**	**50.00**	**60.00**	**65.00**	**70.00**	**75.00**
RESERVE FUND ACCOUNT										
By balance	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	150.00	150.00
By Transfer from Profit and Loss Account	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total	**80.00**	**80.00**	**80.00**	**80.00**	**80.00**	**80.00**	**80.00**	**80.00**	**150.00**	**150.00**

1. After making the usual or necessary provisions in terms of Section 47 of the Reserve Bank of India Act, 1934.

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT *(Contd.)*

(Year ended June)

(Rupees crore)

Item	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	38	39	40	41	42	43	44	45	46	47
INCOME										
Interest, Discount, Exchange, Commission etc.[1]	136.46	157.17	171.29	195.48	228.01	295.00	297.26	316.81	320.26	347.41
Total	**136.46**	**157.17**	**171.29**	**195.48**	**228.01**	**295.00**	**297.26**	**316.81**	**320.26**	**347.41**
EXPENDITURE	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Establishment	20.59	20.93	22.89	28.53	34.65	35.49	35.51	39.58	44.74	55.82
Directors' and Local Board Members' Fees and Expenses	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Remittance of Treasure	0.60	0.67	0.82	0.81	0.94	0.47	0.76	6.50	2.45	0.70
Agency Charges	7.21	7.28	8.31	11.19	31.25	43.01	35.50	42.02	46.01	52.15
Security Printing (Cheque, Note forms etc.)	4.91	4.80	4.96	5.19	5.82	14.38	19.37	21.59	24.32	20.24
Contribution to Staff Gratuity & Superannuation Funds	0.07	0.00	0.50	0.50	0.40	7.08	0.50	0.55	0.60	0.55
Printing and Stationery	0.30	0.28	0.32	0.40	0.57	0.54	0.47	0.61	0.68	0.89
Postage and Telecommunication Charges	0.11	0.12	0.13	0.14	0.16	0.19	0.24	0.23	0.23	0.27
Rent, Taxes, Insurance, Lighting etc.	0.94	1.02	1.08	1.16	1.24	1.59	1.78	2.03	2.34	2.43
Auditors' Fees and Expenses	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Law Charges	0.00	0.02	0.03	0.02	0.01	0.01	0.02	0.02	0.03	0.04
Depreciation and Repairs to Bank's Property	0.95	1.06	1.04	1.11	1.30	1.32	1.33	1.51	1.49	1.59
Miscellaneous Expenses	0.75	0.95	1.20	1.40	1.63	1.82	1.77	2.15	2.26	2.70
Available Balance	100.00	120.00	130.00	145.00	150.00	190.00	200.00	200.00	200.00	210.00
Total	**136.46**	**157.16**	**171.29**	**195.48**	**228.01**	**295.00**	**297.26**	**316.81**	**320.26**	**347.41**
LESS:										
Surplus payable to Central Government	100.00	120.00	130.00	145.00	150.00	190.00	200.00	200.00	200.00	210.00
RESERVE FUND ACCOUNT										
By balance	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
By Transfer from Profit and Loss Account	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**

1. After making the usual or necessary provisions in terms of Section 47 of the Reserve Bank of India Act, 1934.

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT *(Contd.)*

(Year ended June)

(Rupees crore)

Total	**163.95**	**201.76**	**215.42**	**249.68**	**361.98**	**411.40**	**511.33**	**2491.11**	**3005.12**	**3256.61**
Total	**373.95**	**411.76**	**425.42**	**459.68**	**571.98**	**621.40**	**721.37**	**3491.23**	**4030.25**	**4426.73**
Total	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**	**150.00**			

1. After making the usual or necessary provisions in terms of Section 47 of the Reserve Bank of India Act, 1934.
2. These funds are maintained by National Bank for Agriculture and Rural Development (NABARD).

Annex III : RESERVE BANK OF INDIA'S PROFIT AND LOSS ACCOUNT *(Concld.)*

(Year ended June)

(Rupees crore)

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	58	59	60	61	62	63	64	65	66	67	68	69	70	71
INCOME														
Interest, Discount, Exchange, Commission etc.	4624.97	5699.56	5632.12	5281.55	7719.60	8266.88	9051.94	10743.21	9028.09	14694.92	14941.52	16866.39	15561.41	13166.14
Total	**4624.97**	**5699.56**	**5632.12**	**5281.55**	**7719.60**	**8266.88**	**9051.94**	**10743.21**	**9028.09**	**14694.92**	**14941.52**	**16866.39**	**15561.41**	**13166.14**
EXPENDITURE														
Interest	2547.70	3311.47	3057.77	2767.46	2863.93	2541.65	1912.61	1999.24	1976.64	1971.88	1994.80	2334.99	1990.09	1808.48
Establishment	243.69	277.29	303.08	322.17	487.811	682.30	519.48	848.43	683.59	846.75	870.85	1304.36	1488.86	2232.99
Directors' and Local Board Members' Fees and Expenses	0.05	0.08	0.10	0.08	0.13	0.26	0.29	0.33	0.38	0.48	0.37	0.87	0.55	0.93
Remittance of Treasure	4.74	5.59	18.62	9.82	13.28	27.99	24.89	24.93	30.84	16.82	36.78	24.79	28.09	21.09
Agency Charges	265.62	302.34	386.69	334.33	432.09	601.00	829.92	884.25	924.02	1193.62	1160.70	1207.84	1352.41	1539.12
Security Printing (Cheque, Note forms etc.)	162.28	238.30	295.65	273.24	280.07	372.67	386.48	834.23	733.96	1068.44	1122.78	1304.49	1433.09	1709.56
Contribution to Staff Gratuity & Superannuation Funds														
Printing and Stationery	2.54	3.01	2.85	3.41	4.82	8.79	8.61	9.93	10.33	12.93	88.76	27.68	26.16	51.81
Postage and Telecommunication Charges	4.68	5.32	5.65	5.78	6.68	8.46	7.83	10.26	12.24	18.68	16.85	20.96	17.87	23.02
Rent, Taxes, Insurance, Lighting etc.	12.79	15.84	17.36	22.76	24.59	25.98	27.30	39.39	41.07	44.95	47.39	52.48	59.88	58.81
Auditors' Fees and Expenses	0.09	0.08	0.12	0.24	0.21	0.39	0.58	0.54	0.58	0.64	0.82	0.88	1.00	1.29
Law Charges	0.11	0.46	0.31	0.44	0.34	0.49	0.44	0.49	0.56	1.50	2.00	1.85	1.64	1.91
Depreciation and Repairs to Bank's Property	20.28	20.48	20.41	21.55	19.47	23.54	33.25	64.70	67.23	81.23	105.61	125.27	125.53	154.34
Miscellaneous Expenses	15.40	19.30	19.52	16.26	24.15	30.96	32.83	45.38	63.65	83.00	139.81	135.93	198.25	158.78
Total	**3279.97**	**4199.56**	**4128.12**	**3777.55**	**4157.58**	**4324.49**	**3784.51**	**4762.12**	**4545.09**	**5340.92**	**5587.52**	**6542.39**	**6723.41**	**7762.14**
Available Balance	1345.00	1500.00	1504.00	1504.00	3562.01	3942.39	5267.43	5981.10	4483.00	9354.00	9354.00	10324.00	8838.00	5404.00
LESS: Contribution to:														
National Industrial Credit (Long Term Operations) Fund	525.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
National Rural Credit (Long Term Operations) Fund[2]	400.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
National Rural Credit (Stabilisation) Fund[2]	20.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
National Housing Credit (Long Term Operations) Fund	50.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Surplus payable to Central Government	350.00	1500.00	1500.00	1500.00	3558.01	3938.39	5263.43	5977.10	4479.00	9350.00	9350.00	10320.00	8834.00	5400.00
Total	**4624.97**	**5699.56**	**5632.12**	**5281.55**	**7719.60**	**8266.88**	**9051.94**	**10743.21**	**9028.09**	**14694.92**	**14941.52**	**16866.39**	**15561.41**	**13166.14**

1. After making the usual or necessary provisions in terms of Section 47 of the Reserve Bank of India Act, 1934.
2. These funds are maintained by National Bank for Agriculture and Rural Development (NABARD).

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Non-Performing Loans and Terms of Credit of Public Sector Banks in India: An Empirical Assessment

Rajiv Ranjan and Sarat Chandra Dhal*

This paper explores an empirical approach to the analysis of commercial banks' non-performing loans (NPLs) in the Indian context. The empirical analysis evaluates as to how banks' non-performing loans are influenced by three major sets of economic and financial factors, *i.e.*, terms of credit, bank size induced risk preferences and macroeconomic shocks. The empirical results from panel regression models suggest that terms of credit variables have significant effect on the banks' non-performing loans in the presence of bank size induced risk preferences and macroeconomic shocks. Moreover, alternative measures of bank size could give rise to differential impact on bank's non-performing loans. In regard to terms of credit variables, changes in the cost of credit in terms of expectation of higher interest rate induce rise in NPAs. On the other hand, factors like horizon of maturity of credit, better credit culture, favorable macroeconomic and business conditions lead to lowering of NPAs. Business cycle may have differential implications adducing to differential response of borrowers and lenders.

JEL Classification : G21, E51, G11, C23
Key Words : Bank credit, non-performing loans, terms of credit, panel regression.

Introduction

Financial stability is considered as *sine qua non* of sustained and rapid economic progress. Among various indicators of financial stability, banks' non-performing loan assumes critical importance since it reflects on the asset quality, credit risk and efficiency in the allocation of resources to productive sectors. A common perspective is that the problem of banks' non-performing loans is ascribed to political, economic, social, technological, legal and environmental

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(PESTLE) factors across countries (2003, Bhide, *et.al.*, 2002, Das and Ghosh). During the last decade, the PESTLE framework has undergone significant changes, largely, due to structural transformation of emerging economies, including India, amidst reform of financial sector, economic integration induced by rapid increase in the pace of globalisation and advances in information technology. Moreover, Government intervention in the credit market has eased considerably. Advances in technology have facilitated rapid exchange of information across markets, creation of newer financial products, and reduction in transaction costs, thus, contributing to enhanced operational efficiency of banks and financial institutions. The institutional infrastructure has been strengthened in various ways. Countries have adopted international best practices pertaining to prudential regulation and supervision. In the sphere of legal environment, several measures have been undertaken in the areas of debt recovery, securitisation and asset reconstruction, resolution of defaults and non-performing loans, besides changes and amendments to the archaic laws pertaining to banking and financial sector. Overall, these developments have led to structural change in the financial sector, which has created conducive environment for market mechanism, in general, and economic factors, in particular, for playing a critical role in influencing the portfolios of banks and financial institutions.

It is in this context that this study has undertaken an empirical analysis for evaluating the impact of economic and financial factors on banks' non-performing loans. The distinguishing feature of the study is that it provides a framework for analysis of underlying behaviour of borrowers' in terms of their loan repayments in response to lending terms of banks and other macroeconomic indicators. The study is organised into four sections. Section I briefly reviews the extant literature focusing on the proximate determinants of non-performing loans (NPLs) in the light of cross-country evidences. Section II presents stylised facts about Non-Performing Assets (NPAs) and terms of credit variables. Section III postulates a theoretical analysis of the problem of NPL in the Indian context, which provides an underlying framework for the empirical analysis in Section IV. Section V concludes with some policy implications.

Section I
Review of Literature

In the banking literature, the problem of NPLs has been revisited in several theoretical and empirical studies. A synoptic review of the literature brings to the fore insights into the determinants of NPL across countries. A considered view is that banks' lending policy could have crucial influence on non-performing loans (Reddy, 2004). Reddy (2004) critically examined various issues pertaining to terms of credit of Indian banks. In this context, it was viewed that 'the element of power has no bearing on the illegal activity. A default is not entirely an irrational decision. Rather a defaulter takes into account probabilistic assessment of various costs and benefits of his decision'. Mohan (2003)[1] conceptualised 'lazy banking' while critically reflecting on banks' investment portfolio and lending policy. In a study of institutional finance structure and implications for industrial growth, Mohan (2004) emphasised on key lending terms of credit, such as maturity and interest-terms of loans to corporate sector. The Indian viewpoint alluding to the concepts of 'credit culture' owing to Reddy (2004) and 'lazy banking' owing to Mohan (2003a) has an international perspective since several studies in the banking literature agree that banks' lending policy is a major driver of non-performing loans (McGoven, 1993, Christine 1995, Sergio, 1996, Bloem and Gorters, 2001).

In the seminal study on 'credit policy, systems, and culture', Reddy (2004) raised various critical issues pertaining to credit delivery mechanism of the Indian banking sector. The study focused on the terms of credit such as interest rate charged to various productive activities and borrowers, the approach to risk management, and portfolio management in general. There are three pillars on which India's credit system was based in the past; fixing of prices of credit or interest rate as well as quantum of credit linked with purpose; insisting on collateral; and prescribing the end-use of credit. Interest rate prescription and fixing quantum has, however, been significantly reduced in the recent period. The study also highlighted the issues in security-based or collateralised lending, which need careful

examination in the context of growing services sector. Given the fungibility of resources, multiple sources of flow of resources, as well as application of funds, the relevance and feasibility of end-use restrictions on credit need a critical review. The link between formal and informal sectors shows that significant divergence in lending terms between the two sectors still persists, despite the fact that the interest rate in informal markets is far higher than that of the formal sectors- the banking sector. The convergence between formal and informal sectors could be achieved by pushing the supply of credit in the formal sector following a supply leading approach to reduce the price or interest rate. Furthermore, in the context of NPAs on account of priority sector lending, it was pointed out that the statistics may or may not confirm this. There may be only a marginal difference in the NPAs of banks' lending to priority sector and the banks lending to private corporate sector. Against this background, the study suggested that given the deficiencies in these areas, it is imperative that banks need to be guided by fairness based on economic and financial decisions rather than system of conventions, if reform has to serve the meaningful purpose. Experience shows that policies of liberalisation, deregulation and enabling environment of comfortable liquidity at a reasonable price do not automatically translate themselves into enhanced credit flow.

Although public sector banks have recorded improvements in profitability, efficiency (in terms of intermediation costs) and asset quality in the 1990s, they continue to have higher interest rate spreads but at the same time earn lower rates of return, reflecting higher operating costs (Mohan, 2004). Consequently, asset quality is weaker so that loan loss provisions continue to be higher. This suggests that, whereas, there is greater scope for enhancing the asset quality of banks, in general, public sector banks, in particular, need to reduce the operating costs further. The tenure of funds provided by banks either as loans or investments depends critically on the overall asset-liability position. An inherent difficulty in this regard is that since deposit liabilities of banks often tend to be of relatively shorter maturity, long-term lending could induce the problem of asset-liability mismatches.

The maturity profile of commercial bank deposits shows that less than one fifth is of a tenor of more than three years. On the asset side, nearly 40 per cent has already been invested in assets of over three year maturity. Banks also have some capacity to invest in longer term assets, but this capacity will remain highly limited until the fiscal deficit remains as high as it is and the Government demand for investment in long dated bonds remains high. Some enhancement of their capacity to invest in infrastructure, industry and agriculture in longer gestation projects can be achieved by allowing a limited recourse to longer term bond issues.

In an another study, Mohan (2003) observed that lending rates of banks have not come down as much as deposit rates and interest rates on Government bonds. While banks have reduced their prime lending rates (PLRs) to some extent and are also extending sub-PLR loans, effective lending rates continue to remain high. This development has adverse systemic implications, especially in a country like India where interest cost as a proportion of sales of corporates are much higher as compared to many emerging economies.

The problem of NPAs is related to several internal and external factors confronting the borrowers (Muniappan, 2002). The internal factors are diversion of funds for expansion/diversification/modernisation, taking up new projects, helping/promoting associate concerns, time/cost overruns during the project implementation stage, business (product, marketing, *etc.*) failure, inefficient management, strained labour relations, inappropriate technology/technical problems, product obsolescence, *etc.*, while external factors are recession, non-payment in other countries, inputs/power shortage, price escalation, accidents and natural calamities. In the Indian context, Rajaraman and Vasishtha (2002) in an empirical study provided an evidence of significant bivariate relationship between an operating inefficiency indicator and the problem loans of public sector banks. In a similar manner, largely from lenders' perspective, Das and Ghosh (2003) empirically examined non-performing loans of India's public sector banks in terms of various indicators such as asset size, credit growth and macroeconomic condition, and operating efficiency indicators.

Sergio (1996) in a study of non-performing loans in Italy found evidence that, an increase in the riskiness of loan assets is rooted in a bank's lending policy adducing to relatively unselective and inadequate assessment of sectoral prospects. Interestingly, this study refuted that business cycle could be a primary reason for banks' NPLs. The study emphasised that increase in bad debts as a consequence of recession alone is not empirically demonstrated. It was viewed that the bank-firm relationship will thus, prove effective not so much because it overcomes informational asymmetry but because it recoups certain canons of appraisal.

In a study of loan losess of US banks, McGoven (1993) argued that 'character' has historically been a paramount factor of credit and a major determinant in the decision to lend money. Banks have suffered loan losses through relaxed lending standards, unguaranteed credits, the influence of the 1980s culture, and the borrowers' perceptions. It was suggested that bankers should make a fairly accurate personality-morale profile assessment of prospective and current borrowers and guarantors. Besides considering personal interaction, the banker should (i) try to draw some conclusions about staff morale and loyalty, (ii) study the person's personal credit report, (iii) do trade-credit reference checking, (iv) check references from present and former bankers, and (v) determine how the borrower handles stress. In addition, banks can minimise risks by securing the borrower's guarantee, using Government guaranteed loan programs, and requiring conservative loan-to-value ratios.

Bloem and Gorter (2001) suggested that a more or less predictable level of non-performing loans, though it may vary slightly from year to year, is caused by an inevitable number of 'wrong economic decisions' by individuals and plain bad luck (inclement weather, unexpected price changes for certain products, *etc*.). Under such circumstances, the holders of loans can make an allowance for a normal share of non-performance in the form of bad loan provisions, or they may spread the risk by taking out insurance. Enterprises may well be able to pass a large portion of these costs to customers in the form of higher prices. For instance, the interest margin applied by

financial institutions will include a premium for the risk of non-performance on granted loans.

Bercoff, Giovanniz *and* Grimardx (2002) using accelerated failure time (AFT) model in their study of Argentina's banking sector's weakness measured by the ratio of non-performing loans to total loans found that both bank specific indicators such as asset growth, the ratio of net worth to net assets, the ratio of operating cost to assets, exposure to peso loans, and institutional characteristics relating to private bank and foreign bank and macroeconomic variables including credit growth, foreign interest rate, reserve adequacy (imports/reserves) and monetary expansion (M2/reserves), besides the *tequila* effect were reasons behind the banking fragility. Their empirical results suggested that bank size measured by log of assets had a positive effect but asset growth had a negative effect on NPLs. The variables such as operating cost, exposure to peso loans, credit growth, and foreign interest rate had negative effect on NPLs. The macroeconomic variables such as money multiplier, and reserve adequacy, institutional characteristics and *tequila* effect had positive influence on NPLs.

Fuentes and Maquieira (1998) undertook an indepth analysis of loan losses due to the composition of lending by type of contract, volume of lending, cost of credit and default rates in the Chilean credit market. Their empirical analysis examined different variables which may affect loan repayment: (a) limitations on the access to credit; (b) macroeconomic stability; (c) collection technology; (d) bankruptcy code; (e) information sharing; (f) the judicial system; (g) prescreening techniques; and (h) major changes in financial market regulation. They concluded that a satisfactory performance of the Chilean credit market, in terms of loan repayments hinges on a good information sharing system, an advanced collection technology, macroeconomic performance and major changes in the financial market regulation. In another study of Chile, Fuentes and Maquieira (2003) analysed the effect of legal reforms and institutional changes on credit market development and the low level of unpaid debt in the Chilean banking sector. Using

time series data on yearly basis (1960-1997), they concluded that both information sharing and deep financial market liberalisation were positively related to the credit market development. They also reported less dependence of unpaid loans with respect to the business cycle compared to interest rate of the Chilean economy.

Altman, Resti and Sironi (2001) analysed corporate bond recovery rate adducing to bond default rate, macroeconomic variables such as GDP and growth rate, amount of bonds outstanding, amount of default, return on default bonds, and stock return. It was suggested that default rate, amount of bonds, default bonds, and economic recession had negative effect, while the GDP growth rate, and stock return had positive effect on corporate recovery rate.

Lis, *et.al.*,(2000) used a simultaneous equation model in which they explained bank loan losses in Spain using a host of indicators, which included GDP growth rate, debt-equity ratios of firms, regulation regime, loan growth, bank branch growth rates, bank size (assets over total size), collateral loans, net interest margin, capital-asset ratio (CAR) and market power of default companies. They found that GDP growth (contemporaneous, as well as one period lag term), bank size, and CAR, had negative effect while loan growth, collateral, net-interest margin, debt-equity, market power, regulation regime and lagged dependent variable had positive effect on problem loans. The effect of branch growth could vary with different lags.

Kent and D'Arcy (2000) while examining the relationship between cyclical lending behaviour of banks in Australia argued that, the potential for banks to experience substantial losses on their loan portfolios increases towards the peak of the expansionary phase of the cycle. However, towards the top of the cycle, banks appear to be relatively healthy - that is, non-performing loans are low and profits are high, reflecting the fact that even the riskiest of borrowers tend to benefit from buoyant economic conditions. While the risk inherent in banks' lending portfolios peaks at the top of the cycle, this risk

tends to be realized during the contractionary phase of the business cycle. At this time, banks' non-performing loans increase, profits decline and substantial losses to capital may become apparent. Eventually, the economy reaches a trough and turns towards a new expansionary phase, as a result the risk of future losses reaches a low point, even though banks may still appear relatively unhealthy at this stage in the cycle.

Jimenez and Saurina (2003) used logit model for analysing the determinants of the probability of default (PD) of bank loans in terms of variables such as collateral, type of lender and bank-borrower relationship while controlling for the other explanatory variables such as size of loan, size of borrower, maturity structure of loans and currency composition of loans. Their empirical results suggested that collateralised loans had a higher PD, loans granted by savings banks were riskier and a close bank-borrower relationship had a positive effect on the willingness to take more risk. At the same time, size of bank loan had a negative effect on default while maturity term of loans, *i.e.*, short-term loans of less than 1-year maturity had a significant positive effect on default.

The brief review of the literature is used to formulate theoretical analysis of non-performing loans undertaken in Section III. The following section highlights the underlying cross-section differences across banks in India using some stylized facts about banks non-performing assets, credit portfolio, and terms of credit, particularly, cost conditions.

Section II
Stylised Facts About NPAs in India

Cross-Country Perspective

Globally, the level of non-performing loans is estimated at about US $1.3 trillion during 2003, of which the Asian region accounts for about US $ 1 trillion, or about 77 per cent of global NPLs (Table 1). Within Asia, Japan and China have NPLs at about US $ 330 billion and US $ 307 billion thus, together accounting for 49 per cent of global NPLs. Other hot spots of NPLs in the Asian

Table 1: Global Non-Performing Loans : 2003*

Countries	NPLs (US $ billion)	Share in Global (per cent)
Japan	330	25.4
China	307	23.6
Taiwan	19.1	1.5
Thailand	18.8	1.5
Philippines	9.0	0.7
Indonesia	16.9	1.3
India	**30**	**2.3**
Korea	15.0	1.2
Total	746	57.4
Asia	1000	76.9
Germany	283	21.8
Turkey	8.0	0.6
Global	1300	100.0

* NPLs of all financial institutions.
Source: Global NPL Report 2004, Ernst and Young.

region are Taiwan (US $ 19 billion), Thailand (US$ 18.8 billion), Indonesia (US $ 16.9 billion) and Philippines (US $ 9 billion). India's NPLs of the financial sector as a whole is reported at about US$ 30 billion, which works out to a little over 2 per cent of global NPLs[2]. On the basis of information provided in the Report on Trend and Progress of Banking in India, 2002-03, the level of gross NPAs of public sector banks is estimated at Rs. 68,714 crore, which is equivalent to about US $ 15 billion, *i.e.*, about 1 per cent of global NPAs.

In terms of the ratio of NPLs to total assets of banking sector, there is evidence that the performance of the Asian region is far lower than Europe and US (Table 2). The trend in the NPL ratios of select countries, particularly the emerging countries of East Asia, during the last five-six years provides an interesting insight about the impact of structural reform on the accumulation of non-performing loans by banks. In emerging countries like Thailand and Indonesia, structural reform after the Asian crisis had an immediate impact of removing the accumulated excesses from the financial sector and consequently induced a sharp reduction in NPAs

Table 2: Ratio of Non-Performing Loans to Total Loans

(Per cent)

Countries	1998	1999	2000	2001	2002	2003
Brazil	10.2	8.7	8.4	5.7	5.3	5.7
Chile	1.5	1.7	1.7	1.6	1.8	1.8
Mexico	11.3	8.9	5.8	5.1	4.6	3.7
United Kingdom	3.2	3.0	2.5	2.6	2.6	2.2
United States	1.0	0.9	1.1	1.4	1.6	1.3
Japan	5.4	5.8	6.1	6.6	8.9	7.2
France	6.3	5.7	5	5	5	4.9
Germany	4.5	4.6	5.1	4.9	5	-
Greece	13.6	15.5	12.3	9.2	8.1	8.4
Italy	9.1	8.5	7.7	6.7	6.5	-
Russia	17.3	13.4	7.7	6.3	6.5	6.1
Turkey	6.7	9.7	9.2	29.3	17.6	14.2
Argentina	5.3	7.1	8.7	13.2	17.5	22.7
China	–	28.5	22.4	29.8	25.5	22.0
India	**14.4**	**14.7**	**12.7**	**11.4**	**10.4**	**8.8**
Indonesia	48.6	32.9	18.8	11.9	5.8	-
Korea	7.4	8.3	6.6	2.9	1.9	2.3
Malayasia	18.6	16.6	15.4	17.8	15.9	14.8
Philippines	11.0	12.7	14.9	16.9	15.4	15.2
Thailand	42.9	38.6	17.7	10.5	15.8	15.5
Srilanka	16.6	16.6	15	16.9	15.7	13.9
Bangladesh	40.7	41.1	34.9	31.5	28	-
Pakistan	23.1	25.9	23.5	23.3	23.7	20.7

Source: Global Financial Stability Report, April 2004, IMF.

ratio. In Thailand, the NPLs ratio declined by about 25 percentage points from about 43 per cent in 1998 to about 18 per cent in 2003. In a similar manner, the NPAs ratio in Indonesia declined by about 30 percentage points from about 49 per cent in 1998 to 19 per cent in 2003.

Trend in NPAs in India

In absolute terms, the volume of gross NPAs of public sector banks had increased continuously, except for the year 1995 (Table 3). During the entire period, Gross non-performing assets (GNPA) have increased at a trend rate of 4 per cent. The annual growth rate of gross NPAs of public sector banks shows a decelerating trend since 2000 (Chart1). In terms of various NPA ratios, such as GNPAs

Table 3 : Gross NPAs of Public Sector Banks in India

Year	Rs. billion	US $ billion
1993	392.5	12.81
1994	410.4	13.08
1995	383.8	12.22
1996	416.6	12.45
1997	435.8	12.28
1998	456.5	12.28
1999	517.1	12.29
2000	530.3	12.24
2001	546.7	11.97
2002	564.7	11.84
2003	540.9	11.18

Source : Report on Trend and Progress of Banking in India, RBI, Various Issues.

to gross advances, GNPAs to total assets, and net NPAs to total assets and net NPAs to net advances, public sector banks have achieved remarkable improvement (Table 4).

The ratio of gross NPAs to advances has declined at a trend rate of about 9.6 per cent from the level of about 23-25 per cent during 1993-94 to about 9 per cent by end-March 2003. On the other hand, the net NPAs to assets ratio has declined by 50 per cent from the level of 4 per cent in 1995 to about 2 per cent in 2003. The

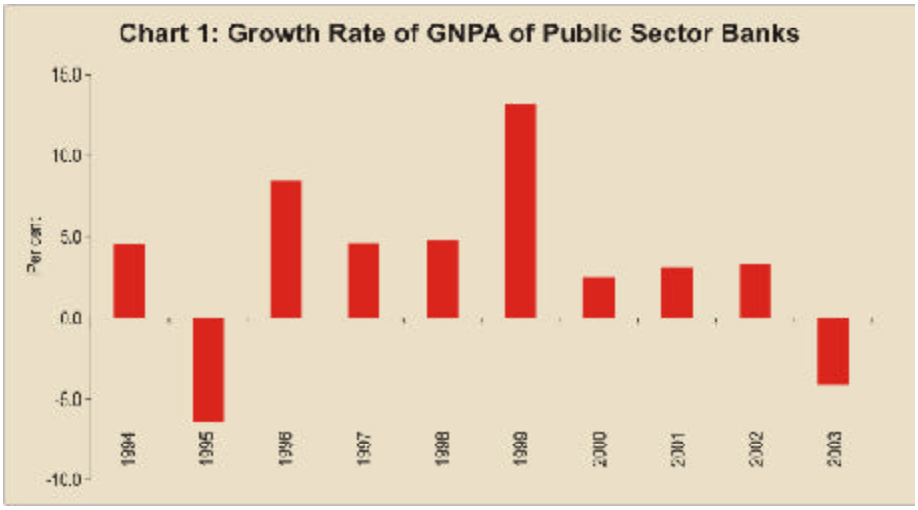


Table 4: NPA Ratios of Public Sector Banks in India

(Per cent)

Year	Gross NPAs to Advances Ratio (GNPA)	Gross NPAs to Assets Ratio (GNPAS)	Net NPAs to Net Advances Ratio (NPA)	Net NPAs to Asset Ratio (NPAS)
1993	23.2	11.8	–	–
1994	24.8	10.8	–	–
1995	19.5	8.7	10.7	4.0
1996	18.0	8.2	8.9	3.6
1997	17.8	7.8	9.2	3.6
1998	16.0	7.0	8.2	3.3
1999	15.9	6.7	8.1	3.1
2000	14.0	6.0	7.4	2.9
2001	12.4	5.3	6.7	2.7
2002	11.1	4.9	5.8	2.4
2003	9.4	4.2	4.5	1.9

Source: Report on Trend and Progress of Banking in India, RBI, Various Issues.

GNPAs ratio declined by 5 percentage points in the year 1994-95, and another 1.5 per centage point in the subsequent year 1995-96. Thus, in two-year span, the ratio of GNPAs was reduced by 6.5 percentage points, reflecting the immediate effect of structural reforms. Since 1996, the reduction of NPAs has been almost gradual, reflecting on reform induced market forces determining the level of NPAs.

Across the banks, the frequency distribution of gross and net NPAs to advances ratio of public sector banks provides some useful insights. During 1995-96, in the category of gross-NPAs to gross advances ratio upto 6 per cent, there was only one bank, but by end-March 2003, there were 5 such banks (Table 5). For the category of gross-NPA to gross advance ratio upto 8 per cent, the number of banks have increased from 1 during 1995-96 to 10 by end-March 2003. As at end-March 2003, about one-third of public sector banks had the ratio of GNPAs to gross advances upto 7-8 per cent, about 60 per cent banks had NPAs upto 9-10 per cent, three-fourth had NPAs upto 12 per cent and about 90 per cent banks had NPAs upto 15 per cent. There was, however, not a single bank having NPAs more than 20 per cent.

Table 5: Non-Performing Assets of Public Sector Banks in India (Gross NPAs to Gross Advances)

	1996	1997	1998	1999	2000	2001	2002	2003
	Statistics							
Minimum	5.68	7.36	6.16	5.66	5.39	5.21	5.19	4.8
Median	17.89	16.92	14.83	14.68	13.19	11.71	10.18	8.55
Maximum	38	39.12	38.96	38.7	32.77	25.31	24.11	19.25
Category	**Frequency Distribution (Number of Public Sector Banks)**							
<=4	0	0	0	0	0	0	0	0
<=6	1	0	0	1	2	2	2	5
<=7	1	0	1	2	2	3	5	8
<=8	1	1	2	2	4	5	6	10
<=9	1	1	2	2	4	5	7	15
<=10	2	2	3	3	5	9	12	16
<=12	5	6	8	5	9	15	18	20
<=15	12	8	14	14	19	21	21	24
<=18	15	15	19	21	22	23	25	26
<=20	16	19	21	22	25	24	26	27
<=22	20	21	22	23	25	26	26	27
<=24	23	22	23	25	25	26	26	27
>24	4	5	4	2	2	1	1	0
Category	**Frequency Distribution (As a per cent of total Public Sector Banks)**							
<=4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<=6	3.7	0.0	0.0	3.7	7.4	7.4	7.4	18.5
<=7	3.7	0.0	3.7	7.4	7.4	11.1	18.5	29.6
<=8	3.7	3.7	7.4	7.4	14.8	18.5	22.2	37.0
<=9	3.7	3.7	7.4	7.4	14.8	18.5	25.9	55.6
<=10	7.4	7.4	11.1	11.1	18.5	33.3	44.4	59.3
<=12	18.5	22.2	29.6	18.5	33.3	55.6	66.7	74.1
<=15	44.4	29.6	51.9	51.9	70.4	77.8	77.8	88.9
<=18	55.6	55.6	70.4	77.8	81.5	85.2	92.6	96.3
<=20	59.3	70.4	77.8	81.5	92.6	88.9	96.3	100.0
<=22	74.1	77.8	81.5	85.2	92.6	96.3	96.3	100.0
<=24	85.2	81.5	85.2	92.6	92.6	96.3	96.3	100.0
>24	14.8	18.5	14.8	7.4	7.4	3.7	3.7	0.0

The distribution of banks' net NPAs to net advances ratio provides a more consolidated picture (Table 6). By end-March 2003, about two-third of banks had NPAs upto 5 per cent, compared to only 11 per cent of banks during 1995-96. About 93 per cent of banks had NPAs within the range of 8-10 per cent and no bank had NPAs above 12 per cent.

Table 6: Non-Performing Assets of Public Sector Banks in India

(Net NPAs to Net Advances)

	1996	1997	1998	1999	2000	2001	2002	2003
	Statistics							
Minimum	2.26	3.63	2.92	1.98	1.92	1.98	2.31	1.44
Median	8.39	9.32	7.66	8.7	7.87	6.86	5.72	4.38
Maximum	23.87	25.24	26.01	21.67	16.18	18.29	16.31	11.82
Category	**Frequency Distribution (Number of Public Sector Banks)**							
<=4 per cent	3	1	2	2	4	3	6	11
<=5	3	2	3	4	4	6	10	17
<=6	5	4	4	4	5	8	16	21
<=7	8	8	7	6	10	15	20	24
<=8	12	11	14	12	15	21	23	25
<=9	16	13	16	17	20	21	24	25
<=10	19	17	17	18	22	22	24	25
<=11	19	18	20	23	22	23	23	24
<=12	22	21	22	24	23	25	26	27
<=13	23	22	24	25	25	26	26	27
<=14	24	25	25	25	26	26	26	27
>=15	3	2	2	2	1	1	1	0
Category	**Frequency Distribution (As a per cent of total Public Sector Banks)**							
<=4	11.1	3.7	7.4	7.4	14.8	11.1	22.2	40.7
<=5	11.1	7.4	11.1	14.8	14.8	22.2	37.0	63.0
<=6	18.5	14.8	14.8	14.8	18.5	29.6	59.3	77.8
<=7	29.6	29.6	25.9	22.2	37.0	55.6	74.1	88.9
<=8	44.4	40.7	51.9	44.4	55.6	77.8	85.2	92.6
<=9	59.3	48.1	59.3	63.0	74.1	77.8	88.9	92.6
<=10	70.4	63.0	63.0	66.7	81.5	81.5	88.9	92.6
<=12	81.5	77.8	81.5	88.9	85.2	92.6	96.3	100.0
<=13	85.2	81.5	88.9	92.6	92.6	96.3	96.3	100.0
<=14	88.9	92.6	92.6	92.6	96.3	96.3	96.3	100.0
>=15	11.1	7.4	7.4	7.4	3.7	3.7	3.7	0.0

Source : Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

Terms of Credit

A comparative position of GNPAs to advances ratio and the terms of credit variables including maturity (share of term loans in total advances), interest cost of deposits, operating expenses to asset ratio, total expenses to asset ratio, and credit-deposit ratio of public sector banks in India during the last ten years presents an interesting picture (Table 7). There is evidence that, for the public sector bank group, the

Table 7: Terms of Credit and Non-Performing Assets of Public Sector Banks in India

(Per cent)

	Gross NPAs to Advances Ratio (GNPA)	Maturity (Share of Term loans in Advances)	Interest Cost of Deposits (RD)	Operating Cost to Total Assets Ratio (OE)	Total Expenses to Assets Ratio (TE)	Credit-Deposit Ratio (CDR)
1993	23.2	30.5	7.7	2.86	10.2	54.3
1994	24.8	28.3	7.2	2.75	9.2	46.9
1995	19.5	25.5	6.5	2.87	8.7	49.8
1996	18.0	26.9	7.0	3.04	9.3	50.7
1997	17.8	29.6	7.6	2.92	9.6	47.5
1998	16.0	32.2	7.2	2.76	9.1	47.3
1999	15.9	33.9	7.3	2.72	9.1	46.4
2000	14.0	35.0	7.2	2.59	9.0	47.3
2001	12.4	35.2	6.9	2.78	9.0	48.5
2002	11.1	35.7	6.8	2.40	8.5	50.6
2003	9.4	39.2	6.1	2.34	7.8	51.4

Source: Statistical Tables Relating to Banks in India and Report on Trend and Progress of Banking in India, RBI, Various Issues.

GNPA ratio has declined from 23 per cent in 1993 to 9 per cent in 2003, amidst an increase in the loan-maturity from 31 per cent to about 39 per cent, declining cost condition as reflected in declining interest cost of deposits, operating expenses and total expenses, and reduction in credit-deposit ratio during the same period.

Loan-Maturity

The data on maturity terms of bank loans, defined over time dimension, is available for public sector banks group as a whole for the last three years (Table 8). The share of short-term loans upto one year, accounts for about 40-42 per cent of total loans followed by loans with one to three years of maturity, which account for 33-36 per cent of bank loans and three to five years of maturity accounting for the remaining 23-25 per cent. The share of bank loans above one year maturity accounts for about 60 per cent. Although, the data for last three-year in respect of loan maturity shows no clear trend across the maturity spectrum, there is evidence that banks' prefer largely term loans for more than 1 year maturity.

Data on maturity of loan defined as the share of term-loans in total advances are available for reasonably long period of time across

Table 8: Loan Maturity Profile of Public Sector Banks : Percentage Distribution of Loans Across Maturity Spectrum

Year	2001	2002	2003
Maturity			
<=1Year	40.6	41.6	39.3
1-3 Year	36.1	33.2	35.2
3-5 Year	10.4	11.4	11.7
>=5 Year	13.3	13.8	13.8
Above 1 year	59.8	58.4	60.7

banks. In this regard, information for the public sector as a whole shows that there is, on an average, an increasing trend in the share of term loans in total advances since 1996, reflecting banks' approach to a better portfolio management (Table 9). However, the cross-section statistics such as minimum and maximum values and standard deviation of loan-maturity across banks provide evidence of differential portfolio strategies of banks over time. The differential range of maturity, which was more pronounced during early 1990s, has narrowed during the late 1990s due to increasing competition. During the early 1990s, at the bottom end, some banks could provide only 10-15 per cent of term loans, while at the upper end, some banks

Table 9: Maturity: Share of Term Loans in Total Advances

(Per cent)

Year	Mean	Median	Maximum	Minimum	Volatility
1992	0.33	0.31	0.63	0.15	11.2
1993	0.31	0.27	0.65	0.17	11.6
1994	0.28	0.27	0.60	0.10	10.3
1995	0.26	0.25	0.41	0.11	8.5
1996	0.27	0.26	0.45	0.12	9.0
1997	0.30	0.27	0.57	0.14	10.7
1998	0.32	0.30	0.76	0.15	12.7
1999	0.34	0.35	0.61	0.18	10.3
2000	0.35	0.35	0.64	0.19	10.2
2001	0.35	0.35	0.55	0.23	8.2
2002	0.36	0.37	0.45	0.23	6.0
2003	0.39	0.40	0.47	0.27	5.4

Source: Annual Accounts of Banking, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

could provide as high as 60-65 per cent of term loans in the credit portfolio. Nevertheless, the upswings and downswings in the cross section volatility statistics of loan maturity over time reflect bank specific dynamic portfolio management strategies.

Cost Condition

The movement of banks' prime lending rate (PLR) over the years reflects the general cost condition for borrowers. The prime lending rate of State Bank of India (SBI) has declined by about 750 basis points from the peak of 19 per cent in 1991-92 to 11.50 per cent during 2002-03 (Table 10). For other commercial banks too, there has been decline in PLR. From the level of 1995-96, SBI's PLR has declined by about 300-450 basis points and similarly for other banks, the PLR has declined somewhat more by about 475 basis points. Another striking feature of distribution of loans across various ranges of interest rates is that the decline in the estimated weighted average lending rate is less than the PLR. For instance, during the period 1995-96 to 2001-02, the PLR of banks has declined by 450-500 basis points, while weighted lending rate has declined by about 300 basis points.

Table 10: Prime Lending Rate

(Per cent)

	PLR of SBI	PLR of Other Banks	Weighted Lending Rate@
1991-92	19.00	16.50	16.5
1992-93	17.00	19.00	16.8
1993-94	14.00	19.00	16.5
1994-95	15.00	15.00	16.1
1995-96	16.50	16.50	17.1
1996-97	14.50-15.00	14.50	16.9
1997-98	14.00	14.00	16.3
1998-99	12.00-13.00	12.00-14.00	15.5
1999-00	12.00-12.50	12.00	15.0
2000-01	11.00- 12.00	11.50	14.3
2001-02	11.00-12.00	11.50	13.9
2002-03	10.75-11.50	10.75	

Source: Handbook of Statistics on the Indian Economy, 2002-03, RBI.
@Rakesh Mohan (2002)

The prime-lending rate, however, is not a fully representative cost of lending for the borrowers as banks lend to different borrowers at different lending rates. Moreover, banks have freedom to lend below PLR to some borrowers. Data on distribution of credit across various ranges of interest rate shows that loans provided at PLR could be about 20-30 per cent of total loans (Table 11).

As the PLR may not be a representative cost of lending, a measure of underlying cost including actual interest costs of deposits and operating expenses, which are available from balance sheets of various banks provide useful insights into the cost structure of public sector banks. In terms of interest cost of deposits, there is evidence that, on an average, effective cost of deposits for public sector banks as a whole[3], has remained almost steady during 1991-92 to 2000-01 (Table 12). Since 2001-02, however, the interest cost of deposits has declined by about 80 basis points. What is most striking in this regard

Table 11: Distribution of Outstanding Credit across Interest Rate Range

(Per cent)

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
PLR (SBI)	15.0	16.5	14.5-15.0	14.0	12.0-13.0	12.0-12.5	11.0-12.0	11.0-12.0
PLR (Others)	15.0	16.5	14.5	14.0	12.0-14.0	12.0	11.5	11.5
Interest Rate Range	**Distribution of Outstanding Credit (Per cent)**							
Upto 6	2.3	1.3	1.1	1.0	0.3	0.2	0.2	0.1
6-10	2.1	0.8	0.5	0.4	3.7	1.0	0.6	3.2
10-12	2.3	1.5	1.4	2.3	**3.3**	**8.0**	**17.0**	**24.5**
12-14	10.6	11.1	10.7	13.2	20.4	26.8	28.6	22.5
14-15	6.7	8.1	10.9	14.9	9.7	11.5	12.6	14.1
15-16	20.3	9.1	9.6	11.7	14.0	17.9	15.7	15.5
16-17	17.3	7.9	8.3	13.7	20.2	17.1	14.1	12.5
17-18	15.6	18.1	17.2	14.3	13.1	8.6	5.2	2.9
Above 18	22.8	42.2	40.2	28.5	15.4	9.0	6.1	4.5
Total	100	100	100	100	100	100	100	100
Volatility	**8.2**	**12.9**	**12.3**	**8.9**	**7.4**	**8.4**	**9.1**	**8.9**

Source: Statistical Tables Relating to Banks in India, RBI, Various Issues.

Table 12: Ratio of Interest Cost to Deposits

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1992	5.6	8.1	7.1	51.6
1993	6.7	8.7	7.7	50.8
1994	5.8	8.4	7.2	60.4
1995	4.6	8.3	6.5	63.3
1996	6.1	9.0	7.0	56.0
1997	6.8	9.3	7.6	52.6
1998	6.3	8.8	7.2	50.5
1999	6.5	8.4	7.3	48.3
2000	6.3	8.1	7.2	47.1
2001	6.1	7.8	6.9	48.1
2002	5.6	7.6	6.8	51.2
2003	5.3	6.8	6.1	46.7

Source: Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

is that interest cost varies across banks since the range of cross-section minimum and maximum values of interest cost differs over time. The range of interest rate has shown a marked decline after 2001-02 compared to the period of the early 1990s.

On the other hand, the average operating cost ratio for banks has declined marginally in the recent years as compared to the period of the 1990s (Table 13). Across banks, the range of minimum and

Table 13: Ratio of Operating Expenses to Assets

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1990	1.7	3.7	2.6	45.6
1991	1.7	3.7	2.6	49.0
1992	2.1	3.9	2.9	51.0
1993	2.0	3.6	2.9	47.7
1994	2.2	3.3	2.7	36.8
1995	2.0	3.9	2.9	42.7
1996	2.1	3.7	3.0	40.7
1997	2.2	3.6	2.9	35.5
1998	2.0	3.4	2.8	38.1
1999	1.8	3.6	2.7	42.6
2000	1.7	3.4	2.6	37.1
2001	1.7	3.8	2.8	44.2
2002	1.6	3.3	2.4	42.4
2003	1.7	3.3	2.3	41.8

Table 14: Ratio of Total Expenses to Assets

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1990	6.9	9.9	8.3	81.8
1991	6.6	10.0	8.5	80.6
1992	7.9	13.2	10.0	110.5
1993	8.1	11.0	10.2	74.6
1994	7.6	10.3	9.2	74.3
1995	6.2	10.1	8.7	75.1
1996	8.1	11.2	9.3	75.1
1997	8.5	11.3	9.6	69.3
1998	7.7	10.2	9.1	55.0
1999	8.3	10.1	9.1	49.1
2000	8.0	10.0	9.0	45.1
2001	7.8	10.3	9.0	59.7
2002	6.9	9.7	8.5	68.0
2003	6.4	9.2	7.8	65.9

Source: Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

maximum operating cost remains steady indicating the continuity of cross section variability. Reflecting the movement in interest cost of deposits and operating costs, average total cost ratio shows a steady movement for most part of the 1990s and showing at times some firmness in the trend (Table 14). The variability across banks continues to be high.

Credit Deployment

The average credit deposit ratio shows a declining trend during the 1900's and an increasing trend thereafter. However, there is significant difference across banks as reflected in the cross-section minimum and maximum values of credit-deposit ratio. Although the variability in credit-deposit ratio has somewhat declined, it has remained steady since 1999-2000 (Table 15).

The ratio of credit to GDP ratio indicates as to how banks have been supporting economic activity of borrowers in general. Since 1990-91, the ratio of bank credit to real GDP shows a continuous improvement except for the year 1994 and 1997, when there was a

Table 15: Credit-Deposit Ratio of Public Sector Banks*

Year	Minimum	Maximum	Average	Volatility
1990	46.6	79.3	56.5	7.4
1991	47.0	81.0	56.7	7.6
1992	43.1	73.7	57.2	8.1
1993	43.2	71.9	54.3	7.2
1994	34.6	58.0	46.9	6.7
1995	33.7	65.3	49.8	8.1
1996	32.4	63.6	50.7	7.6
1997	29.3	58.3	47.5	7.7
1998	28.0	60.0	47.3	7.5
1999	26.5	56.9	46.4	6.6
2000	27.2	56.7	47.3	6.5
2001	31.1	61.6	48.5	6.2
2002	34.8	64.2	50.6	6.3
2003	35.0	66.1	51.4	6.3

*Estimated
Source: Statistical Tables Relating to Banks in India, Various Issues, RBI.

marginal decline. The ratio of bank credit to nominal GDP, however, shows a mixed trend. It declined during first half of the 1990s and improved towards the late 1990s, especially since 1999-2000 (Table 16).

Table 16: Bank Credit Support for Economic Activity

Year	Ratio of Credit to Real GDP (Per cent)	Ratio of Credit to Nominal GDP (Per cent)
1990	17.3	26.0
1991	18.8	25.6
1992	20.4	24.3
1993	20.9	22.9
1994	18.8	18.8
1995	21.2	19.4
1996	23.1	19.3
1997	22.7	17.7
1998	25.6	18.7
1999	27.5	18.6
2000	30.7	20.0
2001	34.6	21.6
2002	38.0	23.0
2003	41.6	24.6

Section III
Non-Performing Loans: A Theoretical Perspective

A credit transaction involves a contract between two parties: the borrower and the creditor (banks) subject to a mutual agreement on the terms of credit. The terms of credit are defined over five critical financial parameters: amount of credit, interest rate, maturity of loans, frequency of loan servicing and collateral. Optimising decision pertaining to the terms of credit could differ from the borrower to that of the creditor (banks). As such, the mutual agreement between the borrower and the creditor may not necessarily imply an optimal configuration for both. At this juncture, distinction between a defaulter and a non-performing loan account is in order. A default entails violation of the loan contract or the agreed terms of the contract, while a non-performing loan entails that the borrower does not renege from the loan contract but fails to comply the repayment schedule due to evolving unfavourable conditions. However, from the perspective of corporate finance, a common perspective is that both the cases of 'defaulter' and 'non-performer' imply similar financial implications, *i.e.,* financial loss to banks. Moreover, in the Indian context, regulatory and supervisory process does not focus on such a distinction between default and non-performer as far as prudential norms are concerned. The NPL is defined as past due concept, taking into account either non-payment of interest due, principal or both. For simplicity, this common perspective prevails in the rest of the theoretical analysis. The most important reason for default could be mismatch between borrower's terms of credit and creditor's terms of credit. The problem of default can be elucidated as follows.

Let the borrower makes an internal assessment of his economic activity for which he requires external financing support. An optimal configuration for the borrower involves that he could carve out a contract C(A*,r*,m*,n*, S*) defined over the amount of finance (A*), interest rate (r*), maturity (m*), instalments (n*) and collateral (S*) for his profitable economic activity. On the other hand, based on competing portfolio considerations, the creditor could carve out a contract C(A, r, m, n, S). When a borrower enters the credit market,

he searches for a bank that could agree to his terms of credit. It may not, however, be possible for him to find a suitable creditor. Since the borrower faces financial constraint, he will have to compromise and agree to the terms of credit stipulated by the creditor. Once the financial constraint is overcome, the borrower explores the opportunity for making changes to the loan contract. In this regard, a decision to default entails that he wants to turn an unfavourable loan contract to a favourable one. The default option however, involves both costs and benefits. The benefits from default could accrue from each of the parameters of the loan contract.

First, let us consider the parameter loan-maturity (m). A default option entails that the borrower wants to lengthen the maturity of the loan. By lengthening the maturity of the loan, *ceteris paribus*, the defaulter could reduce the real burden of credit since the present value of credit would decrease with increase in loan maturity. However, if the borrower is highly bank dependent, a borrower may not consider defaulting on a short-term loan, even though such loans involve high present value of debt burden. In this case, the default option will affect the credit worthiness of the borrower, for which he may find difficulty in approaching banks for further financial support. Moreover, if macroeconomic conditions turn more favourable, implying strong business growth, the borrower would require an increasing financial support from banks to expand his business. In this situation, if the borrower has availed a short-term loan, he would not prefer default option in order to maintain his credit worthiness. Second, if the borrower anticipates that interest rates (r) are likely to move upward in the future, a default option would benefit him enjoy the existing credit facility at a relatively lower interest rate. On the contrary, if interest rates are likely to fall, the borrower would prefer repaying the loan amount in due course of time or even earlier, if possible, through pre-payment. Third, the default option also provides an opportunity for the borrower to use the installment payments (n) for investment in more profitable activities. However, installment of loan constitutes a method of payment, which could be similar across the banks. Accordingly, this may not be a major factor of influence on loan defaults. Fourth, the amount of credit (A) could play a critical

role in influencing the borrower's decision to default on bank loans. A very large amount of credit, *ceteris paribus*, involves high present value of loan burden. The amount of loan will have significant effect on legal cost and may not induce defaults under certain circumstances. Moreover, for a genuine bank dependent borrower, default may not be an option since it would involve reputation cost, which in turn, could affect the borrower's recourse to refinancing or fresh financing for other productive activities. Secondly, for a genuine borrower, the amount of credit could influence borrower's decision pertaining to adequacy of finance to carry on the profitable activity. In other words, the amount of credit relative to measure of economic activity and the level of funds of banks rather than credit itself could be important for borrowers (Mohan, 2004).

From the cost side, a defaulting borrower is likely to face three major costs: reputation cost, legal and bankruptcy costs and penalty charged by banks after disposal of the case in the court. The reputation cost for the defaulter is likely to be higher, if there is provision for exchange of information on defaults across banks or creditors. In the case of a company registered in the stock market, reputation cost could arise from the adverse movement of the company's stock price. For all companies, loss of reputation could signal bad financial condition and thus, affect overall business. In fact, it is precisely with this objective that Credit Information Bureau (CIB) receives policy support in most countries.

The legal cost will arise if banks are prompt in filing suits against the defaulters. Basically, the legal cost will involve two principal components: initial fixed cost on account of stamp duties in response to defend the loan suits and other costs on account of preparation of the law suit and a fixed sum, which could be charged by lawyers in order to pursue the case. Thus, from the perspective of Government regulation, higher the stamp duty, higher the legal costs and lower incentive for defaults. An interesting point to note here is that for very small borrowers, the fixed cost of legal suit could be higher than the credit amount, thus, providing no incentive for defaults. The variable cost of a lawsuit will depend on the charges of the lawyer every time he has to attend the case.

Longer the duration of the case, higher will be the legal costs. At the same time, it is to be noted that longer the duration of the case, the borrower benefits from extended maturity of the loan.

Thus, in view of the above, it is now apparent that before choosing the default option, a rational borrower has to make an assessment of all the benefits and costs (Reddy, 2004).

Section IV

Empirical Analysis

The basic framework for as empirical analysis involves a panel regression model of the following form:

$$NPA_{J,t} = F(E_t, ToC_j, B_j, S, P)$$

where $NPA_{J,t}$ is defined as jth bank's gross non-performing assets to gross advances or net non-performing assets to net advances in period t; macroeconomic environment (E) is captured through the growth rate of aggregate economic activity (GDP); terms of credit (ToC) is defined over banks loan maturity (M), interest rate (R) and collateral value (S) backing the credit to the borrower; the set of bank specific indicators (B) include a measure of bank size (A), and credit orientation or culture reflecting a bank's preference for credit measured by credit-deposit ratio (CDR) relative to that of the banking industry, and P is a measure of loan exposure to priority sector. In this study, the panel regression model is estimated subject to cross-section specific fixed coefficients (intercepts) in order to capture the effect of the differential social and geo-political environment confronting banks' operations. The exact specification of the model is as follows:

$$(GNPA_{J,t}) = C_J + b_1(A_{J,t}) + b_2 M_{J,t} + b_3(R_{J,t} - R_{j,t}^{E}) + b_4 G^{E}_{t}$$

$$+ \beta_6 P_{J,t-1} + \beta_7 CDR_{J,t,} + \beta_8 SR_t$$

where $GNPA_j$ is the ratio of gross non-performing assets to gross advances of a bank, C_j - fixed coefficient, A_j - the ratio of a bank's

asset to the total asset of the bank group, R_j - the difference between the current and past cost conditions, *i.e.*, ratio of total cost to assets of a bank and the average of last three-values of R_j, G^E - expected (one period lag) of the GDP growth rate to capture borrower's response to macroeconomic and business environment, P- the ratio of a bank's priority sector loan to total advances, CDR_j - the difference between credit-deposit ratio of a bank and the bank-group credit-deposit ratio and SR is the expected change in asset (stock) return. A detailed analysis of the explanatory variables used in the model is discussed in the following paragraphs.

Most studies use the logarithm transformation of total assets, capital or deposits of a bank as a measure of bank size. An appropriate way of characterising the competitive bank size, however, entails that the measure should be relative to the industry, group or sector as a whole. Accordingly, in this study, the measure of an individual bank's size is defined in terms of its total assets relative to the aggregate assets of the banking industry and/or group, *i.e.*, the ratio of total assets of an individual bank to total assets of banking sector/group.

For measuring interest cost of credit, it is relevant to use bank-wise lending rate of interest. However, data on bank-wise lending rates are not available on a time series basis. In this study, an alternative indicator of cost of credit has been considered - the ratio of total expenses (operating expenses plus interest cost of deposits) to total assets. The cost variable indicating the pricing terms of credit serves a meaningful purpose under the assumption that banks, which engage in costly operations are most likely to charge higher interest rate on loans and investments. Such characterisation of cost condition is consistent with bank's lending behaviour, as discussed in Reddy (2004).

Again, there are severe data constraints for arriving at an indicator of average maturity of loans across banks. Taking clues from various research studies on the subject and also studies in other areas of finance, particularly, the literature on Government bonds, the maturity term of loans is approximated by the share of term loans in total advances. Such characterisation of the loan maturity has a meaningful

interpretation. A borrower gains from higher maturity of loans due to lower time value of money or present value of credit contract. If a bank provides more term loans, *ceteris paribus*, it is most likely to face fewer defaulting borrowers.

The measure of customer friendliness and credit culture can be measured in different ways. One, it can be measured by a bank's credit-deposit ratio deviating from the industry average credit-deposit ratio. Two, the share of an individual bank credit in total bank credit could be another indicator. However, the share of bank credit indicator will be similar to the asset measure of bank size giving rise to misleading results. Thus, a bank's credit-deposit ratio relative to that of industry is considered. As noted earlier, a relatively more customer friendly bank is most likely to face lower defaults as the borrower will have the expectation of turning back to the bank for further financing requirement.

There cannot be a precise measure of value of collateral or securities backing loans since banks provide loans to various customers across different class of economic activities, which in turn have different types of assets and/or collateral and securities. Nevertheless, as an approximation, it is possible to capture asset price effect on non-performing loans using expected stock market return. Such an approach is based on the premises that changes in stock prices reflect the changes in underlying value of the firms. Higher stock return implies higher value of collateral backing loans and the borrower would not take risk on default. However, from lenders side, high collateral value may induce soft lending and higher level of risky loans. Thus, the effect of stock return on the NPLs is subject to an empirical assessment.

Alluding to various studies, macroeconomic environment, in particular, the aggregate economic activity and business cycle may have differential effect on NPLs due to differential response of borrowers and lenders. Under the assumptions of financial constraint, cash-in-advance economy, and bank dependent system, borrowers' decision on loan repayment would depend upon the expected state of business condition captured through growth path of the economy. A

positive outlook on business condition would entail greater dependence of economic agents including firms on banks for debt financing and thus, favourable loan repayment response of borrowers in order to maintain credit worthiness. On the contrary, from lenders point of view, studies suggest that the expansion phase of macroeconomic activity is likely to amplify asymmetric information and moral hazard for which banks are likely to engage in soft lending, choose more risky borrowers and consequently, face higher loan defaults. Thus, the direction of the effect of macroeconomic shocks on loan losses would depend on the combination of differential response of borrowers and lenders. Accordingly, the empirical analysis has used lagged growth rate of GDP for capturing borrowers response to expected macroeconomic environment and business prospects.

Panel Regression Results

The essence of a cross section analysis is to provide meaningful analysis of inter-linkages among economic and financial variables after duly recognising the heterogeneous nature of economic agents and their behaviour. If economic agents were similar, a time series analysis would serve a meaningful purpose. The panel regression methodology recognises individual characteristics as well as regularity and/or continuity in the cross-section units in order to establish a meaningful relationship between different economic and financial variables. In this context, a pertinent question arises whether public sector banks are homogeneous or heterogeneous in nature. From an institutional perspective, it may be argued that public sector banks are similar entities. However, economic behaviour of each bank as reflected in their loan portfolio, cost structure and performance could not be similar for which a cross section analysis assumes utmost importance.

Since the emphasis of the study is on analysis of borrowers loan repayment response to terms of credit, the appropriate approach entails an empirical evaluation of the ratio of NPAs to advances rather than NPAs to assets ratio. Between the two NPA ratios, *i.e.*, the gross

NPAs to gross advances and net-NPAs to net advances, the former is appropriate for modelling borrowers' behaviour, while the later involves a mix of borrowers' as well as lenders' behaviour since net-NPAs incorporate lenders' decisions about loan loss provisions. The empirical analysis involves various scenarios for modeling gross as well as net NPAs under different formulations:

1. Model without Priority sector and collateral value
2. Model with Priority sector but without collateral value
3. Model with Priority sector and collateral value
4. Business Cycle Effect
5. Competitive Portfolio Effect
6. Testing for Sample Sensitivity

1. Without Priority Sector Loans and Collateral Value

The empirical results of various models are summarised in Annex I. In the first scenario, for the model of gross NPAs to gross advances ratio (Model M-1), the results are as follows:

(i) Bank size, as measured by the ratio of a bank's assets to the total assets of all public sector banks has statistically significant negative impact, implying that larger the bank, lower the level of gross NPAs. The estimated coefficient indicates that if a bank's asset grows by 1 per cent relative to that of the industry, then its gross NPAs would be reduced by 1.8 per cent.

(ii) The maturity terms of credit have significant negative impact, indicating that higher term loans induce lower NPAs. The estimated coefficient of maturity indicates that about 16 per cent increase in the share of term loan could reduce the ratio of gross NPA to gross advances by about 1 percentage point.

(iii) The changes in cost terms of credit, *i.e.*, the difference between current cost and past cost conditions have positive impact on NPAs, implying that the expectation of higher interest rate induced changes in cost conditions would fuel further increase in non-performing loans. The estimated coefficient indicates that

if the current interest cost increases by 2.5 percentage points relative to past cost terms, banks gross NPAs would rise by 1 per cent of gross advances.

(iv) Interestingly, the measure of credit orientation, defined by a bank's credit-deposit ratio relative to that of the industry has significant negative influence on NPAs, implying that borrowers attach considerable importance to relatively more credit (customer) oriented banks. The estimated coefficient suggests that if a bank's credit-deposit ratio is higher by 5 per cent, its level of gross NPAs would be lower by about 1 per cent. Thus, high credit culture has favourable effect of lowering banks' NPAs.

(v) The expectation of higher growth reflecting favourable macroeconomic and business conditions has negative influence on NPAs, suggesting that increased economic activity leads to lower financial distress of borrowers and thus, lower NPAs for banks. The growth rate of 4 per cent has the potential of reducing gross NPAs by 1 per cent.

When the above model is replicated for the ratio of net-NPAs to net-advances (Model M-2), none of the explanatory variables recorded change in the sign of their respective coefficients, thus, implying similar effect of variables and the nature of stability in the postulated empirical model. However, size of the estimated coefficients changes as the impact of loan-maturity, and cost-terms of credit gets amplified, while the effect of bank size, credit orientation and business cycle is moderated for net NPAs ratios.

A change in the definition of size, in terms of the ratio of an individual bank's capital and reserves and surplus to that of the industry as a whole, assuming all other variables remaining in the same form, however, produces some interesting results (Models M-3 & M-4). When the bank size is measured in terms of assets (Models M-1 & M-2), the bank size has negative impact on NPAs, while the measure of bank size in terms of capital (Model M-3 & M-4) gives somewhat opposite result. The measure of bank size in terms of capital has positive and significant effect on gross NPAs but negligible effect

on net NPAs. This implies that as the size of the bank in relation to the industry increases in terms of its capital, then it is likely that its gross NPAs would also rise. The sign condition for remaining explanatory variables, such as maturity, cost, credit orientation, and business cycle does not change, though, the magnitude of the coefficients for these variables are different from the Models M-1 & M-2. In models M-3, and M-4, the maturity, cost, and credit orientation variables, which broadly characterise the overall financial terms of credit, have sharper effect on both gross and net NPAs, while business cycle has sharper effect on gross NPAs but similar effect on net NPAs compared to models M-1 & M-2.

In another scenario, Models M-1 and M-2 were replicated with a change in the definition of cost of credit, where total cost is expressed as a ratio of total advances plus investments rather than total assets. In this case, all the explanatory variables had not only similar sign but also similar magnitude of their respective coefficients. On the other hand, subject to this definition of cost of credit, a change in the definition of bank size in terms of bank capital produced results, which were similar to Models M-3 and M-4.

2. With Priority Sector Loans but Without Implications of Collateral Value

There is a view that banks' exposure to priority sector lending also contributes to higher NPAs. The impact of banks exposure to priority sector loan was examined by introducing an additional variable defined as the ratio of a bank's priority sector lending to its total advances. In contemporaneous terms, the impact of exposure to priority sector loans turned positive and significant for gross NPAs but positive and non-significant for net NPAs. However, a sizeable component of priority sector loans to agriculture, exports and small industry comprise short-term loans upto one-year. Thus, a plausible result was found when the exposure to priority sector loans was allowed with a one-period lag, which had positive and significant effect on both gross and net NPAs. The effect of priority sector exposure was not as high as the effect of other explanatory variables

except the maturity term of loans. The impact of exposure to priority sector loans on gross NPAs (Model M-5) was somewhat higher than that on the net NPAs (Model M-6). In comparision to Model M-1, (*i.e.*, the equation of gross NPAs without priority sector), it is evident from Model M-5, that the exposure to the priority sector accentuates the effects of credit portfolio, terms of credit and macroeconomic environment. The results were more or less in the same direction in the case of net NPAs.

3. With Priority Sector Loans as well as Collateral Value

Initially, the empirical exercise with inclusion of contemporaneous term of the return on stock portfolio (measured by first difference of logarithm transferred stock price index) as an explanatory variable revealed positive and significant effect for gross as well as net NPAs. However, when the stock return was included with one period lag, the estimated coefficient of stock return turned significantly negative in the equation of gross NPAs (Model M-7) but not significant in the equation of net-NPAs (Model M-8). This implies that stock returns have differential implications for banks' NPAs adducing to differential response of borrowers and lenders (banks) to changes in asset prices and collateral value. As expected, inclusion of stock return has inflated the coefficient of bank size, maturity, and macroeconomic shock, but reduced the impact of cost and exposure to priority sector.

4. Business Cycle Effect

In the above, the empirical models analysed loan defaults under the situation when economic agents' form expectation about the state of economic condition in terms of lagged GDP growth rate. From an alternative perspective, the empirical analysis investigated as to how a change in the assumption about economic environment will impinge on the sign condition of terms of lending variables and thus, have differential implications for loan defaults. As pointed out in the review of literature, business cycle can have differential implications for borrowers and lenders. From borrowers' perspective, increased economic activities

would imply an improvement in the financial conditions and thus, lower defaults. On the other hand, from lenders perspective, research studies, which support pro-cyclical bank lending hypothesis, argue that the periods of increased economic activity may involve greater risk taking by banks and higher loan losses. Accordingly, the empirical analysis examined three alternate scenarios: (i) contemporaneous term of GDP growth rate in the place of lagged GDP growth rate, (ii) contemporaneous as well as lagged GDP growth rate; and (iii) contemporaneous GDP growth and cyclical component (defined as change in the growth rate, which charactersie current growth rate less expected growth rate) while keeping unchanged all other explanatory variables. The results of the exercise are set out in Annex II.

It is evident that in the first scenario (S1) contemporaneous growth rate of GDP has positive effect on gross NPAs. The sign condition of all variables but stock return has remained unchanged in all scenarios for models of gross NPAs. Stock return has positive effect as opposed to negative effect derived earlier. In the second scenario (S2), however, current growth rate turned out positive but insignificant while lagged growth rate turned out negative and significant. Stock return turned negative but significant with higher probability, *i.e.*, at about 10 per cent level of significance. In the third scenario, contemporaneous GDP growth rate has negative but insignificant effect, while the cyclical component of GDP growth rate has positive and significant effect on gross NPAs. Stock return was having negative effect at higher level of significance. For all three scenarios, the contemporaneous GDP growth rate has positive and significant effect on net NPAs. However, in the second scenario, the one-period lag GDP growth rate has significant positive effect while the cyclical growth rate has significant negative effect on net NPAs. The sign condition of stock return has significant positive effect on net NPAs. Thus, the empirical results corroborate differential response of borrowers and lenders to asset prices and macroeconomic and business cycle conditions.

5. Competitive Portfolio Effect

The empirical analysis undertaken above suggested that positive deviation of an individual bank's credit-deposit ratio from that of industry's average could have favourable effect on reducing NPAs. This explains how a bank can gain from strategic competitive portfolio management. However, the empirical analysis did not specify to what extent such competitive advantage could accrue. In this regard, there is a need for a sensitive analysis to arrive at robust findings. The sensitive analysis investigates the non-linear effect of portfolio adjustment by introducing an additional variable (Z), which is defined below.

Let a dummy variable D_j is defined as

$$D_j = \begin{cases} 1, if\ (CDR_j - CDR) >= k, \\ 0, otherwise \end{cases}$$

where D takes values 1 when (CDR_i-CDR) is greater than or equal to some positive value of k, and zero otherwise. The Z variable is defined as

$$Z_j = D_j*(CDR_i\text{-}CDR)$$

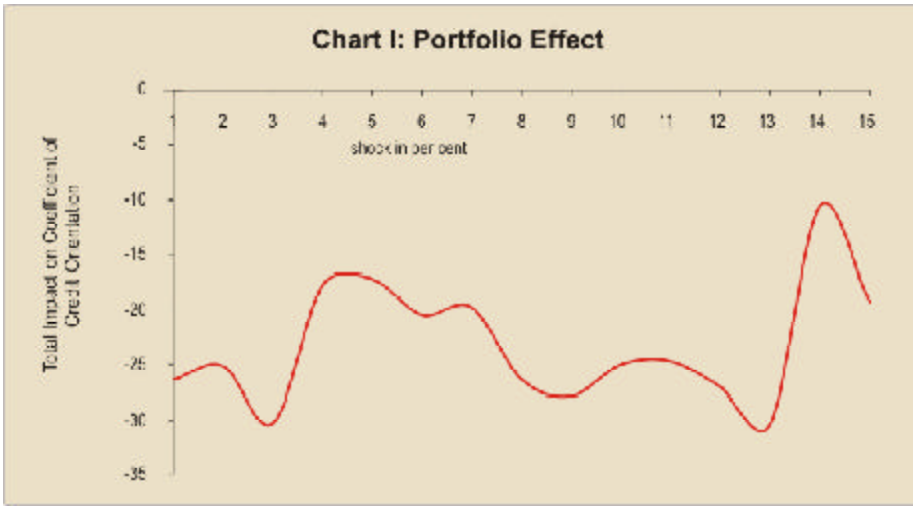
which implies that Z takes a non-zero value (CDR_i-CDR) when (CDR_i-CDR) is greater than or equal to k, and zero otherwise.

The modified regression model will be as follows.

$$Y = \alpha + \Sigma\beta_i X_i + \gamma_1 (CDRi\text{-}CDR) + \gamma_2 (Z)$$

Thus, the impact of a bank's competitive portfolio (CDRi-CDR) will be (γ_1+γ_2) when (CDRi-CDR) is greater than and equal to k and the impact will be γ_1 otherwise.

The sensitive analysis was carried out for gross NPAs equation (Model M-7) for various values of k in the range of 1-15 per cent implying the extent to which a bank can strategically chose its CDR_i higher than the industry average CDR. The results of the sensitive analysis pertaining to the coefficient of (CDRi-CDR) and Z are shown in Chart I. It is evident that a bank could exploit competitive portfolio



advantage within a range of about 8-13 per cent difference between its own CDR and that of the industry.

6. Sample Sensitivity

The cross-section empirical analysis may be sensitive to the behaviour of a dominant economic unit for which results may not be robust enough for arriving at meaningful conclusion. In this regard, the robustness of the empirical model was examined by removing the largest bank from the sample and re-estimating parameters of the model.

The results of such exercise are outlined in Annex I for gross NPAs (Model M-9) and net NPAs (Model M-10), respectively. From a comparative perspective, the results indicate that the sign condition of parameters does not alter for any explanatory variable, thereby, reiterating the stability of the empirical model. As obvious, the size of various coefficients has changed, *albeit,* marginally. The inclusion of the dominant bank inflates coefficients of all variables except cost and priority sector loan variables. However, the effect is more pronounced on bank size while less pronounced on other variables, in particular, terms of credit variables. Overall, such finding reinforce the robustness of original cross-section analysis, which includes a dominant bank in the sample.

Section V
Conclusion

This study attempted an empirical analysis of the non-performing loans of public sector banks in India and investigated the response of NPLs to terms of credit, bank size and macroeconomic condition. The empirical analysis suggested that terms of credit variables have significant effect on the banks' non-performing loans in the presence of bank size and macroeconomic shocks. Moreover, alternative measures of bank size could give rise to differential impact on bank's non-performing loans. For instance, the bank size measured in terms of assets, has negative impact on NPAs, while the measure of bank size in terms of capital has positive and significant effect on gross NPAs but negligible effect on net NPAs. Thus, appropriate measure of size assumes importance. The empirical analysis suggests that asset measure of size could yield meaningful results relating to borrowers' loan response.

The changes in the cost of credit in terms of expectation of higher interest rate induce increase in NPAs. On the other hand, factors like horizon of maturity of credit, better credit culture, and favorable macroeconomic and business conditions lead to lowering of NPAs.

The results confirm the viewpoint that banks exposure to priority sector lending could not be more important than credit culture and terms of lending variables. The empirical analysis suggests that positive deviation of an individual bank's credit-deposit ratio (CDR), from that of industry's average could have favourable effect on reducing NPAs. Banks could exploit competitive portfolio advantage within a range of about 8-13 per cent difference between their own CDR and that of the industry. The robustness of results was tested by excluding a major bank from the sample and re-estimating parameters of the model. As a result, the sign condition of parameters does not alter for any explanatory variable, thereby, reiterating the stability of the empirical model.

The results of the study are in line with a considered view in the banking literature and provide an important insight for banks'

lending behavior. Appropriate credit culture and lending policy designed with relevant economic and financial factors constituting the terms of credit will make a significant impact on banks non-performing loans.

For further research, there is scope for improvement and additional insights. Over time, as database expands, future studies may use time-dimensional maturity composition of loans, various other formulations of appropriate cost condition and interest rates charged to borrowers for identification of differential response of borrowers and lenders.

Annex I
Empirical Analysis of Non-Performing Loans

	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10
Bank Size (Asset measure)	-185.04 (-5.2)	-111.34 (-4.5)			-205.83 (-6.7)	-111.63 (-4.4)	-214.41 (-7.4)	-113.37 (-4.4)	-209.04 (-6.1)	-132.8 (-5.2)
Bank size (measure of Capital and Reserves)			66.45 (4.6)	7.77 (0.5)*						
Maturity	-6.16 (-3.5)	-10.73 (-5.5)	-2.08 (-1.2)*	-10.18 (-4.6)	-9.64 (-5.2)	-10.61 (-5.1)	-6.83 (-3.4)	-10.46 (-4.9)	-7.16 (-3.5)	-10.79 (-5.0)
Cost Condition	48.56 (5.1)	47.77 (5.2)	82.1 (12.7)	59.77 (6.5)	65.79 (7.9)	61.62 (7.1)	48.9 (5.4)	61.65 (7.2)	49.63 (5.3)	61.61 (7.1)
Credit Orientation	-19.05 (-11.60)	-16 (-7.6)	-17.14 (-15.57)	-11.74 (-5.49)	-21.76 (-14.67)	-16.1 (-8.35)	-19 (-11.6)	-16.35 (-8.8)	-18.62 (-11.7)	-17.45 (-9.3)
Expected Macroeconomic Environment	-0.28 (-11.0)	-0.19 (-5.5)	-0.28 (-14.4)	-0.18 (-4.9)	-0.34 (-14.8)	-0.2 (-6.6)	-0.32 (-12.2)	-0.2 (-6.7)	-0.32 (-12.3)	-0.22 (-7.5)
Exposure to Priority sector					16.16 (7.5)	10.61 (4.8)	14.52 (6.9)	10.59 (4.8)	14.5 (7.0)	10.58 (4.7)
Expected Asset return							-0.63 (-5.1)	-0.08 (-0.5)*	-0.58 (-4.7)	-0.17 (-0.2)*
Adjusted R^2 DW statistics	0.98 1.88	0.91 1.93	0.99 1.88	0.87 1.93	0.98 1.92	0.94 1.96	0.98 1.84	0.92 1.96	0.98 1.82	0.94 1.93

* are not significant. Remaining coefficients are all significant at 5 per cent level of significance.

Annex II
Business Cycle Effect on Non-Performing Loans

	Models of Gross NPAs Ratio			Models of Net NPAs Ratio		
Variables	S1	S2	S3	S4	S5	S6
Bank Size (Asset measure)	-190.64 (-6.9)	-210.99 (-7.4)	-210.97 (-7.3)	-120.51 (-5.2)	-147.84 (6.4)	-147.84 (6.4)
Maturity	-6.94 (-3.3)	-6.68 (-3.4)	-6.68 (-3.4)	-10.83 (6.3)	-5.62 (4.7)	-5.62 (4.7)
Cost Condition	18.67 (2.0)*	43.31 (3.9)	43.29 (3.8)	36.78 (4.3)	-42.39 (3.9)	-42.39 (3.9)
Credit Orientation	-18.67 (-10.4)	-18.89 (-11.3)	-18.89 (-11.3)	-15.60 (9.0)	-13.46 (8.7)	-13.46 (8.7)
Exposure to Priority Sector	13.30 (6.3)	14.2 (6.6)	14.22 (6.6)	9.91 (5.0)	5.50 (3.1)	5.50 (3.1)
Expected Stock Return	0.35 (2.1)	-0.46 (-1.6)**	-0.46 (-1.6)**	1.09 (6.8)	3.18 (13.9)	3.19 (13.9)
GDP Growth Rate	0.37 (10.7)	0.07 (0.8)***	-0.20 (-1.4)	0.38 (11.3)	1.02 (14.4)	1.57 (12.5)
GDP Growth Rate (lag)		-0.27 (-3.6)			0.55 (9.6)	
Cyclical GDP Effect (Change in GDP growth rate)			0.27 (3.6)			-0.55 (-9.6)
DW / R2	0.98, DW =1.8 3	0.98, DW =1.82	0.98, 1.82	0.95, 1.9	0.96, 1.64	0.96,1.64

* significant at 5 per cent, ** significant at 10 per cent, and*** notsignificant. Remaining coefficients are highly significant at below 5 per cent.

Notes

[1] 'Bonds hold attraction for India's lazy bankers', Times News Network, November 25, 2003

[2] Source: Global NPL Report, 2004, Ernst and Young.

[3] As measured by balance sheet information on interest expenses on account of deposits

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Dynamics of Market Structure and Competitiveness of the Banking Sector in India and its Impact on Output and Prices of Banking Services

Kaushik Bhattacharya and Abhiman Das*

The paper examines the nature and the extent of changes in the market concentration in the Indian banking sector and their possible implications on prices and output of banking services. The first part of the paper attempts to measure market concentration in banking in India in alternative ways from 1989-90 to 2000-01. In contrast to earlier empirical applications on banking, it focuses on both static and dynamic measures of market concentration. The paper finds a strong evidence of change in the market structure in banking in India. Interestingly, results reveal that a major part of the change in market structure occurred during the early 1990s. Despite a spate of mergers during the late 1990s, market concentration was not significantly affected. It is also observed that the different concentration ratios rank the changes similarly over time.

The second part of the paper analyses the possible impact of changes in banking market structure on prices and output of this sector during the same period. It is demonstrated that measurement problem of real output pertaining to banking sector in the national income data could be severe. The implied inflation as obtained through the GDP deflator for the banking sector in India led to unbelievable measures of inflation for banking services, casting some doubt on the methodology adopted. Alternatively, proxy price measures based on the spread appear to be more consistent with the changes in market structure in India during the late 1990s. The paper argues that the favourable market structure in India could be one important factor that led to a reduction in the 'prices' of banking services after the administered interest regime was lifted.

JEL Classification : D40, G21, L11, L89

Key Words : Concentration, Competition, Banking

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Introduction

The role of competition in ushering economic efficiency has been extensively examined in the literature. In view of globalisation and renewed interest in shaping appropriate competition policies in many countries, the issue has once again become germane (Neumann, 2001). A major requirement for enhancing competition in an economy is the removal or minimisation of entry barriers. An important source of removing them is to ensure the availability of cheap finances, which *inter alia*, is easier to meet in the presence of a thriving and competitive banking sector. Theoretical results demonstrate that monopolistic market power of banks raises the opportunity costs of capital and thus, tends to make financing more expensive (Smith, 1998). Lack of adequate competition in banking could thus, adversely affect economic development.

To analyse competitiveness in any sector, an in-depth analysis of the structure of the market is essential. While highly concentrated markets do not necessarily imply lack of competitive behaviour, it is generally agreed that market concentration is one of the most important determinants of competitiveness (Nathan and Neavel, 1989). For banking sector, the relationship between market concentration and competitiveness has been examined in detail for many countries and the results indicated that a high concentration tends to reduce competitiveness in this sector (Gilbert, 1984). Most of the empirical evidences in the literature are, however, based on developed economies. The financial structures in many developing countries being sharply different from the developed ones, it is necessary to examine to what extent the established empirical findings in the developed economies apply to these countries, especially in an environment where financial structures are undergoing rapid and swift changes.

This paper examines the nature and the extent of changes in the structure of banking in India during the 1990s and analyses the possible impact of these changes on prices and output of banking services during the same period. The concepts of price and real output

in the banking sector being fuzzy, an analytical discussion on these aspects has also been attempted. Currently, a detailed examination of these issues is relevant because the economic reforms in India during the 1990s ushered in phenomenal changes in the Indian banking sector. The new regime, in sharp contrast to the earlier regime that thrived on banking through public sector, is perceived as more accommodative towards competition. A fundamental change in this context during the second half of the 1990s had been the liberalisation of the earlier administered interest rate regime. Besides that, other significant policy measures included reduction in reserve ratio, relaxation of quantitative restrictions assets/liability composition and removal of some of the major barriers to entry into the financial system. The new policy framework also entailed considerable institutional reforms, including new laws and regulations governing the financial sector, the restructuring and privatisation of banks, and the adoption of indirect instruments of monetary policy. In the current regime, banks enjoy almost full freedom in pricing their products. Furthermore, a spate of new entries of private Indian and foreign banks and mergers among some of the existing players during the second half of the 1990s is expected to usher in significant changes in the structure of the banking sector in India.

The changes in the market structure of firms could be examined through alternative measures. Recent survey of Bikker and Haaf (2001a) lists 10 such measures proposed and used in the literature. Among these, the more popularly used ones are *k*-Bank Concentration Ratios and Herfindahl-Hirschman Index (HHI). The Lorenz Ratio (Gini Coefficient), a popular measure in the literature on income inequality, is also used to measure industrial concentration. In India, some of these measures have been used by the official agencies to address similar problems.[1] It may, however, be noted that the scope of these popular measures is somewhat limited. For example, the HHI and the Gini coefficient are based on the variance of market shares. So far as market concentration is concerned, policy makers are in most cases not interested in the variance *per se*, but at the tails of the distribution of market shares. Although some of the measures

listed by Bikker and Haaf (2001a) attempt to address these problems, all of them ignore the inherent dynamics associated in this process. To analyse competitiveness in an industry, specification of a full dynamic framework is necessary to gain sufficient hold on the market in the long run, while firms may initiate price wars, resulting in apparently misleading changes in the short-run concentration profiles. Although the dynamic aspects of concentration have been addressed in the literature, earlier studies focussed primarily on a descriptive analysis of the changes in indices of concentration from year to year in specific industries and related it to "competitiveness" measured in alternative ways.

Recent advances in the literature have, however, explicitly focussed on the dynamic aspects of concentration measures. Borrowing concepts from the related literature on income mobility, Maasoumi and Slottje (2002) have classified measures of industrial concentration based on generalised entropies, obtained asymptotic distributions for these measures and applied them on the US steel industries. Empirical results reveal that the incorporation of the dynamic aspects could lead to changes in inferences drawn from more traditional static measures. As this development is a nascent one, the empirical relevance of these developments in the banking sector is yet to be examined.

So far as banking sector is concerned, our study is different from the earlier studies in two respects. First, we examine the changes in concentration in the banking sector in India in both static and dynamic framework and compare them empirically. While the static framework employs standard measures of concentration, in the dynamic frameworks, we measure these changes through generalised entropy measures as developed by Maasoumi (1986) and Maasoumi and Zandvakili (1990). Wherever possible, results are compared to those obtained for other countries. Second, while examining the implications of changes in the concentration profiles on competitiveness and on the prices and output of the banking sector, we demonstrate that standard measures of prices and output as per

the national accounts statistics could provide a distorted picture. We argue that alternative proxies of 'price' based on the spread between the lending and the deposit rates appear to be more consistent with the changes in the concentration profiles of banks in India during this period.

The plan of the paper is as follows: Section I presents a brief review of literature on measuring concentration, with special reference to dynamic measures of concentration. Section II describes the empirical evidence on changes in the structure of banking sector in India. Section III attempts to analyse the possible impact of these changes on prices and quantities of the financial intermediation services. Finally, Section IV concludes the paper with some critical comments, focussing on policy aspects.

Section I

A Brief Review of Literature

So far as measurement of market concentration is concerned, many of the existing results on income inequality could be readily translated. Drawing analogies from the literature on income inequality, the 'inequality' in the share of sales (or output or share of industry employees) of individual firms in an industry has been specified as appropriate empirical measure of market concentration. These measures have been estimated and related them to competitiveness measured in alternative ways.

In the income inequality literature, inequality has also been examined in a dynamic framework. These mobility studies have been compared to videotapes on inequality as against a spot picture provided by the static measures. Recently, attempts have been made to translate the framework to measure market concentration.

Accordingly, Subsection I.1 reviews the static measures of concentration and Subsection I.2 does that for the dynamic measures.

I.1 Static Measures of Concentration

In the static inequality literature, different inequality measures do not necessarily imply the same ordering of distributions. Either explicitly or implicitly, almost all these measures or orderings are based on a weighted average of the income (or, wealth) vector of individuals (or, households). The disagreement occurs in the specification of the weights. The disagreement is irrelevant, if there are 'good' reasons to demonstrate the superiority of one measure over others. The 'good' reasons could be specified in alternative ways. One way is to identify a few desirable properties that a measure on inequality should satisfy. Some of these properties are symmetry, continuity, invariance to scalar multiplication, additive decomposability and satisfaction of transfer principle (Shorrocks, 1984). Another way is to derive an inequality measure or an ordering from a social welfare function (SWF). The SWF is specified as a function of the income (or, wealth) vector of all individuals (or, households). Thus, different income distributions can be ordered based on the SWF pertaining to them. This approach often involves specifying an axiomatic structure that such a SWF should satisfy. Subsequent task involves characterising indices or orderings that would satisfy such axioms.

Like indices of inequality, different indices of concentration put different weights over different parts of the distribution of market shares across firms and may give contradictory evidence. Let there be n firms in an industry with market shares s_1, s_2, …, s_n. A simple but general linear form of an index of industrial concentration (IIC) is:

$$(1) \qquad IIC = \sum_{i=1}^{n} w_i s_i$$

where w_i (i=1,2, …, n) are weights that may or may not sum to unity. Following the taxonomy of Marfels (1971), there could be four broad classes of weighing schemes: (i) unity to top k firms and zero to the rest, (ii) individual ranks of firms, (iii) firms' own market shares or their power, and (iv) the negative of the logarithm of market shares.

The weighing scheme reflects different assessment regarding the relative impact of larger and smaller firms. Depending upon the weighing scheme, the individual measures may vary, but they may lead to similar orderings.[2]

As in the inequality literature, there are two ways to deal with the problem of lack of robustness with respect to weights. One way is to report "complete rankings'' through a class of concentration measures that reflect the sensitivity to concentration in all parts of the share distribution. Another approach is to consider "partial but uniform'' orderings that evaluate concentration over a restricted part, but over a larger class of evaluative functions. Whatever be the strategy, Maasoumi and Slottje (2002) argue that for transparency's sake, it is imperative for the policymakers and analysts to declare the "weights'' they attach to a reduction in concentration over various parts of a distribution.

The most common measure used in the literature on market concentration has been a simple concentration index, aggregating such shares of a few top firms (say, k). These measures for banking firms are called k-Bank Concentration Ratios. There is no rule for choosing an appropriate value of k. So, the number of firms included in the concentration index is an *ad hoc* and an arbitrary decision. The index ranges from zero to unity. The index approaches zero for an infinite number of equally sized banks and it equals unity, if the firms included in the calculation of the concentration ratio make up the entire industry.

Another popularly used measure is the Hirfendahl-Hirschman index (HHI)[3]. For n firms in an industry with market shares s_i, ($i=1,2, \ldots , n$), the HHI is defined as:

$$(2)\quad \text{HHI} = \sum_{i=1}^{n} s_i^2$$

HHI can be written as an increasing function of the population variance of market shares. The more "equal" the firm's size is, the smaller is the HHI. HHI also satisfies the well known "transfers''

property. By definition (1/*n*) <HHI <1, where *n* is the number of firms in an industry. The maximum concentration of unity occurs when one firm has all the sales, output, *etc*. Minimum of concentration (*1/n*) occurs when each firm has an equal share of *1/n*.

Despite its popularity, HHI suffers from a few limitations. A major limitation is that distributions of market shares with radically different tail properties may have HHI of similar magnitude (Rhoades, 1995). Recently, Maasoumi and Slottje (2002) have argued that common economic phenomena like mergers between a strong and a weak firm or entries and exits only change certain parts of the distribution of market share – often the tails only. Indices based solely on "dispersion'' or variance, (e.g., HHI, Gini, *etc.*) may miss such changes. Another popular measure that shares most of the properties of HHI is the Gini ratio. The Gini ratio, in a continuous variable framework, is defined as:

(3) $G = (2/m_x)\int_0^{\infty} x[F - \tfrac{1}{2}]\mathrm{dF}$

Some other measures, which have been extensively used in the literature, are:

(a) *The Hall-Tideman Index (HTI)*. It is defined as:

(4) $HTI = 1/(2\sum_{i=1}^{n} is_i - 1)$

where the market share of each bank is weighted by its ranking in order to ensure that the emphasis is on the absolute number of banks, and that the largest bank receives weight *i*=l. This index includes the number of banks in the calculation of a concentration index, because it reflects to some extent the conditions of entry into a particular industry.

(b) *The Rosenbluth Index (RI)* is defined as:

(5) *RI=1/(n(1-G))*, where G is the Gini-coefficient.

(c) *The Comprehensive Industrial Concentration Index* (CCI) is defined as :

$$(6) \quad CCI = s_1 + \sum_{i=2}^{n} s_i^2 (1 + (1 - s_i))$$

It is the sum of the proportional share of the leading bank and the summation of the squares of the proportional sizes of each bank, weighted by a multiplier, reflecting the proportional size of the rest of the industry.

(d) *The Hannah and Kay Index (HKI)* is defined as :

$$(7) \quad HKI = (\sum_{i=1}^{n} s_i^a)^{1/(1-a)} \qquad a > 0 \text{ and } a \neq 1$$

where **a** is an elasticity parameter to be specified and intended to reflect their ideas about changes in concentration as a result of the entry or exit of banks, and the sales transfer among the different banks in the market. The freedom to choose **a** allows for alternative views on: what is the appropriate weighting scheme and for the option to emphasise either the upper or the lower segment of the bank size distribution. Therefore, in addition to the distribution of the banks in the market, the value of the index is sensitive to the parameter **a**. For $a \to 0$, the index approaches the number of banks in the industry, and for $a \to \infty$, it converges towards the reciprocal of the market share of the largest bank.

(e) *The Hause Indices*

i) The multiplicatively modified Hause Index takes the form:

$$(8) \quad H_m(a, \{s_i\}) = \sum_{i=1}^{n} s_i^{2-(s_i(HHI - s_i^2))^a}$$

where HHI is the Herfindahl-Hirschman Index and **a** is the parameter capturing the degree of collusion.

ii) Hause furthermore proposes the additively adjusted measure of concentration, which is defined as:

$$(9) \quad H_a(b, \{s_i\}) = \sum_{i=1}^{n} (s_i^2 + (s_i(HHI - s_i^2))^b)$$

with $b > 1$.

(f) Entropy Measure

The Entropy measure has its theoretical foundations in information theory and measures the *ex-ante* expected information content of a distribution. It takes the form:

(10) $E = -\sum_{i=1}^{n} s_i \log s_i$

(g) Coefficient of Concentration (CC) is defined as:

(11) C= n/(n-1)*G

Indices *(a)* to *(g)* are discussed in detail in Bikker and Haaf (2001a). It may be noted that some of the indices are based on higher moments of market shares. For example, the Comprehensive Concentration Index (CCI) could be associated with the third moment of market shares. In some cases, they are functions of market shares as well as the HHI. Some of the measures, in fact, represent broad classes. The values of a specific measure within that class will depend on specific values of certain parameters. In an empirical exercise, the choices of the values of these parameters are often not clear. Researchers typically specify a set of "plausible" values of these parameters and examine the robustness of the obtained results.

Availability of so many indices implies that in any specific exercise, it is important to specify the underlying axiomatic structure under which the corresponding index becomes the "best" index. In their various incarnations, axiomatic structures identify the generalised entropy (GE) as an "ideal" family of indices. For a weighted random vector $X=(X_1,\ldots,X_n)'$ with weights $w=(w_1,\ldots,w_n)'$ the GE concentration measure is defined as:

(12) $$I_l(X) = \frac{1}{nl(1+l)} \sum_{i=1}^{n} \left(\frac{w_i}{\overline{w}}\right) \left[\left(\frac{X_i}{\overline{X}}\right)^{1+l} - 1 \right] \qquad \text{for} \quad l \neq 0,-1$$

where $\overline{X} = \frac{1}{n} \sum_{i=1}^{n} \left(\frac{w_i}{\overline{w}}\right) X_i$ and $\overline{w} = \frac{1}{n} \sum_{i=1}^{n} w_i$, the weights being the

reciprocal inclusion probabilities. This family includes HHI, variance of logarithms, square of the coefficient of variation, and for λ=0, -1, this index converges to the first and second Theil measures of information respectively:

(13) $$I_0(X) = \sum_{i=1}^{n} \left(\frac{w_i}{\bar{w}}\right)\left[\left(\frac{x_i}{\bar{x}}\right)\log\left(\frac{x_i}{\bar{x}}\right)\right]$$

(14) $$I_{-1}(X) = -\frac{1}{n}\sum_{i=1}^{n} \left(\frac{w_i}{\bar{w}}\right)\left[\log\left(\frac{x_i}{\bar{x}}\right)\right]$$

It has been shown that Theil's second measure (λ = -1) provides the most unambiguous answer to such fundamental questions as: How much of the overall concentration is due to the concentration within the r^{th} group? The groups could be with respect to type of product, technology, location, or the size itself. These two measures in (13) and (14) were further studied by Maasoumi and Theil (1979) with a view to determine their characteristics in terms of the moments of distributions. Let log(x)=z, E(z)=μ, var(z)=σ^2, γ_1=E(z-μ)^3/σ^3 as the skewness, and γ_2=E(z-μ)^4/σ^4-3 as the kurtosis of the log output distribution. Assuming the existence of the first four moments and carrying out Nagar type approximations, they obtained :

(15) $I_0 = -\frac{1}{2}\sigma^2[1+\frac{2}{3}\sigma\gamma_1-\frac{1}{4}\sigma^2\gamma^2+o(\sigma^2)]$

(16) $I_{-1} = -\frac{1}{2}\sigma^2[1-\frac{1}{3}\sigma\gamma_1-\frac{1}{2}\sigma^2\gamma^2+o(\sigma^2)]$

When z has a lognormal distribution, both indices equal - (1/2)σ^2. HHI can be shown to be a simple function of σ^2, but not of the higher moments. Thus, it can fail with departures from lognormality. The above approximate formulae can be used when the underlying distribution is not known. They allow us to see that positive skewness and leptokurtosis increase concentration, and that I_0 is more sensitive to positive skewness (high sales/output groups) and fat tails (large extreme sales groups) than I_{-1}.

As these entropy measures appear more general and relatively easy to implement, their use in the context of measuring market concentration has often been suggested. This is because entropy is shown as a much richer function of all the moments of a distribution, and more closely identifies it than any single moment such as variance or HHI.

I.2 Dynamic Measures of Concentration

The dynamic measures of concentration emerge from the realisation that it is misleading to consider states of a market at only single points in time. Transitory conditions may mislead and become difficult to disentangle when looking at several periods/situations. It is thus, desirable to consider market concentration over several periods, and to develop a dynamic concentration profile, following the concepts of mobility as in Maasoumi and Zandvakili (1990).

Let X_{it} denote sales/output of firm i, $(i=1,\ldots,N)$, in period t=1,…,T. We denote the vector $\mathbf{X}_t=(X_{1t},X_{2t},\ldots,X_{Nt})$¢. Let $S_i=S_i(X_{i1},\ldots,X_{iT})$ be the 'permanent' or "aggregate'' sales of firm i over T periods. Of course, one can define the aggregates over periods 1 to T¢£ T, say, and develop a mobility profile as T¢ approaches T. Then

$$S=(S_1,\ldots,S_n)\text{¢} \tag{17}$$

is the vector of aggregate sales for a chosen time frame. Following Maasoumi (1986), the following type of aggregation functions are justified on the basis that they minimize the generalized entropy distance between S and all of the T "sales'' distributions:

$$S_i=\left(\sum_{t=1}^{T}a_t(X_{it})^{-b}\right)^{-1/b} \qquad \text{for } b\neq 0,-1 \tag{18}$$

$$=\prod_{t=1}^{T}(X_{it})^{a_{it}} \qquad \text{for } b=0$$

$$=\sum_{t=1}^{T}a_tX_{it} \qquad \text{for } b=-1$$

where $\mathbf{a}_t$ is the weight attached to sales in period t, $\mathbf{S}\mathbf{a}_t=1$. The elasticity of substitution of sales/output across time is constant at $\mathbf{a}=1/(1+\mathbf{b})$. The case $\mathbf{b}=-1$ corresponds to perfect inter-temporal substitution, which subsumes Shorrocks' analysis for certain weights. This case is also the most common formulation of the "permanent income'' concept in economics. In this context, we can think of the concept as "permanent output'', or "expected sales''.

Mobility is measured as the ratio of "long run'' concentration occurring when the period of examination is extended, and a measure of

short run concentration. The latter may be represented by any one period of interest, or a weighted average of the single period concentrations. We might think of this as a notion of "competition enhancing'' mobility, a *welfare theoretic* base in favour of large, non-concentrated markets.[4] The extension of the time interval is meant to reflect the dynamics and smooth out the transitory or business cycle effects in the industry. Shorrocks (1978) proposed the following mobility measures:

$$M = 1 - \frac{I(S)}{\sum_{t=1}^{T} a_t I(X_t)} \tag{19}$$

where *I()* is the "inequality'' measure. For convex inequality measures I(), 0£M£1 is easily verified when *S* is the linear "permanent output'' function. For other aggregator functions see Maasoumi and Zandvakili (1990). *A priori,* there would be no reason for an analyst to give unequal weights to different years under study. Nevertheless, Shorrocks (1978) suggests the ratio of year *t* income to total income over the *T* periods as suitable values for a_t s. We consider both weighting schemes here.[5]

Section II

Empirical Analysis

Compared to many other developing countries, India has an extensive banking network. Before an empirical analysis, a brief discussion on the taxonomy and the historical development of the structure of the Indian banking market would be essential.[6] Accordingly, Subsection II.1 presents such a review in brief. Subsections II.2 and II.3 present results based on static and dynamic measures, respectively.

II.1 Taxonomy and Historical Development

The scheduled banking structure in India consists of banks that are included in the Second Schedule of the Reserve Bank of India Act, 1934. These scheduled banks are divided in two groups, viz., scheduled commercial banks and scheduled co-operative banks. This study is restricted to scheduled commercial banks that account for more than 90 per cent of banking business in India. For analytical purposes, the scheduled

commercial banks could be further classified into four groups, *viz*., public sector banks, Indian private sector banks, regional rural banks and foreign banks. Among the public sector banks, official reports generally indicate results separately for State Bank of India (SBI) and its Associates and Other Nationalized Banks, due to the large size of the former.

So far as banking is concerned, the year 1969 marked a watershed, during which fourteen major banks in India were nationalised. At that time, there were 73 scheduled commercial banks in India, of which 15 were foreign banks. Due to strong emphasis on increasing the savings rate of the economy, the 1970s and 1980s experienced phenomenal growth in the banking network that spanned the entire country. As a result, though the absolute number of scheduled commercial banks (other than regional rural banks) did not increase much (78 as at end-March 1990, of which 22 were foreign banks), the number of bank branches increased from 8,262 in 1969 to 59,752 as at end-March 1990, resulting in a very high annual compound growth rate of 18.8 per cent in deposit mobilisation, from Rs.4,646 crore as at end-March 1969 to Rs.1,73,515 crore as at end-March 1990. The Indian Government has historically undertaken a number of extensive and elaborate policy initiatives to extend the outreach of formal credit systems to the rural population. One of the major initiatives taken was the establishment of Regional Rural Banks (RRBs) in 1975. These policy initiatives during 1970-90 had a far-reaching impact on the functional reach and geographical spread of banking in India. However, this period is also characterised by widespread control, limiting the scope of competition. Interest rates were strictly administered and had multiple layers. On the lending side, the focus was on priority sectors. The banking market during this period was also highly segmented.

Following the balance of payments crisis in India during the early 1990s, the earlier regime experienced a radical change. A major change was to shift away from the earlier administered rates towards market determined ones. On the lending side, the deregulation began in 1994 with emphasis on the development of money, Government securities and foreign exchange markets. The conduct of monetary policy also slowly moved away from the use of direct instruments of monetary control to indirect measures such as open market operations. Banks were given freedom to set their Prime Lending Rates and to devise their own

lending policies. On the liabilities side, the entire gamut of deposit rates – except on savings deposits – were deregulated, and the banks were given freedom to offer different interest rates for different maturities/ size-groups. Interest rates on Government securities were made market-determined. The refinance facility of Reserve Bank of India (RBI) was also rationalised and sector specific refinance facilities were de-emphasised. During 1997, another overriding development with far reaching implications was, however, the reactivation of the Bank Rate, which was linked to other interest rates including the Reserve Bank's refinance rate. During this period, banks were also permitted to rationalise their existing branch network *viz*., to shift their existing branches within the same locality, open certain type of specialised branches, convert the existing non-viable rural branches into satellite offices, *etc*.

Table 1 presents the movement of select banking indicators during last two decades. It is observed that the decade 1992-02 is marked with significant increase in the banking business by Indian private banks. While the deposits of Indian public sector banks grew at an annual compound growth rate of around 15.55 per cent during 1992-02, the same for Indian private banks grew at an annual compound growth for around 28.57 per cent. In the case of bank credit also, a similar pattern is observed.

Table 1: Movement of Select Banking Indicators during 1982-92 to 1992-02

Bank-groups	Growth in number of branches		Compound growth of deposits		Compound growth of bank credit	
	1982-92	1992-02	1982-92	1992-02	1982-92	1992-02
State Bank of India & its Associates	26.54	7.69	16.18	15.48	14.64	15.32
Nationalised Banks	32.64	3.41	15.15	15.59	13.81	15.23
Regional Rural Banks	60.09	-1.82	27.46	23.07	21.64	16.52
Indian Private Banks	-5.87	23.67	15.57	28.57	17.85	28.23
Foreign Banks	12.58	17.93	25.91	13.46	21.53	19.29
Total	35.33	4.80	16.12	16.75	14.83	17.00

The liberalisation measures adopted during the beginning of the study period, attempted to reduce entry barriers by discarding the earlier licence-permit regime. As a consequence, there were a number of new entrants in the banking business during this period. Table 2 lists the

new arrivals of banks in India between 1989-90 and 2000-01 chronologically. It is interesting to note that during the first few years, there were no new arrivals. The early 1990s was the period of consolidation after the economic debacle following the balance of payments crisis experienced by India during the year 1990-91. The arrivals started during early 1994 after the crisis was effectively tackled and in consequence, the pace of liberalisation in the Indian financial sector accelerated. Table 2 reveals the arrival of 33 new banks during this period, among which 24 are of foreign origin. It is also interesting to note that the arrival of the foreign banks accelerated during the later period.

Table 2: Entry of New Banks during 1990-2001

Bank Name	Date of Opening	Ownership Category	Bank Name	Date of Opening	Ownership Category
Barclays Bank	8/10/90	Foreign Bank	Bank of Ceylon	30/10/95	Foreign Bank
Sanwa Bank	20/12/90	Foreign Bank	Commerz Bank	1/12/95	Foreign Bank
UTI Bank	28/02/94	Indian Private Bank	Siam Commercial Bank	14/12/95	Foreign Bank
IndusInd Bank	2/04/94	Indian Private Bank	Bank International Indonesia	6/04/96	Foreign Bank
ICICI Bank	17/05/94	Indian Private Bank	Arab Bangladesh Bank	6/04/96	Foreign Bank
ING Bank	1/06/94	Foreign Bank	Chinatrust Commercial Bank	8/04/96	Foreign Bank
Global Trust Bank	6/09/94	Indian Private Bank	Cho Hung Bank	6/05/96	Foreign Bank
Chase Manhattan Bank	21/09/94	Foreign Bank	Fuji Bank	20/05/96	Foreign Bank
State Bank of Mauritius	1/11/94	Foreign Bank	Krung Thai Bank	6/01/97	Foreign Bank
HDFC Bank	5/01/95	Indian Private Bank	Overseas Chinese Bank	31/01/97	Foreign Bank
Centurion Bank	13/01/95	Indian Private Bank	Commercial Bank of Korea	12/03/97	Foreign Bank
DBS Bank	15/03/95	Foreign Bank	Sumitomo Bank	20/06/97	Foreign Bank
Bank of Punjab	5/04/95	Indian Private Bank	Hanil Bank	5/07/97	Foreign Bank
Times Bank	8/06/95	Indian Private Bank	Toronto-Dominion Bank	25/10/97	Foreign Bank
Dresdner Bank	21/08/95	Foreign Bank	Bank Muscat International	9/09/98	Foreign Bank
IDBI Bank	28/09/95	Indian Private Bank	Morgan Guaranty	24/12/98	Foreign Bank
			Trust K. B. C. Bank	15/02/99	Foreign Bank

The new environment in banking demanded restructuring and reorienting the policy goals of banks. One way to adapt to the new environment was through mergers. It may be noted that though bank mergers were common phenomenon in many developed and developing countries, they were comparatively new in India during the 1990s.[7] Table 3 presents the list of mergers and acquisitions among the banks. It lists 18 such mergers. Once again, it may be noted that 10 of the mergers and restructuring took place during the second half of the 1990s. To understand the nature of these mergers in detail, the type of merger has also been indicated in Table 3. Most of the mergers took place either between two private sector banks or two public sector banks. Among the public sector banks, generally a "weak" bank had been merged with a "strong" bank. Thus, if one considers public sector or private sector as a group, the effect of merger on bank performance may not be very significant. In one or

Table 3 : Mergers and Acquisitions of Banks: 1985-2002

Name of the merging entity	No. of Branches	Name of the merged entity	Date/Year of merger
United Industrial Bank	145	Allahabad Bank	31/10/89
Bank of Tamil Nadu	99	Indian Overseas Bank	20/02/90
Bank of Thanjavur	156	Indian Bank	20/02/90
Parur Central Bank	51	Bank of India	20/02/90
Purbachal Bank	40	Central Bank of India	29/08/90
Bank of Karad	48	Bank of India	2/05/92
New Bank of India	591	Punjab National Bank	1993
BCCI (Mumbai)	1	State Bank of India	1993
Kashinath Seth Bank	11	State Bank of India	1/01/96
Bari Doab Bank	10	Oriental Bank of Commerce	8/04/97
Punjab Co-operative Bank	9	Oriental Bank of Commerce	8/04/97
20th Century Finance		Centurion Bank	1/01/98
Bareilly Corporation Bank	65	Bank of Baroda	3/06/99
Sikkim Bank	7	Union Bank of India	22/12/99
Times Bank	10	HDFC Bank	26/02/00
Bank of Madura	270	ICICI Bank	10/03/01
Sakura Bank	2	Sumitomo Bank	1/04/01
Morgan Gurantee Trust	1	Chase Manhattan Bank	10/11/01

two cases, it is observed that a non-banking financial company had been merged with a bank.

II.2 Changes in the Market Structure in Indian Banking: Static Measures

The evidences in Tables 1–3 reflect the changes in the structure of Indian banking. We now attempt to examine these changes in detail by measuring the changes in different concentration indices over the years. We estimated the measures of concentration at industry as well as at bank-group level with respect to total assets, total deposits and total income. However, for the sake of brevity, we have presented the values at industry level based on total assets.[8]

From an analytical point of view, before discussing the trends of the various concentration measures in the post-reform period, we present a brief statistical profile of various concentration measures (Table 4).[9] The first impression demonstrates the diverging results yielded by the various concentration measures when applied to the same underlying market. Even a short glance reveals the wide spread in these values. The results show clearly that not only does the range of possible values differ strongly across the indices, but so do the values of the indices within this range. For instance, the value is high for the CR_k and low for the *HHI* and Rosenbluth index.

Table 5 presents the trends in various concentration measures during 1989-90 to 2000-01. Note that as these figures are population figures (scheduled co-operative banks are excluded, we interpret scheduled commercial banks as the 'population'), computations of standard errors are not necessary. In general, concentration indices, as presented in Table 5, appear to be inversely related to the number of banks. This is owing to the well-known weakness of concentration indices, namely, their dependency on the size of the banking market. The value of the *k*-bank concentration ratios (for various values of *k*) always exceeds the value of HHI, since the latter gives less prominence to the markets shares (the weights again being market shares) than the former (unit weights). Irrespective of the choice of the concentration index, measures of concentration have declined in

Table 4: Average Measures of Concentration: 1989-90 to 2000-01

Index type	Range	Parameters	Typical features	Avg. Value	Std. Dev.	CV
GINI				0.736	0.012	1.631
CR_1	$0 < CR_k \leq 1$		Takes only large banks into account; arbitrary cut off	0.250	0.020	7.931
CR_2				0.311	0.025	8.160
CR_5				0.472	0.032	6.690
CR_{10}				0.628	0.044	6.940
HHI	$1/n \leq HHI \leq 1$		Considers all banks; sensitive to entrance of new banks	0.085	0.012	13.835
HTI	$0 < HTI \leq 1$		Emphasis on absolute number of banks	0.050	0.005	9.805
Rosen-bluth	$0 < RI \leq 1$		Sensitive to changes in the size distribution of small banks	0.044	0.007	15.753
CCI	$0 < CCI \leq 1$		Addresses relative dispersion and absolute magnitude; suitable for cartel markets	0.293	0.023	7.810
CI				0.745	0.013	1.700
HKI	$(1/s_1) \leq HKI \leq n$	$\alpha = 0.005$	Stresses influence small banks	86.880	11.292	12.998
		$\alpha = 0.25$		62.355	8.264	13.253
		$\alpha = 5$		5.686	0.542	9.529
		$\alpha = 10$	Stresses influence large banks	4.688	0.399	8.501
Hause index	$0 < H_m \leq 1$	$\alpha = 0.25$	Suitable for highly collusive markets	0.138	0.019	13.481
		$\alpha = 1$		0.085	0.012	13.947
		$\alpha = 2$	Suitable for not collusive markets	0.085	0.012	13.837
Entropy	$0 \leq E \leq \log n$		Based on expected information content of a distribution	3.282	0.152	4.633

the post-reform period. Two different patterns are very clear: (a) there exists a uniform ordering/trend across various measures, (b) although reform process reduced concentration in the industry, the speed of reduction has been noticeably slow. However, the role of financial liberalisation in lowering concentration is clearly established. It is interesting to note that the major part of the change in the structure had occurred during the early 1990s. Thus, the spate of mergers during the late 1990s did not change the market structure significantly.

Table 5 : Movement of Various Measures of Concentration: 1989-90 to 2000-01

Year	No. of Banks	GINI	1-Bank Ratio	HHI	HTI	RI	CCI	CC	Entropy
1990	75	0.757	0.281	0.103	0.058	0.055	0.328	0.767	3.057
1991	77	0.757	0.279	0.102	0.057	0.054	0.325	0.767	3.079
1992	77	0.750	0.278	0.101	0.055	0.052	0.324	0.760	3.105
1993	76	0.733	0.261	0.091	0.052	0.049	0.306	0.742	3.174
1994	74	0.721	0.256	0.089	0.050	0.048	0.301	0.731	3.192
1995	83	0.725	0.237	0.079	0.049	0.044	0.282	0.734	3.300
1996	92	0.738	0.241	0.079	0.047	0.041	0.283	0.746	3.340
1997	97	0.734	0.233	0.075	0.045	0.039	0.274	0.742	3.404
1998	100	0.734	0.226	0.072	0.045	0.038	0.267	0.742	3.437
1999	100	0.732	0.234	0.075	0.046	0.037	0.273	0.740	3.433
2000	100	0.729	0.236	0.074	0.045	0.037	0.273	0.736	3.441
2001	99	0.727	0.244	0.077	0.045	0.037	0.279	0.735	3.425

To establish the observed first pattern, Table 6 presents product-moment correlations among various concentration indices in India over time[10]. Results based on almost all the pairs are similar, displaying a high degree of correlation. The strongest correlations are found between CR1 and CR2, RI and CR3, CCI and CR1, HHI and CR1. These results clearly demonstrate that, at least in the Indian context, the behaviour of various concentration indices is very similar. Thus, our results indicate that though a host of measures for market concentration are available, an empirical application is unlikely to yield different rankings of a single economy over time. Our results thus, compliment the results of Bikker and Haaf (2001a), who did a similar exercise over space. The observed correlations are, however, not very strong when the measures are based on either total deposits or total income , indicating that some differences could exist across the variable, which is used to compute the size distribution (*e.g.,* asset, deposit and income)[11]. This is not unlikely because the markets for different bank products could be sharply different and the largest banks in one market may not be necessarily so in other ones.

Finally, we compare concentration measures of Indian banking industry to those in a few other developed economies based on the results of Bikker and Haaf (2001a). Bikker and Haaf (2001) observed high market concentration in Denmark, Greece, Netherlands and Switzerland and low market concentration in France, Germany, Italy,

Table 6 : Product Moment Correlations among Different Measures of Concentration

	GINI	HHI	RI	CR1	CR2	CR3	CR4	CCI	CC	ENT
GINI	1.00									
HHI	0.74	1.00								
RI	0.66	0.97	1.00							
CR 1	0.73	0.99	0.94	1.00						
CR 2	0.76	0.99	0.97	0.99	1.00					
CR 3	0.72	0.98	0.99	0.95	0.98	1.00				
CR 4	0.70	0.95	0.99	0.91	0.95	0.99	1.00			
CCI	0.73	0.99	0.97	0.99	0.99	0.98	0.95	1.00		
CC	0.99	0.79	0.72	0.78	0.81	0.77	0.75	0.78	1.00	
ENT	-0.66	-0.98	-0.99	-0.95	-0.97	-0.99	-0.99	-0.98	-0.72	1.00

Luxembourg and the US. Table 7 juxtaposes the *HHI* and CR_k (for k=3, 5 and 10) measures based on total assets for India along with similar measures for 20 countries during the year 1997. It is interesting to observe that market concentration in banking in India appears to be low as compared to other countries. For example, India ranks joint 8th (with Spain) with respect to HHI and joint 6th (with UK) with respect to CR_3 measure.

Table 7: Concentration Indices for 21 Countries, based on Total Assets: 1997

Countries	HHI	CR_3	CR_5	CR_{10}	No. of banks
Australia	0.14	0.57	0.77	0.90	31
Austria	0.14	0.53	0.64	0.77	78
Belgium	0.12	0.52	0.75	0.87	79
Canada	0.14	0.54	0.82	0.94	44
Denmark	0.17	0.67	0.80	0.91	91
France	0.05	0.30	0.45	0.64	336
Germany	0.03	0.22	0.31	0.46	1803
Greece	0.20	0.66	0.82	0.94	22
India	**0.08**	**0.34**	**0.43**	**0.62**	**97**
Ireland	0.17	0.65	0.73	0.84	30
Italy	0.04	0.27	0.40	0.54	331
Japan	0.06	0.39	0.49	0.56	140
Luxembourg	0.03	0.20	0.30	0.49	118
Netherlands	0.23	0.78	0.87	0.93	45
Norway	0.12	0.56	0.67	0.81	35
Portugal	0.09	0.40	0.57	0.82	40
Spain	0.08	0.45	0.56	0.69	140
Sweden	0.12	0.53	0.73	0.92	21
Switzerland	0.26	0.72	0.77	0.82	325
UK	0.06	0.34	0.47	0.68	186
US	0.02	0.15	0.23	0.38	717

Source : Except India, other figures have been taken from Bikker and Haaf (2001a).

II.3 Changes in the Market Structure in Indian Banking: Dynamic Measures

In the case of computing generalised entropy measures, the permanent assets (deposits/income) are computed based on μ_t weights. These μ_t weights used here are the ratio of mean assets at time t to the mean assets over the entire M periods. In our computations, the substitutions parameter β is restricted by the relation $-\gamma = 1 + \beta$. We computed four different aggregator functions corresponding to four inequality measures with $-\gamma = V = (2, 1, 0.5, 0.0)$. $V = 0.0$ and 1.0 correspond to Theil's first and second inequality measures, respectively, combined with the linear and the Cobb-Douglas forms of the aggregator function. Table 8 provides the annual short-run inequalities, the inequalities in the aggregated (long-run) assets, and the assets stability measures R_M. Decomposition of each 'between' and 'within' groups is also presented.

Short-run inequality in Table 8 has generally decreased. Surprisingly, the inequality has not become greater with larger degrees of relative inequality aversion *(V)*. For V other than 2, the 'within-group' component of short-run inequalities is dominant. However, the absolute values of both 'within-group' and 'between-group' inequality measures have recorded a significant decline over the 12 years period.

The long-run inequality has recorded relatively less volatility. In all the years, the values of $I_\gamma(S)$ have decreased and in most cases they are dominated by 'within-group' component measures. In some cases, the long-run inequality measures are higher than the short-run component. It may be mentioned that these relative values are somewhat sensitive to the size distribution. The corresponding stability measures showed somewhat different pattern. Although, the stability measures have fallen over the years, they have been highly dominated by 'between-group' component and the impact of 'within-group' has been marginalised. Thus, there is a tendency for the profiles of the banks to fall, and then level off in the years to come. These patterns are robust with respect to the choice of aggregation function, size-adjustment and inequality measure.

Table 8: Empirical Values of Generalised Entropy Measures

Year	Short run			Long run			Stability		
	Overall	Between	Within	Overall	Between	Within	Overall	Between	Within
Degree of inequality aversion = 2.0									
1990-93	2.028	0.891	1.137	2.068	0.904	1.164	1.020	1.014	0.006
1990-95	1.744	0.762	0.982	1.877	0.794	1.084	1.076	1.042	0.035
1990-97	0.959	0.641	0.319	1.243	0.696	0.547	1.296	1.086	0.210
1990-99	0.777	0.544	0.233	1.036	0.620	0.416	1.333	1.139	0.194
1990-01	0.696	0.475	0.221	0.904	0.564	0.340	1.299	1.187	0.112
1996-01	**0.552**	**0.354**	**0.198**	**0.581**	**0.362**	**0.219**	**1.053**	**1.022**	**0.030**
Degree of inequality aversion = 1.0									
1990-93	1.333	0.507	0.826	1.141	0.375	0.766	0.856	0.740	0.116
1990-95	1.254	0.460	0.794	1.074	0.348	0.727	0.856	0.755	0.102
1990-97	1.175	0.409	0.766	1.016	0.311	0.705	0.865	0.759	0.105
1990-99	1.134	0.364	0.770	0.982	0.276	0.706	0.866	0.758	0.108
1990-01	1.112	0.328	0.784	0.972	0.246	0.726	0.874	0.750	0.124
1996-01	**1.052**	**0.273**	**0.780**	**0.956**	**0.232**	**0.724**	**0.909**	**0.852**	**0.057**
Degree of inequality aversion = 0.5									
1990-93	1.068	0.425	0.643	1.063	0.422	0.641	0.995	0.993	0.002
1990-95	1.017	0.394	0.623	1.008	0.387	0.621	0.991	0.982	0.009
1990-97	0.966	0.357	0.609	0.955	0.344	0.611	0.989	0.965	0.024
1990-99	0.936	0.323	0.613	0.921	0.305	0.616	0.984	0.945	0.039
1990-01	0.921	0.294	0.627	0.905	0.272	0.633	0.983	0.927	0.055
1996-01	**0.879**	**0.251**	**0.628**	**0.879**	**0.247**	**0.632**	**1.000**	**0.981**	**0.019**
Degree of inequality aversion = 0.0									
1990-93	1.147	0.438	0.709	1.331	0.506	0.825	1.160	1.155	0.006
1990-95	1.093	0.397	0.696	1.262	0.458	0.804	1.155	1.153	0.001
1990-97	1.041	0.358	0.683	1.194	0.405	0.789	1.147	1.132	0.015
1990-99	1.011	0.333	0.678	1.143	0.358	0.785	1.131	1.075	0.055
1990-01	0.997	0.324	0.673	1.115	0.320	0.795	1.118	0.988	0.130
1996-01	**0.955**	**0.303**	**0.652**	**1.063**	**0.271**	**0.792**	**1.113**	**0.893**	**0.220**

The fact that the profiles are becoming flatter is an indication that, although there have been some transitory movements in the size distribution of assets, there is a lack of any permanent equalization. Further more, while some equalisation has taken place within each group of banks, inequality between groups has been noticeably high.

Section III
Impact on Prices and Quantities

In this section, we examine the possible impact of the changes in concentration on the prices and output in the banking sector. It may be noted that as we have limited observations

(*e.g.*, annual data only), the causal nature of market structure and performance is difficult to establish. It is well known that even in a market structure that is apparently monopolistic, competitive prices may exist due to threat of entry. Our arguments in this section are, therefore, not definitive. However, despite limitations, our observations in this section may turn out to be useful in reconciling the conceptual anomalies and as a consequence, in forming the suitable hypotheses.

The literature that discusses the relationship between market structure and competitiveness is voluminous. The survey of Bikker and Haaf (2001a) also covers this area, focussing on different theoretical and empirical approaches with special reference to banking. To link concentration and competitiveness empirically, one needs to specify and estimate appropriate models based on panel data.[12] In the panel data models, disaggregated bank specific data on some 'performance' measures is regressed on the bank's own market share, market concentration at the aggregate level and other 'control' factors. The 'performance' measures are typically based on profits or prices. While data on profits are taken from the profit and loss accounts of banks, appropriate bank specific interest rates are supposed to be a proxy for the prices. Empirical findings suggest monopolistic competition; competition appears to be weaker in the local markets and stronger in the international markets. The relationship for the impact of market structure on competition seems to support the conventional view that concentration impairs competitiveness.

It may be noted that whatever be the theoretical structure specified, the empirical measures for 'prices' in banking are not very clear. As there is no clear common methodology for measuring prices and output of financial intermediation services and SNA 1993 recognizes this as a problem area, Subsection III.1 discusses a few common conceptual problems in the literature, and in this context, emphasises that the direct use of select interest rates as a 'price' measure may not be conceptually appropriate. Arguing on the basis of the user cost approach, we suggest the use of spread as 'price' measures for banking. Subsection III.2 reviews alternative empirical estimates of prices and output for this sector

in India during the reference period, and attempts to relate it to our earlier findings. In particular, it compares inflation measures for banking based on traditional GDP deflators and spread, and finds the latter to be more consistent with the changing patterns of market structure of banking in India.

III.1 Conceptual Problems in Measurement of Prices and Output of Financial Intermediation Services

It may be noted that measurements of prices and output of services are difficult because services are produced and consumed at the same point of time. Also, prices of services are more dispersed across regions because of their non-tradable nature (Grilliches, 1992). Besides these common problems, measurements of prices and output of financial services are further limited due to many conceptual problems that have not yet been resolved satisfactorily. First, it is not clear whether financial services are attached to the financial instruments, accompanying the transactions or to the monetary units being transacted. Most of the activities of a bank involve processing documents (such as cheques and loan payments) and dealing with customers (Benston *et al.*, 1982). Consequently, previous researchers have used the average number of deposit and loan accounts serviced per month as their unit of output to measure the customer related services. Alternatively, Fixler (1993) has argued that the amount of financial services sold by a bank can be more appropriately measured by the money balances in the various products. Secondly, it is not clear which financial services are relevant to the measurement of output: those attached to assets, liabilities or both? This question concerns the precise identification of inputs and outputs. *The debate on measurement of bank output mainly revolves around the status of demand deposit related financial services*. Demand deposits have the characteristics of both input and output. On one hand, they are like 'raw materials' in the financial intermediation process and are used for 'production' of loans and investment; on the other hand, a host of 'final' services (*e.g.*, maintenance of money, free cheque facilities, *etc.*) are attached to them. Till now, consensus regarding the status of demand deposit has not emerged in the literature. Thirdly, many of

the financial services are jointly produced with a sequence of barter transactions and are typically assigned to a bundle of financial services, the 'pricing' of which is difficult and is often apparently 'free' in nature.

These conceptual problems imply that any measurement of the services provided by banks in real terms would be difficult. In the absence of precise measures of prices and output in banking, researchers have attempted to resolve the problem indirectly by developing certain indicators – either for production or for the prices. A few common indicators have been used widely in official statistics, for conversion of value added of the banking sector from current prices to constant prices. In many cases, the indicators have focused on a single aspect related to the sector, concentrating on a simple ratio-variable and hoping that other related variables move proportionally to the one proposed.

Till the end of 1980s, the United States' (US) Bureau of Economic Analysis (BEA) used one such indicator for conversion of gross product originating (GPO) in the banking sector from current prices to constant prices. To do that, the benchmark value of GPO at current prices was determined for a particular year. Output for subsequent years was calculated by extrapolating the benchmark value by a factor based on the 'number of persons engaged in production', the implicit assumption in the method being that there had not been any growth in labour productivity in banking! When applied, the estimates showed very small real output growth in the banking sector, so small that many economists believed that the method underestimated real output of the banking sector in the US economy (Fixler, 1993). So far as the other countries are concerned, it is also not uncommon to find the movement of value added at constant prices estimated by means of changes in the compensation of employees at constant prices (SNA 93, page 397).

The conversion factor used in the National Accounts Statistics (NAS) in India is slightly different. In India, the base year estimates of value added from the banking sector are carried forward using an indicator based on the ratio of aggregate deposits for the two years and the

wholesale price index (WPI). The volume of activity is measured in value terms, the indicator being the ratio of aggregate deposits. To obtain the quantity index, the ratio of deposits for two years is deflated by WPI.

It may be noted that the 'quantity index' of banking used in the NAS in India covers only one aspect of banking, *i.e.*, deposits; other aspects like credit are totally neglected. This may turn out to be a serious limitation because the different products of banks are fairly heterogeneous in nature. A composite index based on activities of a bank would perhaps be more preferable. Moreover, deflation by WPI to derive the quantity index is tantamount to the assumption that 'prices' for banking move parallel to that of the goods sector as a whole, which may not be valid in reality.

Besides these simple indicators, models of real banking activity and measures for 'prices' and 'quantities' of various products offered by banks have also been developed in the bank regulation literature. To determine whether economies of scale exist in banking, researchers have estimated explicit multioutput production or cost functions. Typically, such functions include bank financial inputs and outputs, and the usual capital, labour and material inputs. Though precise measures of nominal and real outputs are absolutely crucial for such studies, a variety of approaches have been followed, and a consensus on conceptual questions has not yet emerged.

In the literature, three distinct approaches, *viz.*, the asset approach, value added approach and user cost approach, are available. The process of generation of output and the role of demand deposit in all these three approaches are sharply different. Each of these approaches has certain advantages and certain drawbacks and adoption of any one of them depends on the objective of the study. A detailed discussion on all these approaches is beyond the scope of the paper.[14]

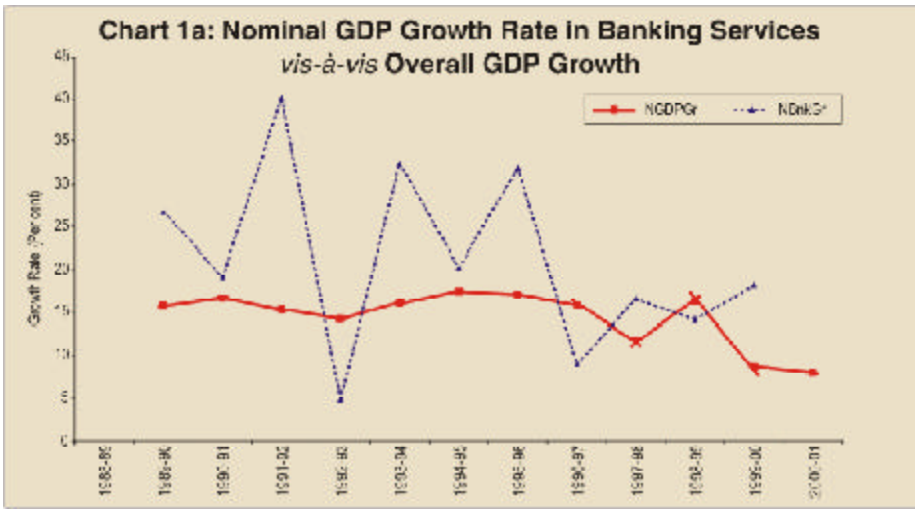
The paper restricts its attention on the user cost approach because a major focus in this approach is on measuring the implicit prices of financial intermediation through user cost (Hancock, 1985; Fixler and

Zieschang, 1992; Fixler, 1993). The user cost approach attempts to measure prices of financial intermediation from the interest rates of different financial instruments. In traditional applications, prices of different financial instruments have been measured as deviations of the rate of return associated with them from a benchmark risk-free financial instrument (*e.g.*, discount rates of treasury bill, coupon rates of standard Government bonds, bank rates, *etc.*). But the problem with this approach is that the estimates provided by it would be crucially related to the profitability of the banking sector. If the risk of default is high, banks might not be willing to disburse more credit as the amount disbursed might turn into a non-performing asset (NPA). If NPAs of banks increase, the effective returns from these assets would decrease. In such situations, the banks might tend to allocate a substantial portion of their funds in approved securities. Thus, if the profitability of the banking sector decreases, returns from advances would become closer to the return from the benchmark rates and for some periods, it might be less than these rates leading to zero or negative prices for some instruments. Alternatively, the weighted average rates of all asset and liability products of the banking sector have also been considered as the 'standard' rate.

In the Indian context, Srimany and Bhattacharya (1998) have obtained empirical estimates based on traditional user cost approach and compared the results with alternative estimates. Samanta and Bhattacharya (2000), on the other hand, highlight the role of spread in this context. Their study demonstrates that under some simplifying conditions, the spread between rates of interest charged by the bank to borrowers and depositors could be given the interpretation of a price for financial intermediation.

III.2 Empirical Estimates of Prices and Output of Banking Services in India

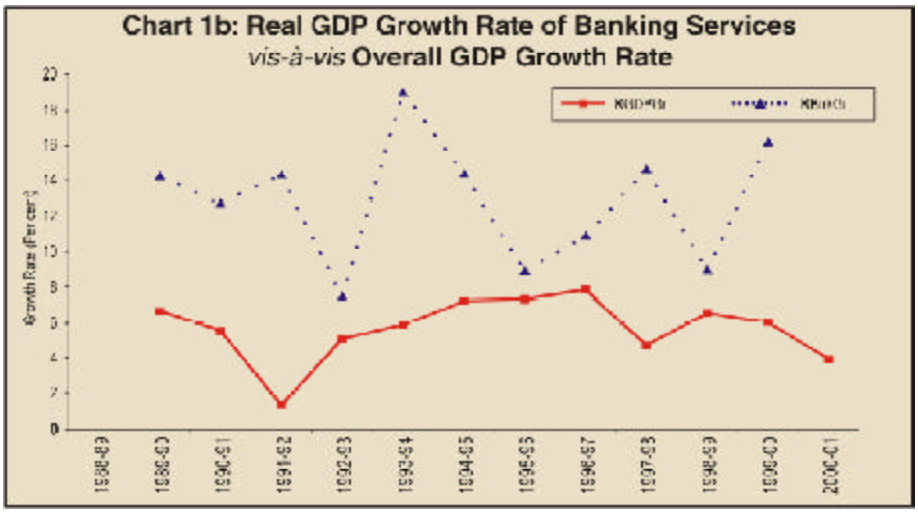
In this section, we examine the behaviour of 'price' and 'output' of the banking sector from the national income data. Figure 1 presents the nominal (Chart 1a) and the real (Chart 1b) growth rates in GDP from the banking sector during the period under study. To compare the sector's relative performance, these figures have been juxtaposed with the overall nominal and real growth of GDP in the respective parts. In Chart 1a, the



curves of NGDPGr and NBnkGr reflect the nominal overall GDP growth and GDP growth pertaining to the banking sector, respectively. Similarly, In Chart 1b, the curves of RGDPGr and RBnkGr show the corresponding values in real terms.

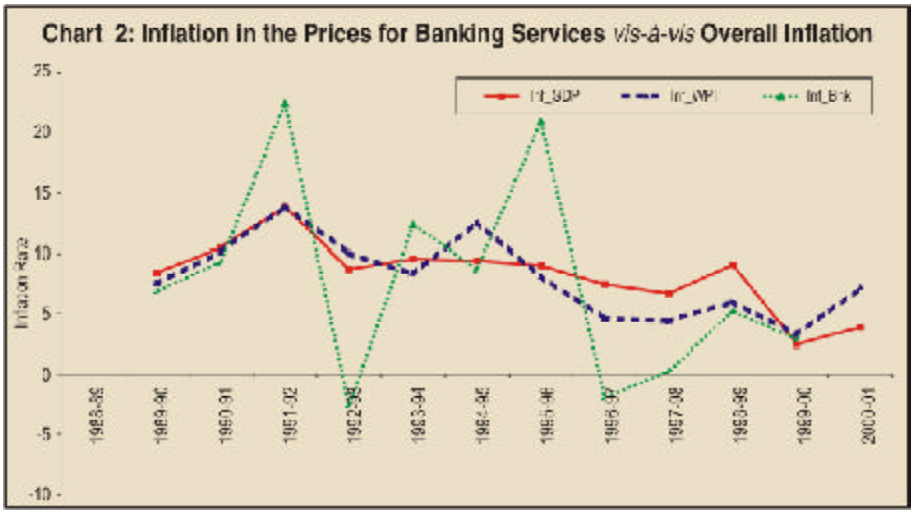
Using the nominal and real GDP figures, the implicit deflators in banking as well as for the entire economy could be obtained. These deflators could be used to obtain measures pertaining to sectoral and overall inflation. Chart 2 presents the implicit 'inflation' in banking services as per the NAS in India (Inf_Bnk). Once again, to compare its relative performance, these figures have been juxtaposed with (i) the overall 'inflation' in all commodities and services as measured by the GDP deflator (Inf_GDP), and (ii) inflation based on WPI (Inf_WPI).

It may be noted that the method adopted by India in preparing National Accounts Statistics is fully consistent with the international conventions. Given this, the above figures look strange. While it is expected that the growth rates in a services sector may be erratic and may fluctuate from year to year, such high fluctuation reveals the general methodological weakness in the convention adopted internationally. Is it possible that when inflation rates in almost all the sectors in an economy are on a declining trend, the banking sector experiences a more than 20 per cent rise in the prices and in the very next year experiences a deflation? We argue that the NAS is providing



a misleading picture because there is circularity in measurement of banking services. The circularity occurs because of the use of WPI to deflate the 'nominal' figures of the value added in the banking services, and that too based on solely the movements in deposits.

As an alternative, we examine the movements in spread-based measures. Although the theoretical implications of spread have been examined in detail, there is no unique empirical definition of spread. Brock and Rojas-Saurez (2000) have suggested six alternative proxies for banks spread, ranging from a narrow concept – one that includes



loans and investments in the assets side and deposits and borrowings in the liability side – to a broad concept, where all interest earning assets and interest bearing liabilities *plus* associated fees and commissions are included. In addition, one may perhaps consider the simple difference of a standard lending rate and the deposit rate as a proxy. In the Indian context, some of these measures have been computed and examined, sometimes separately across bank groups. For example, Chapter VII of the Report on Currency and Finance (1999-2000) defines spread as net interest income to total assets and computes this measure separately across bank groups from 1991-92 to 1999-00. The Report observes a gradual reduction of spread and attributes this reduction to competitive pressures. The Report also observes "…a tendency towards their convergence across all bank-groups, except foreign banks …" (pp. VII-1)

In addition to the measures suggested by Brock and Rojas-Saurez (2000), in this paper, we have considered three additional measures based on the simple differences between lending and deposit rates. As the interest structure during the early 1990s in India was administered, these measures are expected to reveal the extent of "administered spread" in India during the same period. The definitions of these measures are presented in Table 9.

Table 10 presents estimates pertaining to the nine alternative measures of spread from 1989-90 to 2001-02. From Table 10, it is observed that there are strong correlations among many of the pairs of measures for spread. In general, correlations for pairs within a broad group are high and sometimes more than 0.95. However, in general correlations for pairs in different groups are moderate. Interestingly, measures in Group 3 have negative correlations with measures in other groups.

A detailed examination of these measures reveals that they are in general agreement with the observations of Reserve Bank of India. Almost all the measures display a decreasing trend during the second half of the 1990s. Thus, the spread appears to have decreased, implying a change in the price for financial intermediation. In this context, it may be noted that as during the early 1990s, interest rates in India were administered, the measures for spread during these periods may not reflect market forces properly and thus, may not be consistent with the existing

Table 9: Alternative Definitions of Spread

Group 1

SPN1= [(interest earned on advances/advances)–(interest paid on deposits/deposits)]* 100;

SPN2 = [(interest earned on advances/advances)–(interest paid on deposits and borrowings)/(deposits+borrowings)]* 100;

SPN3 = [(interest earned on advances and investments)/(advances+investments)–(interest paid on deposits and borrowings)/(deposits+borrowings)]* 100;

Group 2

SPB1 = (interest earned –interest paid)/(total assets)*100;

SPB2 = [{(interest earned)/(interest earning assets[15])}–{(interest paid)/(interest bearing liabilities[16])}]*100;

SPB3 = [{(interest earned +commission, exchange and brokerage)/(interest earning assets)} – {(interest paid)/(interest bearing liabilities)}]* 100;

Group 3

SPI1 = Lending Rate – Time Deposit Rate for Less Than One Year Maturity

SPI2 = Lending Rate – Time Deposit Rate for One to Three Years Maturity

SPI3 = Lending Rate – Time Deposit Rate for Beyond Five Years Maturity

market structure. However, it is interesting to observe that from 1995-96 onwards, all the measures of spread pertaining to the first two groups reveal a strong downward trend. Thus, it is logical to argue that as soon as the administered price regime in banking in India was lifted, the

Table 10 : Alternative Measures of Spread in the Banking Sector in India: 1989-90 to 2001-02

Year	SPN1	SPN2	SPN3	SPB1	SPB2	SPB3	SPI1	SPI2	SPI3
1989-90			1.78	2.46	3.28	7.00	6.50	6.50	
1990-91			1.77	2.43	3.32	7.00	5.50	5.50	
1991-92	6.27	5.57	3.95	3.31	4.14	4.99	4.50	3.50	3.50
1992-93	4.81	4.63	3.67	2.50	3.48	4.33	8.00	8.00	8.00
1993-94	5.22	5.14	3.71	2.54	3.32	4.22	9.00	9.00	9.00
1994-95	4.25	4.24	4.37	3.01	3.65	4.59	4.00	4.00	4.00
1995-96	5.43	5.37	4.90	3.15	3.82	4.85	4.50	3.50	3.50
1996-97	6.29	6.29	4.86	3.22	3.85	4.82	3.00	2.00	1.75
1997-98	4.60	4.60	4.21	2.95	3.38	4.28	3.25	2.25	2.25
1998-99	4.19	4.26	3.85	2.78	3.15	4.00	3.00	2.00	2.00
1999-00	3.59	3.61	3.58	2.72	3.13	3.94	3.00	1.75	1.75
2000-01	3.74	3.78	3.62	2.84	3.18	3.91	2.75	1.75	1.75
2001-02#	3.05	3.22	3.15	2.81	3.10	3.82	3.25	2.87	2.87

: Provisional for SPI1, SPI2 and SPI3.

favourable market structure put a downward pressure on the prices through competition. The result once again establishes that a favourable market structure alone may not be adequate for competitive prices and other institutional features and policy measures also contribute significantly towards it.

Section IV
Conclusion

The paper examined the nature and the extent of changes in the market concentration in the Indian banking sector and their possible implications on competitiveness, prices and outputs of banking services. The paper was logically divided into two parts. The first part measured market concentration in banking in India in alternative ways from 1989-90 to 2000-01. In contrast to earlier empirical applications on banking, this paper focussed on both static and dynamic measures of market concentration. The paper found strong evidence of change in market structure in banking in India. Interestingly, results reveal that a major part of the change in market structure occurred during the early 1990s. Despite a spate of mergers during the late 1990s, banking market concentration in India was not significantly affected. It was also observed that different concentration ratios rank the changes of banking market concentration in India similarly over time. This result, in conjunction with Bikker and Haaf (2001a), provides evidence that despite the existence of a host of concentration measures, empirical rankings of countries over space or time may not be significantly affected due to differences in measures used.

The second part of the paper analysed the possible impact of changes in banking market structure on prices and output during the same period. It was articulated that before measuring competitiveness, the fuzzy issues relating to measurements of prices and quantities of banking services needed to be satisfactorily resolved. Using Indian data, the paper demonstrated that measurement problem of real output pertaining to banking sector in the national income data could be severe. The implied inflation as obtained through the GDP deflator for the banking sector in India led to unbelievable measures of inflation for banking services, casting some doubt on the methodology adopted. Alternatively, proxy price measures based on spread appeared to be more consistent with the changes in market structure in India during the late 1990s. The paper argued that the favourable market structure in India could be one important factor that led to a reduction in the 'prices' of banking services after

the administered interest regime was lifted. Although it might be wrong to attribute the entire change in spread to the change in market structure, it was logically one important factor that could lead to lagged reduction in the 'prices' of banking services in a favourable environment, freed from arbitrary price restrictions. A deeper study addressing these problems in a cross-country perspective would thus, be useful in narrowing the current gaps in the literature.

Notes

[1] For example, the Report on Currency and Finance (1998-99) published by the Reserve Bank of India reports some of these indices and comments on the nature of concentration of export of the Indian economy (pp.IX.6).

[2] For example, the survey of Bikker and Haaf (2001a) demonstrates that for 20 countries, the rankings of the *k*-Bank Concentration Ratios and the HHI are strongly correlated.

[3] In the US, the Department of Justice, uses HHI to assess whether mergers and acquisitions "significantly'' constitute a threat to competition.

[4] This is particularly so in the case of econometric studies of "wage dispersion'' in which statistical causes of dispersion are usefully identified, but welfare-theoretic motivation is lacking with regards to ''dispersion'' as a measure of "mobility'', or inequality.

[5] In other work with PSID data, Maasoumi and Zandvakili (1990) have studied different weights, including Principal Component weights and unequal subjective weights. They find these weights are inconsequential for the qualitative inferences and rankings.

[6] The taxonomy, in detail, is available in the "Report on Trend and Progress of Banking in India", published by the Reserve Bank of India (RBI), for different years. These Reports also analyse the implications of the major developments in the Indian banking market in detail.

[7] See the Box II.1 entitled 'Merges and Acquisition in Banking: International Experiences and Indian Evidence' in the "Report on Trend and Progress of Banking in India 2000-01" (pp. 51–52) by the Reserve Bank of India for details.

[8] The results based on other indicators at industry as well as bank-group level are available with the authors.

[9] See Bikker and Haaf (2001a) for details

[10] The rank-correlations among various indices also show similar results.

[11] Results are available with the authors and can be obtained on request.

[12] The structural approach to model competition includes Structure-Conduct-Performance (SCP) paradigm and efficiency hypothesis. The SCP paradigm investigates, whether a highly concentrated market causes collusive behaviour among large banks resulting in superior market performance; whereas efficiency hypothesis tests, whether it is the efficiency of larger banks that makes for enhanced performance. On the other hand, non-structural models

like Panzar and Rosse (P-R) model, uses explicit information about the structure of the market.

[13] These types of indices have been applied to measure productivity of the banking sector. U.S. measures of banking labor productivity adopt the activity approach – bank output includes counts of loan and deposit activities (such as loan applications processed and cheques cleared).

[14] For a recent survey of literature, see Srimany and Bhattacharya (1998).

[15] Interest earning assets include advances, investments, balances with central bank, balances with other banks and money at call and short notice.

[16] Interest bearing liabilities include deposits and borrowings.

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Allocative Efficiency of the Indian Banking System in the Post-Reform Period: A State Level Analysis

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This paper examines whether allocative efficiency of the Indian Banking system has improved after the introduction of financial sector reforms in the early 1990s. Allocative efficiency has been studied for twenty three States of India. To get a comparative perspective, allocative efficiency has been estimated for two periods 1981-1992 and 1993-2001; broadly corresponding to the pre financial sector reforms and the post reforms periods, respectively. The analysis carried under panel cointegration framework reveals that overall allocative efficiency of the banking system has almost doubled in the post reform period. This goes to suggest the success of reforms in improving allocative efficiency of the banking system in India. Allocative efficiency at the State and sectoral level has also been estimated to get a deeper insight. While allocative efficiency of Banks' funds deployed in the services sector has improved that in the agriculture and industry has deteriorated in the post reform period for the majority of the States. The study finds improvement in the overall allocative efficiency in the post reform period for the majority of the States. Further, the improved allocative efficiency is more marked for the services sector than for industry across the States.

JEL Classification: C230, D610, R110

Key Words: Allocative Efficiency, Panel Cointegration and Panel FMOLS.

Introduction

Enduring growth, in the context of a developing economy like India invariably requires that the economy be put to a trajectory of higher savings and ensuring, further, that the realised savings are chanelised into productive investment. In this scheme of growth, the banking system has a dual role to play. The banking system acts both as a mobiliser of savings as well as an allocator of credit for production and investment. Effectiveness of the banking sector's contribution to the economic

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growth and development is broadly determined by its efficiency in the allocation of the mobilised savings amongst competing projects.

Financial sector reforms were initiated in India in 1992-93 to promote a diversified, efficient and competitive financial system with the prime objective of improving the allocative efficiency of available resources. Banking sector being the dominant segment in India's financial system, a number of measures specific to the banking system were initiated to improve its allocative efficiency. Freedom to price their products along commercial considerations, relaxation in various balance sheet restrictions in the form of statutory pre-emptions, exposing the banking sector to an increased competition by allowing entry of new private sector banks and the introduction of prudential norms relating to income recognition, asset classification and capital adequacy were some of the ingredients of the banking sector reforms. Improved allocative efficiency was sought to be achieved through operational flexibility, improved financial viability and institutional strengthening.

The early initiatives in the banking reforms were geared towards removing the functional and operational constraints impinging upon bank operations, and subsequently, providing them with greater operational autonomy to take decision based on commercial considerations. With gradual relaxation of administered controls, banks and financial institutions were expected to evolve as truly commercial entities. More importantly, the operation of banks under free interplay of market forces in a deregulated atmosphere was expected to lead to increased allocative efficiency of scarce resources among competing sources of demand. Banking sector reforms have been in vogue for more than a decade in India. In this context, it would be appropriate to study whether the various reform measures have helped in improving the allocative efficiency of the banking system.

This study seeks to enquire whether the financial sector reforms in general, and banking sector reforms in particular had any beneficial impact on the allocative efficiency of the banking system. To get a comparative perspective, the allocative efficiency of the banking

system in the post banking sector reforms period has been compared and contrasted with that of the pre-reform period. Allocative efficiency is measured for the twenty-three States of India, individually and as well for all the States taken together. In addition to the scenario at the aggregate level, the allocative efficiency in the sectoral context has also been studied to get a deeper insight. The rest of the study is schematised as follows. Section I discusses the manner in which allocative efficiency has been construed in this study. Section II reviews the literature on allocative efficiency. Some of the stylized facts regarding the credit deployment pattern are discussed in Section III. The data and the empirical framework have been discussed in Section IV. The econometric findings are discussed in Section V. Finally, Section VI presents some concluding observations.

Section I

Interpreting Allocative Efficiency

Efficiency of a financial system is generally described through four broad nomenclatures *i.e.*, information arbitrage efficiency, fundamental valuation efficiency, full insurance efficiency and functional efficiency. The ensuing discussion in this paper would centre around the concepts of functional or allocative efficiency. Allocative efficiency can be judged either directly by monitoring some proxy of allocative efficiency or indirectly by estimating the contribution of a financial variable to economic growth. As far as direct measures are concerned, the interest rate structure, cost of intermediation and net interest margin (RBI, 2002a) as measures of bank efficiency are the oftenly-used criterions to evaluate the allocative efficiency of the banking system.

Allocative efficiency, however, can also be inferred indirectly by studying whether a bank's resources are allocated to most productive uses or not. Most productive use, in turn, can be defined in terms of the economic rate of return (ERR) of a project financed by the banking system. Allocative efficiency would mean that projects with very high ERR are being financed by the banks. It would imply that the funds

of the banking system are so deployed as to maximise the rate of return (ERR) of the projects financed by them. The ERR of individual bank financed projects, however, is difficult to quantify in practice. Akin to the interpretation of allocative efficiency of a bank's resources in terms of the ERR for individual projects, one can conceptualise the allocative efficiency of the entire banking system. In an aggregated sense, allocative efficiency would imply that maximum output is obtained from the deployment of banking system's resources. The concept of 'maximum output', however, is rather vague. As such, studying changes in allocative efficiency reflected in changes in output from a given pool of financial resources under two different time periods or circumstances is more comprehendible than the concept of allocative efficiency *per se*.

Allocative efficiency of an individual bank involves some sort of constrained optimisation. When studied in the cross section dimension, efficiency measurement generally involves use of nonparametric frontier methodology (English, Grosskopf *et al.*, 1993). In the panel context, however, the frontier approach does not capture the panel nature of the data and treats each observation as a separate unit. So it is like a pooled regression, unlike random/ fixed effects models. There are recent developments to overcome this problem, but it is still in a nascent stage. Consequently in a panel context, following RBI (2002a) allocative efficiency has been approximated by the elasticity of output with respect to credit in this study

Section II

Review of Literature

There has been a revival of finance and economic development linkage by the endogenous growth theory over the past decade. In the endogenous growth theory framework, bank finance has a scope to influence economic growth by either increasing the productivity of capital, lowering the intermediation cost, or augmenting the savings rate. The role of financial institutions is to collect and

analyse information so as to channel investible funds into investment activities that yield the highest returns [Greenwood and Jovanovic (1990)]. Though in a pure neo-classical framework, the financial system is irrelevant to economic growth, in practice, an efficient financial system can simultaneously lower the cost of external borrowing, raise the return to savers, and ensure that savings are allocated in priority to projects that promise the highest returns; all of which have the potential for improving growth rates (RBI, 2001a).

Commercial banks are the main conduit for resource allocation in a bank dominated financial system like India. Commercial banks generally provide the working capital needs of business. There is no strict boundary of division, however, in the usage of the funds; once disbursed by financial institutions. Once allocated, a part of the bank funds may very well be put towards building up fixed capital. This is because, a business enterprise would be encouraged to undertake fixed capital formation, once it is assured of working capital needs. Though in India there have been institutions created specifically to meet the long term investment needs of business enterprise, the pervasive character of the scheduled commercial banks had a greater role to play in reaching to a wider mass of people through its vast branch-banking network.

Pattrick (1966) provides a reference framework to study financial development by enunciating the 'demand-following approach' and the 'supply-leading approach' to financial development. Demand following is defined as a situation where financial development is an offshoot of the developments in the real sector. In the case of supply leading, financial development precedes and stimulates the process of economic growth; the supply of financial services and instruments create the demand for them. Patrick suggested that in the early stages of economic development, a supply-leading relation is more likely since a direct stimulus is needed to mobilise savings to finance investment for growth. At a later stage, when the financial sector is more developed, the demand-

following relation will be more prevalent. Empirical studies such as Gupta (1984), Jung (1986) and St. Hill (1992) are broadly suggestive of the pattern of financial development envisaged by Patrick (1966). However, such a theoretical dichotomy between 'demand following' and 'supply leading' is difficult to defend in the context of continuous interaction between the real and the financial sectors in practice.

Regarding the impact of bank finance on growth, a number of empirical studies drive home the positive impact of bank credit on output. Employing GMM panel estimators on a panel data set of 74 countries and a cross sectional instrumental variable estimator for 71 countries, Levine *et al* (2000) find that the exogenous component of financial intermediary development is positively associated with economic growth. Further, empirical studies by King and Levine (1993), Gregorio and Guidotti (1995) strongly borne out the positive effect of financial development on the long run growth of real per capita GDP. In the tradition of disentangling the impact of bank credit on growth, Reserve Bank of India (2002a) explored the relative impact of finance in inducing output growth using panel regression techniques. Estimates of elasticity of output with respect to credit improved from 0.30 during the period 1981-1991 to 0.35 during 1992-2001 indicating as improvement in the allocative efficiency of the banking system at the all India level (RBI 2002a). Sector-wise credit elasticities of output also indicate as improvement in the allocative efficiency for most of the sectors in the post reform period compared to the 1980s. However, no attempt has been made to study allocative efficiency at the State level and across the sectors. The present study seeks to fill this gap.

Section III

Credit and Output in the Spatial Dimension: Some Stylised Facts

The relative growth rates in credit and output in the pre and post-reforms periods can act as pointers to allocative efficiency. Aggregate credit has grown at a similar pace both in the pre reform and the post

Table 1: Growth of Output and Credit

(Per cent)

VARIABLE	1981-1992		1993-2001		1981-2001	
	Output	Credit	Output	Credit	Output	Credit
NSDP*	2.7	12.9	4.1	12.9	3.1	13.2
Agriculture	1.6	11.1	0.7	9.6	1.5	9.1
Industries	3.6	15.1	5.6	11.5	4.2	14.2
Services	4.0	11.2	6.0	15.3	4.6	13.3

* Net State Domestic Product

Source : Central Statistical Organisation and Reserve Bank of India

reform period, aggregate output, however, grew at a distinctly higher rate in the post reform phase. This indicates that at the aggregate level, there could be some improvement in the allocative efficiency. However, one finds a mixed picture at the sectoral level. While both output and credit growth has decelerated for the agricultural sector, that for services sector has accelerated in the post reform phase as compared to the pre reform phase. For industry, however, higher growth in output is witnessed in spite of deceleration in credit growth in the reform period.

Focusing only on growth rates of output and credit to comment on the allocative efficiency may be quite misleading, if the share of different sectors in aggregate credit and output has not remained the same. In fact, the share in credit and output has increased for both industry and services sector and has declined for the agriculture sector in the post reform period (Table 2). Thus, a much deeper

Table 2: Share in Output and Credit

(Per cent)

Sector	Average Share in the pre-banking sector reform period		Average Share in the post banking sector reform period	
	Output	Credit	Output	Credit
Agriculture	37	15.7	29	10
Industry	23	43.5	25.5	48
Services	40	40.8	45.5	42

Source : Central Statistical Organisation and Reserve Bank of India.

analysis is required to comment on the allocative efficiency in different sectors in the post reform phase.

At the State level, all the States under study can be broadly classified into four categories based on their shares in aggregate credit and output. States with increased share in output and credit in the post reform phase as compared to the pre reform period are the 'Group A' States. States with increased share in output but reduced share in credit are the 'Group B' States. States with increased share in credit and reduced share in output are 'Group C' status, and States with decline in their share in output and credit belong to the 'Group D' category. As can be seen from Table 3, the majority of the States (Thirteen) belong to Group D, which have suffered a decline in their share in aggregate output and credit. In total, share of credit in the aggregate credit has gone down for 16 States and has improved for 7 States in the post reform phase.

Considerable inequality is thus, seen among the States in terms of their share in overall credit. In such a scenario, it becomes

Table 3 : Changing Share of Different States in Output and Credit: A Comparison of Pre-Reform and Post-Reform Period

States with increased share in output and credit (Group A)	States with increased share in output but reduced share in credit (Group B)	States with increased share in credit and reduced share in output (Group C)	States with decline in their share in output and credit (Group D)
Andhra Pradesh, Delhi, Tamil Nadu, Maharastra, Karnataka and Gujarat	Arunachal Pradesh, Rajasthan and West Bengal	Kerala	Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Pondicherry, Manipur, Madhya Pradesh, Punjab, Orissa, Uttar Pradesh, Tripura, Meghalaya and Haryana

Source : Central Statistical Organisation and Reserve Bank of India.

interesting to enquire, whether, States receiving an increasing share of the credit resource have been able to make the most of it. In other words, whether, rising credit shares are also accompanied with improved allocative efficiency. Further, if allocative efficiency of credit has improved even for States that have undergone a decline in their share of credit, it would have well served the purpose of reforms in the banking sector. Hence, it would be useful to decipher, if any pattern is emerging at the State level, when allocative efficiency of the banking system is seen in conjunction with their credit shares.

Apart from differences in their shares in output and credit, States have also exhibited a varied pattern in their growth of output and credit in the post reform period. Based on their growth in aggregate credit and output, there can be four categories of States. States with increased share in output and credit in the post reform phase as compared to the pre reform period are the 'Group E' States. States with higher growth in output but lower growth in credit belong to 'Group F'. 'Group G' States are those with higher growth in credit and lower growth in output and States with reduced growth both in output and credit belong to the 'Group H' category.

Table 4: Growth in Output and Credit of Different States: A Comparison of Pre – Reform and Post - Reform Period

States with higher growth in output and credit (Group E)	States with higher growth output but lower growth in credit (Group F)	States with higher growth in credit and lower growth in output (Group G)	States with lower growth in output and credit (Group H)
Delhi, Karnataka, Kerala Maharastra, and Rajasthan	Andhra Pradesh, Gujarat, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Manipur, Meghalaya Pondicherry, Tamil Nadu, Tripura and West Bengal	Punjab and Haryana	Arunachal Pradesh, Assam, Bihar, Orissa and Uttar Pradesh

Source : Central Statistical Organisation and Reserve Bank of India.

The differential growth pattern in credit and output can act as a guide to comment on allocative efficiency across States. Group F States that have shown an increased growth in output along with low credit growth in the post reform period are likely to exhibit higher allocative efficiency. On the other hand, Group G States with lower output and higher credit growth are clear candidates where allocative efficiency would be deteriorating.

However, it is tricky to judge about the allocative efficiency for States belonging to the Group E and group H, that have experienced either increased or reduced growth both in credit and output. For Group E States, that have witnessed higher growth both in credit and output, allocative efficiency would be guided by the relative growth of output *vis-a-vis* that of credit. Similarly, for Group H States that have experienced a lower growth of both credit and output in the post reform phase, allocative efficiency would depend on the relative decline in one *vis-a-vis* the other.

The indications for allocative efficiency obtained from the above informal analysis, however, need to be corroborated with more rigorous analysis to arrive at robust inferences. The empirical framework to estimate the allocative efficiency is discussed in the next section.

Section IV

Data and Empirical Methodology

The study examines the allocative efficiency of the banking system for 23 States of India. Allocative efficiency has been estimated separately for the two periods 1981-1992 (first period) and 1993-2001(second period). The periods have been so chosen as to represent the pre banking sector reforms and the post banking sector reforms scenarios, respectively. The credit output dynamics has been studied for three broad sectors of each State *viz*, agriculture, industry and services. While measuring output; the following classification has been used. Agriculture includes agriculture, forestry and fishing

and logging. Industry includes mining, quarrying and manufacturing (registered and non-registered) and services include electricity, gas and water supply, transport, storage and communication, trade, hotels and restaurants, banking and insurance, real estate, ownership of dwellings and business services, public administration and other services. Income originating from the States rather than income accruing to State concept has been used to measure output. The data on output has been taken from the information supplied by the various States to the Central Statistical Organisation. SDP data at the 1993-94 base has been used in the study. The data on credit refers to the outstanding credit to different sectors from all scheduled commercial banks in a region. The data for credit has been taken from the 'Basic Statistical Returns' published by the Reserve Bank of India.

The output variable is represented by log of per capita net State Domestic Product (LPNSDP) and the credit variable by the log of per capita credit for the State (LPTCAS). Though certain new regions have been carved out from the existing ones in the year 2000, for analytical purposes, necessary adjustments have been made to make the output and credit figures for the year 2001 comparable to that for the previous years. The choice of the regions and the time period have been completely motivated by the availability and consistency of the data. However, with inclusion of regions having share of less than one percent and as well having more than ten percent in the combined NSDP for all the 25 regions, heterogeneity that prevails across the regions in India has been captured considerably.

Empirical Methodology

To estimate the credit elasticities of output, we have twelve data points for the pre reform and nine data points in the post reform period. Use of time series estimation techniques, however, is precluded given the small number of observations for estimation. However, taking advantage of the panel nature of the data, one can use panel data techniques. With panel data techniques, information

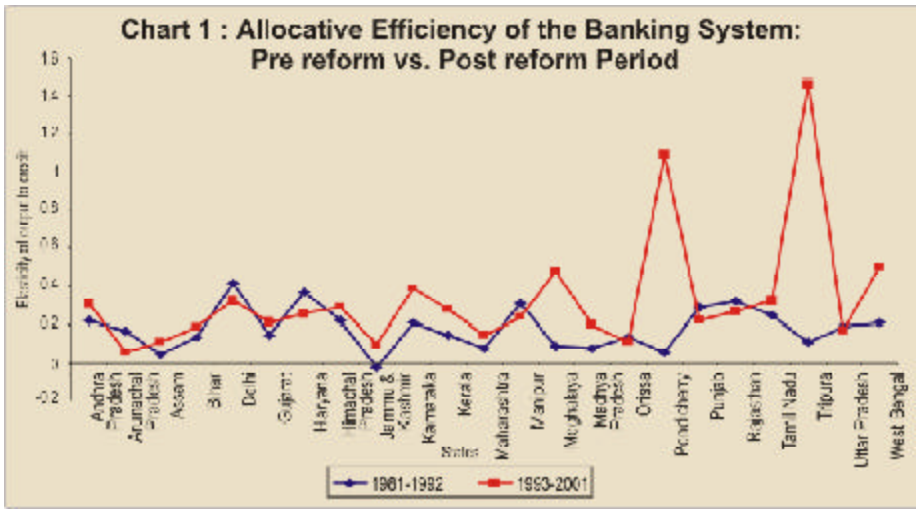
from the time-series dimension is combined with that obtained from the cross-sectional dimension, in the hope that inference about the existence of unit roots and cointegration can be made more straightforward and precise.

To ascertain the appropriate estimation technique, the variables have been first examined for stationarity in a panel context. If the variables are found to contain a unit root, the variables are then examined for possible cointegration. In the event cointegration between the variables, Fully Modified OLS (FMOLS) estimation technique is used to obtain coefficient estimates. Specifically, the panel unit root tests developed by Levin, Lin and Chu and Im, Pesaran and Shin have been employed. Pedroni's method is used to test for panel cointegration. Fully modified OLS estimation technique given by Pedroni is used to derive the elasticities. The details of the empirical methodology are given in the Annex 6.

Section V

Empirical Results

The results of the panel unit root tests for each of our variables are shown in Annex 3. In no case, can we reject the null hypothesis that every country has a unit root for the series in log levels. Once ascertained that both the variables are I (1), we turn to the question of possible cointegration between log of per capita SDP and log of per capita credit. In the absence of cointegration, we can first differentiate the data and then work with these transformed variables. However, in the presence of cointegration, the first differences do not capture the long run relationships in the data and the cointegration relationship must be taken into account. Annex 4 depicts the evidence on the cointegration property between per-capita SDP and per-capita credit for the Indian States. The panel cointegration tests suggested by Pedroni (1999) have been applied. In general, the Pedroni (1999) tests turn out to be in favour of a cointegrating relation between the variables that are non stationary. The agriculture sector has not been



studied for cointegration as the output variable for agriculture is stationary and the credit variable is non stationary. [2]

Efficient FMOLS estimation technique is used to obtain the estimate of elasticity of output with respect to credit for each sub-period. The results are given in Annex 5. The changing allocative efficiency over time and across States can be seen from Chart 1. The results broadly indicate an improvement in the allocative efficiency for the majority of the States.[3] For instance, for fifteen States, there was an improvement in allocative efficiency with respect to the State Domestic Product. It may be noted that eight out of these fifteen States had undergone a decline in their share in aggregate credit in the post reform period.

As indicated by the analysis of growth in terms of credit and output, the allocative efficiency of banks' funds has improved for all States that had higher output and lower credit growth in the post reform phase.[4] For all States taken together, allocative efficiency has improved from 0.18 to 0.34 as indicated by the pooled estimates. An overview of the results in terms of States and sectors that have witnessed an improvement in allocative efficiency of bank funds is given in Table 5. At the sectoral level, an improvement in allocative efficiency of bank funds in the services sector is witnessed for 18 States and in the industrial sector for 12 States (Table 5).

Table 5: Allocative Efficiency Across Sectors and States in the Post reform period

State	Sectors		
	Industry	Services	Overall[5]
ANDHRA PRADESH	Ö	Ö	Ö
ARUNACHAL PRADESH		Ö	
ASSAM	Ö		Ö
BIHAR		Ö	Ö
DELHI			
GUJARAT		Ö	Ö
HARYANA		Ö	
HIMACHAL PRADESH	Ö	Ö	Ö
JAMMU & KASHMIR		Ö	Ö
KARNATAKA	Ö	Ö	Ö
KERALA	Ö	Ö	Ö
MADHYA PRADESH	Ö		Ö
MAHARASHTRA	Ö	Ö	Ö
MANIPUR			
MEGHALAYA		Ö	Ö
ORISSA		Ö	
PONDICHERRY	Ö	Ö	Ö
PUNJAB	Ö	Ö	
RAJASTHAN	Ö		
TAMIL NADU	Ö	Ö	Ö
TRIPURA		Ö	Ö
UTTAR PRADESH		Ö	
WEST BENGAL	Ö	Ö	Ö

Note : Ö indicates improvement in allocative efficiency in the post reform phase as compared to the pre reform period. Blank cells indicate deterioration in allocative efficiency in the post reform period.

Section VI

Conclusion

One of the main aims of financial sector reforms in the post 1990s was to improve the allocative efficiency of the financial system. The efficiency improvement of the banking system has a bearing on the overall efficiency of the Indian financial system as the banking sector has a dominant role to play in the entire financial edifice. This study attempted to enquire into the allocative efficiency of the Indian banking system on a wider canvass encompassing twenty three States and across the agriculture, industry and services sectors.

The finding of the study broadly corroborates that there has been an improvement in allocative efficiency for all States taken together as far as elasticity of total output to total credit is concerned. At the sectoral level, however, the picture is mixed. For the services sector there has been a distinct improvement in allocative efficiency of credit in the post reform period. The agriculture and industry sector, however, have witnessed a decline in the allocative efficiency of credit in the same period. At the State level, majority of the States witnessed an improvement in the overall allocative efficiency in the post reform period. The improved allocative efficiency is more marked for the services sector than for industry across the States.

Notes

1 Given that credit – output relations involve relatively short time series dimensions, and the well known low power of conventional unit root tests when applied to a single time series, there may be considerable potential for tests that can be employed in an environment where the time series may be of limited length, but very similar data may be available across a cross–section of countries, regions, firms, or industries.

2 Both fixed and random effects estimation of elasticity of output with respect to credit shows deterioration in allocative efficiency in the post reform period for the agriculture sector.

3 Allocative efficiency as defined by elasticity of SDP with respect to total credit. The individual and pooled FMOLS estimates are given in Annex-5.

4 Manipur is an exception

5 Overall refers to the State Domestic Product

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Annex 1: Growth of Sector-wise Output[1]

(Per cent)

State	Agriculture			Industry			Services			NSDP		
	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001
ANDHRA PRADESH	0.1	1.5	0.7	6.1	6.2	6.3	6.0	5.8	5.4	3.6	4.5	3.8
ARUNACHAL PRADESH	5.1	-3.5	2.4	5.1	0.9	5.3	6.0	6.8	6.6	5.4	1.0	4.4
ASSAM	0.1	-0.3	-0.1	1.4	2.0	0.5	2.4	1.4	2.3	1.2	0.8	1.0
BIHAR	0.2	-0.4	-1.3	4.3	3.8	2.1	3.2	3.6	2.7	2.2	2.1	0.9
DELHI	-0.3	-10.8	-6.8	4.1	-0.3	2.7	3.4	5.9	4.5	3.5	4.1	3.8
GUJARAT	-2.8	-3.1	-0.2	4.8	4.3	5.9	5.0	6.8	5.5	2.4	3.7	4.0
HARYANA	2.1	-0.3	1.3	6.4	4.1	4.3	5.4	7.2	5.1	4.0	3.5	3.3
HIMACHAL PRADESH	0.3	-1.8	-0.2	5.4	7.2	6.5	5.0	5.1	4.1	3.0	3.6	3.1
JAMMU & KASHMIR	-2.6	1.2	-0.8	2.4	-2.9	0.2	1.1	3.7	2.2	-0.3	1.8	0.7
KARNATAKA	0.7	3.0	1.9	4.9	5.8	4.8	5.5	9.0	6.4	3.4	6.1	4.3
KERALA	1.2	0.4	1.8	1.9	4.1	4.3	2.8	6.8	4.8	2.0	4.3	3.7
MADHYA PRADESH	-0.4	-1.8	0.3	2.7	7.4	6.8	4.1	4.0	3.5	1.6	2.1	2.1
MAHARA-SHTRA	0.7	-0.9	1.7	3.9	4.4	4.3	5.0	5.9	6.2	3.6	4.2	4.6
MANIPUR	-0.4	1.9	0.2	4.0	8.1	3.0	4.1	5.3	4.2	2.2	4.9	2.7
MEGHALAYA	-1.6	2.7	-1.1	2.6	6.7	4.0	4.9	2.8	3.6	2.3	3.4	2.2
ORISSA	-0.8	-0.9	-1.4	5.1	-1.9	4.1	4.3	5.9	4.4	2.0	1.6	1.4
PONDI-CHERRY	-1.8	-2.7	-2.6	1.0	21.6	3.2	2.2	10.0	5.2	0.9	12.3	2.8
PUNJAB	3.1	0.2	1.9	5.1	4.9	5.0	2.5	4.9	2.8	3.3	2.8	2.9
RAJASTHAN	1.9	0.0	1.7	4.3	7.0	5.6	6.2	5.8	5.4	3.7	4.1	3.8
TAMIL NADU	2.6	0.8	2.7	3.2	4.4	4.1	5.1	8.2	6.2	3.9	5.3	4.7
TRIPURA	-0.1	0.4	-0.6	-1.2	12.3	4.2	6.2	5.0	5.9	2.6	4.4	3.1
UTTAR PRADESH	0.5	0.0	0.3	5.2	2.5	3.3	3.9	2.9	3.0	2.5	1.7	1.9
WEST BENGAL	3.2	2.1	2.9	1.3	4.4	2.6	2.7	8.3	4.6	2.4	5.5	3.5

[1] Compound annual growth rates.

Annex 2: Growth of Sector-wise Credit[2]

(Per cent)

State	Agriculture			Industry			Services			Total Credit		
	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001	1981-1992	1993-2001	1981-2001
ANDHRA PRADESH	14.0	11.1	11.0	17.1	12.3	14.9	19.7	17.2	17.4	17.0	14.1	14.8
ARUNACHAL PRADESH	37.3	7.7	19.6	36.4	-7.2	11.1	23.8	20.3	18.5	32.3	5.7	15.2
ASSAM	15.3	-1.9	7.2	19.4	1.7	8.9	17.8	13.7	13.2	18.0	6.8	10.6
BIHAR	14.8	0.3	10.0	11.0	1.6	8.7	20.2	8.4	14.8	15.1	4.9	11.5
DELHI	-5.9	19.4	9.1	14.1	10.3	16.2	4.3	15.1	11.0	7.9	12.3	13.2
GUJARAT	14.3	6.7	11.1	15.1	15.4	14.0	15.3	16.0	15.6	15.0	14.5	14.0
HARYANA	11.4	8.5	7.6	12.8	15.8	12.4	13.2	13.3	12.1	12.4	13.5	11.0
HIMACHAL PRADESH	13.4	7.1	7.6	18.0	12.2	12.4	16.8	12.2	13.3	16.5	11.6	12.1
JAMMU & KASHMIR	13.0	8.6	7.3	16.6	4.8	8.9	16.1	17.9	14.8	15.9	14.2	12.6
KARNATAKA	16.1	12.2	12.1	14.8	15.1	14.0	17.2	19.5	16.0	15.9	16.3	14.3
KERALA	13.6	12.3	11.1	11.8	11.1	11.0	14.9	17.6	15.3	13.5	14.9	13.2
MADHYA PRADESH	17.1	10.2	12.1	18.7	14.6	14.6	19.2	10.7	15.0	18.5	12.1	14.1
MAHARA-SHTRA	12.0	12.8	10.6	14.1	16.6	15.5	13.1	17.6	15.4	13.4	16.9	15.1
MANIPUR	23.3	7.9	13.0	38.8	1.3	19.9	21.2	12.8	14.1	25.3	8.6	15.3
MEGHALAYA	27.2	-3.7	10.1	36.0	5.7	16.0	17.1	9.5	14.3	23.3	6.3	13.7
ORISSA	14.0	8.1	9.2	19.8	7.9	12.2	20.1	14.1	14.9	18.5	11.0	12.7
PONDI-CHERRY	7.8	7.5	6.9	15.4	7.1	12.2	16.2	15.1	15.8	14.0	10.6	12.5
PUNJAB	7.9	11.0	7.0	15.9	14.2	13.4	10.1	14.7	12.7	11.3	13.8	11.3
RAJASTHAN	14.2	12.3	11.1	12.9	12.7	13.0	14.6	16.1	14.1	13.8	13.9	12.9
TAMIL NADU	16.1	8.4	12.2	16.0	16.1	15.5	17.9	17.6	17.8	16.6	15.8	15.9
TRIPURA	20.4	1.7	10.1	26.9	-2.3	10.9	21.8	4.6	12.5	22.5	2.8	11.6
UTTAR PRADESH	13.6	9.0	10.8	13.8	8.5	11.3	16.7	11.3	13.2	14.8	9.8	11.9
WEST BENGAL	14.4	3.9	8.1	11.8	8.7	10.9	16.7	13.1	14.4	13.4	10.0	11.8

[2] Compound annual growth rates.

Annex 3 : Panel Unit Root Tests

	1981-1992				1993-2001			
Variable	**Levin-Lin rho -stat**	**Levin-Lin t-rho -stat**	**Levin-Lin ADF-stat**	**IPS ADF -stat**	**Levin-Lin rho -stat**	**Levin-Lin t-rho -stat**	**Levin-Lin ADF-stat**	**IPS ADF -stat**
LPAGRI	-7.80	-4.52	-2.58	-6.13	-6.67	-4.56	-3.73	-6.31
LPINDS	1.15	2.27	2.37	2.45	0.47	0.73	0.73	-0.42
LPSERV	2.45	3.36	3.53	4.54	2.49	3.46	3.25	2.85
LPNSDP	1.75	2.91	3.58	3.99	1.58	2.18	2.51	2.29
LPACS	0.82	0.68	1.33	1.46	1.67	2.82	2.63	2.36
LPICS	2.09	2.40	1.98	0.74	1.49	2.57	1.87	0.17
LPSCS	1.08	1.20	2.81	5.31	2.36	3.49	3.22	3.88
LPTCAS	1.64	1.73	2.58	2.20	2.47	3.53	3.33	2.54

Notes : a. The critical values are from Levin and Lin (1992).
b. IPS indicates the Im et al. (1997) test. The critical values are taken from Table 4.
c. Unit root tests include a constant and heterogeneous time trend in the data.

Annex 4 : Panel Cointegration Tests

	1981-1992			1993-2001		
Statistics	**LPINDS and LPICS**	**LPSERV and LPSCS**	**LPNSDP and LPTCAS**	**LPINDS and LPICS**	**LPSERV and LPSCS**	**LPNSDP and LPTCAS**
Panel *v*-statistics	4.52	2.49	2.97	1.02	2.80	1.79
Panel *rho*-statistics	-1.96	-1.71	-1.51	-0.39	-0.84	-0.80
Panel *pp*-statistics	-3.57	-2.96	-2.96	-3.83	-2.89	-3.65
Panel *adf*-statistics	-4.45	-3.47	-1.99	-2.03	-3.32	-2.48
Group *rho*-statistics	-0.34	0.21	0.0006	1.01	1.35	0.47
Group *pp*-statistics	-4.31	-3.02	-3.20	-6.66	-3.56	-6.44
Group *adf*-statistics	-5.75	-5.09	-3.75	-23.83	-15.36	-22.65

Notes : The critical values for the panel cointegration tests are base on Pedroni (2001a).

LPAGRI = Log of per capita agricultural output
LPINDS = Log of per capita industrial output
LPSERV = Log of per capita services sector output
LPNSDP = Log of per capita net State domestic product
LPACS = Log of per capita agricultural credit
LPICS = Log of per capita industrial credit
LPSCS = Log of per capita services sector credit
LPTCAS = Log of per capita total credit outstanding for all sectors of the State

Annex 5 : Individual and Pooled FMOLS Results

States	1981-1992	1993-2001	1981-1992	1993-2001	1981-1992	1993-2001
	LPNSDP	LPNSDP	LPINDS	LPINDS	LPSERV	LPSERV
ANDHRA PRADESH	0.22 (-12.95)	0.31 (-33.96)	0.41 (-10.60)	0.44 (-27.86)	0.32 (-13.61)	0.35 (-45.14)
ARUNACHAL PRADESH	0.17 (-42.90)	0.06 (-26.11)	0.15 (-31.56)	0.1 (-6.07)	0.34 (-19.96)	0.38 (-8.08)
ASSAM	0.05 (-78.06)	0.11 (-48.25)	-0.03 (-86.56)	0.25 (-11.31)	0.14 (-37.71)	0.09 (-52.65)
BIHAR	0.14 (-26.38)	0.19 (-8.86)	0.34 (-12.21)	0.05 (-6.08)	0.17 (-153.24)	0.37 (-8.82)
DELHI	0.42 (-10.74)	0.33 (-11.09)	0.32 (-32.89)	-0.09 (-16.46)	0.55 (-2.82)	0.36 (-9.69)
GUJARAT	0.15 (-29.75)	0.21 (-13.17)	0.28 (-15.23)	0.27 (-24.29)	0.34 (-27.64)	0.47 (-14.50)
HARYANA	0.37 (-11.96)	0.26 (-85.73)	0.52 (-9.53)	0.25 (-235.33)	0.43 (-8.25)	0.52 (-31.67)
HIMACHAL PRADESH	0.22 (-12.84)	0.29 (-41.42)	0.03 (-14.24)	0.47 (-7.34)	0.34 (-11.42)	0.46 (-18.74)
JAMMU & KASHMIR	-0.02 (-38.75)	0.1 (-61.07)	-0.19 (-13.13)	-0.24 (-13.86)	0.08 (-67.00)	0.2 (-51.85)
KARNATAKA	0.21 (-25.53)	0.39 (-13.58)	0.02 (-43.88)	0.4 (-12.76)	0.34 (-24.92)	0.47 (-15.15)
KERALA	0.15 (-15.67)	0.28 (-49.23)	0.09 (-13.33)	0.3 (-36.07)	0.2 (-31.35)	0.4 (-25.86)
MAHARASHTRA	0.08 (-33.23)	0.15 (-36.83)	-0.05 (-47.65)	0.29 (-27.18)	0.23 (-47.62)	0.38 (-18.57)
MANIPUR	0.31 (-14.19)	0.24 (-74.81)	0.03 (-9.61)	0.25 (-55.47)	0.4 (-5.83)	0.35 (-24.06)
MEGHALAYA	0.09 (-97.31)	0.48 (-2.92)	-0.01 (-129.84)	0.02 (-1.38)	0.2 (-47.02)	0.44 (-7.77)
MADHYA PRADESH	0.08 (-22.14)	0.2 (-6.10)	-0.06 (-75.61)	0.14 (-5.11)	0.29 (-10.05)	0.24 (-9.58)
ORISSA	0.14 (-55.82)	0.11 (-58.34)	0 (-16.08)	-0.59 (-9.70)	0.25 (-76.56)	0.43 (-60.82)
PONDICHERRY	0.06 (-57.65)	1.09 -0.48	-0.12 (-13.49)	2.19 -1.18	0.14 (-133.73)	0.66 (-8.45)
PUNJAB	0.29 (-11.00)	0.22 (-86.15)	0.16 (-7.50)	0.34 (-17.70)	0.27 (-18.51)	0.37 (-16.08)
RAJASTHAN	0.32 (-12.24)	0.27 (-11.18)	0.14 (-6.93)	0.53 (-13.45)	0.46 (-8.75)	0.37 (-16.27)
TAMILNADU	0.25 (52.30)	0.33 (-63.08)	0.16 (-23.21)	0.24 (-28.70)	0.32 (-65.09)	0.5 (-15.10)
TRIPURA	0.11 (-22.23)	1.46 -1.91	0 (-39.83)	-2.31 (-3.05)	0.3 (-19.08)	0.97 (-0.64)
UTTAR PRADESH	0.19 (-63.23)	0.17 (-38.75)	0.05 (-51.47)	0.29 (-11.36)	0.27 (-30.85)	0.28 (-64.79)
WEST BENGAL	0.21 (-30.22)	0.5 (-29.80)	0.21 (-16.57)	0.49 (-29.83)	0.17 (-70.59)	0.63 (-9.82)
POOLED	**0.18 (-162.03)**	**0.34 (-166.41)**	**0.03 (-156.24)**	**0.18 (-124.94)**	**0.28 (-194.26)**	**0.42 (-111.37)**

Note : Figures are estimated elasticities of output with respect to credit of the respective sectors.
Figures in parenthesis indicate t-values

Annex 6

Panel Unit Root, Panel Cointegration and Fully Modified OLS Estimation

Panel unit root Tests

There are several techniques, which can be used to test for a unit root in panel data. Specifically, we are interested to test for non-stationarity against the alternative that the variable is trend stationary.

Levin, Lin and Chu (LLC) Test

One of the first unit root tests to be developed for panel data is that of Levin and Lin, as originally circulated in working paper form in 1992 and 1993. Their work was finally published, with Chu as a coauthor, in 2002. Their test is based on analysis of the equation:

$$\Delta y_{i,t} = \alpha_i + \delta_i t + \theta_t + \rho_i y_{i,t-1} + \varepsilon_{i,t}\ ,$$
$$i = 1,2,..N, t = 1,2,...T.$$

This model allows for two-way fixed effects (α and θ) and unit-specific time trends. The unit-specific fixed effects are an important source of heterogeneity, since the coefficient of the lagged dependent variable is restricted to be homogeneous across all units of the panel. The test involves the null hypothesis H_0: $\rho_i = 0$ for all i against the alternative H_A: $\rho_i = \rho < 0$ for all i with auxiliary assumptions under the null also being required about the coefficients relating to the deterministic components. Like most of the unit root tests in the literature, LLC assume that the individual processes are cross-sectionally independent. Given this assumption, they derive conditions and correction factors under which the pooled OLS estimate will have a standard normal distribution under the null hypothesis. Their work focuses on the asymptotic distributions of this pooled panel estimate of ρ under different assumptions on the existence of fixed effects and homogeneous time trends. The LLC test may be viewed as a pooled Dickey-Fuller (or ADF) test, potentially with differing lag lengths across the units of the panel.

The Im-Pesaran-Shin Test

The Im-Pesaran-Shin (IPS, 1997) test extends the LLC framework to allow for heterogeneity in the value of ρ_i under the alternative hypothesis.

Given the same equation: $$\Delta y_{i,t} = \alpha_i + \delta_i t + \theta_t + \rho_i y_{i,t-1} + \varepsilon_{i,t}\ ,$$
$$i = 1,2,..N, t = 1,2,...T.$$

The null and alternative hypotheses are defined as: $H_0 : \rho_i = 0 \forall i$

and $H_A : \rho_i < 0, i = 1,2,..., N_1; \rho_i = 0, i = N_1 + 1, N_1 + 2,...N$

Thus under the null hypothesis, all series in the panel are nonstationary processes; under the alternative, a fraction of the series in the panel are assumed to be stationary. This is in contrast to the LLC test, which presumes that all series are stationary under the alternative hypothesis. The errors are assumed to be serially autocorrelated, with different serial correlation properties and differing variances across units. IPS propose the use of a group-mean Lagrange multiplier statistic to test the null hypothesis. The ADF regressions are computed for each unit, and a standardized statistic computed as the average of the LM tests for each equation. Adjustment factors (available in their paper) are used to derive a test statistic that is distributed standard Normal under the null hypothesis.

IPS also propose the use of a group-mean *t*-bar statistic, where the *t* statistics from each ADF test are averaged across the panel; again, adjustment factors are needed to translate the distribution of *t*-bar into a standard Normal variate under the null hypothesis. IPS demonstrates that their test has better finite sample performance than that of LLC. The test is based on the average of the augmented Dickey-Fuller (ADF) test statistics calculated independently for each member of the panel, with appropriate lags to adjust for auto-correlation. The adjusted test statistics, [adjusted using the tables in Im, Pesaran, and Shin (1995)] are distributed as N(0,1) under the

null of a unit root and large negative values lead to the rejection of a unit root in favor of stationarity.

Panel Cointegration Tests and Efficient Estimation

Cointegration analysis is carried out using a panel econometric approach. Since the time series dimension is enhanced by the cross section, the analysis relies on a broader information set. Hence, panel tests have greater power than individual tests, and more reliable findings can be obtained.

We use Pedroni's (1995, 1997) panel cointegration technique, which allows for heterogeneous cointegrating vectors. The panel cointegration tests suggested by Pedroni (1999) extend the residual based Engle and Granger (1987) cointegration strategy. First, the cointegration equation is estimated separately for each panel member. Second, the residuals are examined with respect to the unit root feature. If the null of no-cointegration is rejected, the long run equilibrium exists, but the cointegration vector may be different for each cross section. Also, deterministic components are allowed to be individual specific. To test for cointegration, the residuals are pooled either along the within or the between dimension of the panel, giving rise to the panel and group mean statistics (Pedroni, 1999). In the former, the statistics are constructed by summing both numerator and denominator terms over the individuals separately; while in the latter, the numerator is divided by the denominator prior to the summation. Consequently, in the case of the panel statistics the autoregressive parameter is restricted to be the same for all cross sections. If the null is rejected, the variables in question are cointegrated for all panel members. In the group statistics, the autoregressive parameter is allowed to vary over the cross section, as the statistics amounts to the average of individual statistics. If the null is rejected, cointegration holds at least for one individual. Therefore, group tests offer an additional source of heterogeneity among the panel members.

Both panel and group statistics are based on augmented Dickey Fuller (ADF) and Phillips- Perron (PP) method. Pedroni (1999) suggests 4 panel and 3 group statistics. Under appropriate

standardization, each statistic is distributed as standard normal, when both the cross section and the time series dimension become large.

The asymptotic distributions can be stated in the form

$$Z = \frac{Z^* - m\sqrt{N}}{\sqrt{v}} \qquad (1)$$

where Z* is the panel or group statistic, respectively, N the cross section dimension **m** and **n** and arise from of the moments of the underlying Brownian motion functionals. They depend on the number of regressors and whether or not constants or trends are included in the co-integration regressions. Estimates for **m** and **n** are based on stochastic simulations and are reported in Pedroni (1999). Thus, to test the null of no co-integration, one simply computes the value of the statistic so that it is in the form of (1) above and compares these to the appropriate tails of the normal distribution. Under the alternative hypothesis, the panel variance statistic diverges to positive infinity, and consequently the right tail of the normal distribution is used to reject the null hypothesis. Consequently, for the panel variance statistic, large positive values imply that the null of no co-integration is rejected. For each of the other six test statistics, these diverge to negative infinity under the alternative hypothesis, and consequently the left tail of the normal distribution is used to reject the null hypothesis. Thus, for any of these latter tests, large negative values imply that the null of no co-integration is rejected. The intuition behind the test is that using the average of the overall test statistic allows more ease in interpretation: rejection of the null hypothesis means that enough of the individual cross sections have statistics 'far away' from the means predicted by theory were they to be generated under the null.

Panel FMOLS

In the event the variables are co-integrated, to get appropriate estimates of the co-integration relationship, efficient estimation techniques are employed. The appropriate estimation method is so designed that the problems arising from the endogeneity of the regressors and serial correlation in the error term are avoided.

Due to the corrections, the estimators are asymptotically unbiased. Especially, fully modified OLS (FMOLS) is applied. In the model

$$y_{it} = a_i + b_i x_{it} + u_{it}$$
$$x_{it} = x_{it-1} + e_{it}, \quad v_{it} = (u_{it}, e_{it})' \tag{2}$$

the asymptotic distribution of the OLS estimator depends on the long run covariance matrix of the residual process w. This matrix is given by

$$\Omega_i = \lim_{T\to\infty} \frac{1}{T} E\left(\sum_{t=1}^{T} v_{it}\right)\left(\sum_{t=1}^{T} v_{it}\right) = \Sigma_i + \Gamma_i + \Gamma_i' = \begin{pmatrix} v_{u,i} & v_{ue,i} \\ v_{ue,i} & v_{e,i} \end{pmatrix} \tag{3}$$

for the *i*-th panel member, where

$$\Sigma_i = \lim_{T\to\infty} \frac{1}{T} \sum_{t=1}^{T} E\left(v_{it} v_{it}'\right) = \begin{pmatrix} s_{u,i}^2 & s_{ue,i} \\ s_{ue,i} & s_{e,i}^2 \end{pmatrix}$$

$$\Gamma_i = \lim_{T\to\infty} \frac{1}{T} \sum_{k=1}^{T-1} \sum_{t=k+1}^{T} E\left(w_{it} w_{it-k}'\right) = \begin{pmatrix} g_{u,i} & g_{ue,i} \\ g_{ue,i} & g_{e,i} \end{pmatrix} \tag{4}$$

denote the matrices of contemporaneous correlation coefficients and the auto-covariance, respectively, where the latter are weighted according to the Newey and West (1994) proposal. For convenience, the matrix

$$q_i = \begin{pmatrix} q_{u,i} & q_{ue,i} \\ q_{eu,i} & q_{e,i} \end{pmatrix} = \Sigma_i + \Gamma_i = \sum_{j=0}^{\infty} E\left(w_{ij} w_{i0}\right)' \tag{5}$$

is defined. The endogeneity correction is achieved by the transformation

$$y_{it}^* = y_{it} - \hat{v}_{ue,i}\, \hat{v}_{e,i}^{-1}\, \Delta x_{it} \tag{6}$$

and the fully modified estimator is

$$\hat{b}_i^* = \left(X_i' X_i\right)^{-1} \left(X_i' y_i^* - T \hat{q}_{eu}^*\right) \tag{7}$$

where, $\hat{q}_{eu}^* = \hat{q}_{eu} - \hat{q}_e\, \hat{v}_{ei}^{-1}\, \hat{v}_{eu,i}$

provides the autocorelation correction, The estimates needed for the transformations are based on OLS residuals obtained in a preliminary step. The panel FMOLS estimator is just the average of the individuals parameters.

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Derivatives and Volatility on Indian Stock Markets

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Derivative products like futures and options on Indian stock markets have become important instruments of price discovery, portfolio diversification and risk hedging in recent times. This paper studies the impact of introduction of index futures on spot market volatility on both S&P CNX Nifty and BSE Sensex using ARCH/GARCH technique. The empirical analysis points towards a decline in spot market volatility after the introduction of index futures due to increased impact of recent news and reduced effect of uncertainty originating from the old news. However, further investigation also reveals that the market wide volatility has fallen during the period under consideration. Surrogate indices like BSE 200 and Nifty Junior are introduced to evaluate whether the introduction of index futures *per se* has been instrumental in reducing the spot market volatility or the volatility has fallen in line with general fall in market wide volatility. The results using these surrogate indices show that while the 'futures effect' plays a definite role in the reduction of volatility in the case of S&P CNX Nifty, in the case of BSE Sensex, where derivative turnover is considerably low, its role seems to be ambiguous.

JEL Classification: G1, G14, G15

Key words: Derivatives, index futures, stock markets, volatility, ARCH-GARCH

Introduction

A derivative is financial instrument whose value is 'derived' from another underlying security or a basket of securities. Traders can assume highly leveraged positions at low transaction costs using these extremely flexible instruments. Derivative products like index futures, stock futures, index options and stock options have become

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important instruments of price discovery, portfolio diversification and risk hedging in stock markets all over the world in recent times. With the introduction of all the above-mentioned derivative products in the Indian markets a wider range of instruments are now available to investors. Introduction of derivative products, however, has not always been perceived in a positive light all over the world. It is, in fact, perceived as a market for speculators and concerns that it may have adverse impact on the volatility of the spot market are neither new nor understudied. Recent research, however, strengthens the argument that introduction of these products have not only deepened the markets but have also been instrumental in reduction of volatility in the spot markets.

The index futures were introduced in the Indian stock markets in June 2000 and other products like index options, stock futures and options and interest rate futures followed subsequently. The volumes in derivative markets, especially in the case of National Stock Exchange (NSE), has shown a tremendous increase and presently the turnover in derivative markets is much higher than the turnover in spot markets.

This article makes an effort to study whether the volatility in the Indian spot markets has undergone any significant change after the introduction of index futures in June 2000. It also attempts to evaluate whether such volatility change is due to unrelated macroeconomic reasons or it could be attributed to the derivative products introduced in the Indian stock markets. This article is organised as follows: Section I presents the literature survey, Section II assesses the available data presents the methodology and evaluates the results of the empirical exercise and Section III draws conclusions from the study.

Section I

Literature Survey

The effect of introduction of derivatives on the volatility of the spot markets and in turn, its role in stabilising or destabilising the

cash markets has remained an active topic of analytic and empirical interest. Questions pertaining to the impact of derivative trading on cash market volatility have been empirically addressed in two ways: by comparing cash market volatilities during the pre-and post-futures/ options trading eras and second, by evaluating the impact of options and futures trading (generally proxied by trading volume) on the behaviour of cash markets. The literature is, however, inconclusive on whether introduction of derivative products lead to an increase or decrease in the spot market volatility.

One school of thought argues that the introduction of futures trading increases the spot market volatility and thereby, destabilises the market (Cox 1976; Figlewski 1981; Stein, 1987). Others argue that the introduction of futures actually reduces the spot market volatility and thereby, stabilises the market (Powers, 1970; Schwarz and Laatsch, 1991 *etc*.). The rationale and findings of these two alternative schools are discussed in detail in this section.

The advocates of the first school perceive derivatives market as a market for speculators. Traders with very little or no cash or shares can participate in the derivatives market, which is characterised by high risk. Thus, it is argued that the participation of speculative traders in systems, which allow high degrees of leverage, lowers the quality of information in the market. These uninformed traders could play a destabilising role in cash markets (Chatrath, Ramchander and Song, 1995). However, according to another viewpoint, speculation could also be viewed as a process, which evens out price fluctuations.

The debate about speculators and the impact of futures on spot price volatility suggests that increased volatility is undesirable. This is, however, misleading as it fails to recognise the link between the information and the volatility (Antoniou and Holmes, 1995). Prices depend on the information currently available in the market. Futures trading can alter the available information for two reasons: first, futures trading attract additional traders in the market; second, as transaction costs in the futures market are lower than those in the

spot market, new information may be transmitted to the futures market more quickly. Thus, future markets provide an additional route by which information can be transmitted to the spot markets and therefore, increased spot market volatility may simply be a consequence of the more frequent arrival and more rapid processing of information.

On the other hand, arguments suggesting that the future and option markets have become important mediums of price discovery in cash markets are equally strong. Several authors have argued that trading in these products improve the overall market depth, enhance market efficiency, increase market liquidity, reduce informational asymmetries and compress cash market volatility (Kumar, Sarin and Shastri, 1995; Antoniou, Holmes and Priestley, 1998).

It has been argued that the introduction of derivatives would cause some of the informed and speculative trading to shift from the underlying cash market to derivative market given that these investors view derivatives as superior investment instruments. This superiority stems from their inherent leverage and lower transaction costs. The migration of informed traders would reduce the information asymmetry problem faced by market makers resulting in an improvement in liquidity in the underlying cash market. In addition, it could also be argued that the migration of speculators would cause a decrease in the volatility of the underlying cash market by reducing the amount of noise trading. This hypothesis would also suggest that the advent of derivatives trading would be accompanied by a decrease in trading volume in the underlying security.

In a recent study, Bologna and Cavallo (2002) investigated the stock market volatility in the post derivative period for the Italian stock exchange using Generalised Autoregressive Conditional Heteroscedasticity (GARCH) class of models. To eliminate the effect of factors other than stock index futures (*i.e.*, the macroeconomic factors) determining the changes in volatility in the post derivative period, the GARCH model was estimated after adjusting the stock return equation for market factors, proxied by the returns on an index

(namely Dax index) on which derivative products are not introduced. This study shows that unlike the findings by Antoniou and Holmes (1995) for the London Stock Exchange (LSE), the introduction of index future, *per se*, has actually reduced the stock price volatility. Bologna and Covalla also found that in the post Index-future period the importance of 'present news' has gone up in comparison to the 'old news' in determining the stock price volatility.

A few studies have been undertaken to evaluate the effect of introduction of derivative products on volatility of Indian spot markets. These studies have mainly concentrated on the NSE, and the evidence is inconclusive in this regard. While Thenmozhi (2002) showed that the inception of futures trading has reduced the volatility of spot index returns due to increased information flow. According to Shenbagaraman (2003), the introduction of derivative products did not have any significant impact on market volatility in India. Raju and Karande (2003) also reported a decline in volatility of S&P CNX Nifty after the introduction of index futures.

In the present study, following Bologna and Cavallo (2002) a GARCH model has been used to empirically evaluate the effects on volatility of the Indian spot market and to see that what extent the change (if any) could be attributed to the of introduction of index futures. We use BSE-200 and Nifty Junior as surrogate indices to capture and study the market wide factors contributing to the changes in spot market volatility. This gives a better idea as to: whether the introduction of index futures in itself caused a decline in the volatility of spot market or the overall market wide volatility has decreased, and thus, causing a decrease in volatility of indices on which derivative products have been introduced. Finally, the studies in the Indian context have evaluated the trends in NSE and not on the Stock Exchange, Mumbai (BSE) for the reason that the turnover in NSE captures an overwhelmingly large part of the derivatives market. However, since the key issue addressed here is the volatility of the cash market as affected or unaffected by the derivative market, the importance of evaluating the trends in BSE as well was felt and the empirical analysis was carried out likewise.

Section II

Empirical Analysis

Daily data for BSE Sensex and S&P CNX Nifty have been used for the period January 1997 to March 2003. Alongwith these two series on which derivative products are available, we also consider the volatility on the broad based BSE-200 and Nifty Junior on which derivative products have not been introduced. Though BSE and NSE prices are tightly bound by arbitrage, the derivative turnover differs considerably among these markets (with the NSE recording a maximum turnover in the derivative market). A comparison of fluctuations in volatility between BSE-200/Nifty Junior and Sensex/Nifty may provide a clue to segregate the fluctuations due to introduction of future products and due to other market factors. There are several broad based indices available like BSE-100, BSE-200, BSE-500 and Nifty Junior. However, longer time series is available only for Nifty Junior and BSE 200. These indices also capture 80 to 90 per cent of market capitalisation of the BSE or the NSE and therefore, they are chosen as surrogate indices.

The empirical exercise attempts to evaluate whether the introduction of index futures had any significant impact on the spot stock return volatility. It uses the daily BSE Sensex returns and daily S&P CNX Nifty returns along with returns on BSE-100, BSE-200 and BSE-500 to evaluate the impact of these policy changes on the stock returns volatility. Following Bologna and Cavallo (2002), this paper uses Generalised Autoregressive Conditional Heteroscedasticity (GARCH) framework to model returns volatility.

The GARCH model was developed by Bollerslev (1986) as a generalised version of Engle's (1982) Autoregressive Conditional Heteroscedasticity (ARCH). In the GARCH model the conditional variance at time '*t*' depends on the past values of the squared error terms and the past conditional variances.

The GARCH (p,q) model suggested by Bollerslev (1986) is represented as follows:

$$Y_t = \alpha X + \varepsilon_t$$

$$\varepsilon_t / \varepsilon_{t-1} \sim N(O, h_t)$$

$$h_t = \beta_o + \sum \beta_i \varepsilon^2_{t-i} + \sum \beta_j h_{t-j} \quad \text{where } i=1,2..p \text{ and } j=1,2\ldots q$$

Where Y_t is the dependent variable and Xis a set of independent variable(s). ε_t is the GARCH error term with mean zero and variance h_t.

The GARCH (1,1) framework has been extensively found to be most parsimonious representation of conditional variance that best fits many financial time series (Bollerslev, 1986; Bologna and Cavallo, 2002) and thus, the same has been adopted to model stock return volatility. The model specification is as follows:

$$R_t = \alpha_o + \alpha_1 R_{t-1} + \varepsilon_t$$

$$\varepsilon_t / \varepsilon_{t-1} \sim N(O, h_t)$$

$$h_t = \beta_o + \beta_1 \varepsilon^2_{t-1} + \beta_2 h_{t-1} + \lambda D_f$$

where R_t is the daily return on the BSE Sensex and R_{t-1} is the lagged return. As regards the conditional variance, following Bologna and Cavallo (2002), it has been augmented with a dummy variable D_t which takes value zero for the pre-index-futures period and one for the post-index-futures period. The direction and the magnitude of the dummy variable coefficients are used to infer whether the introduction of index futures could be related to any change in the volatility of the spot market. This exercise also estimates the coefficients of the GARCH model separately for the pre-index future and post-index future period to have a deeper insight in the change in the values of the coefficients and their implications on the stock return volatility. The results of this exercise are presented in Table 1 below.

Table 1: Changes in Volatility in BSE Sensex after the Introduction of Index Futures

a_0	a_1	b_0	b_1	b_2	l
Estimates for the Whole Period					
0.05	0.11	0.55	0.18	0.69	-0.28
(0.19)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Before the Introduction of Index Future					
0.10	0.09	0.44	0.12	0.76	
(0.12)	(0.02)	(0.01)	(0.00)	(0.00)	
After the Introduction of Index Future					
0.03	0.13	0. 32	0.26	0.61	
(0.53)	(0.00)	(0.00)	(0.00)	(0.00)	

Note : P-values are reported in parentheses.

The first two rows of the Table 1 present the result for the whole period under consideration for BSE Sensex. It shows the coefficient of the index-futures dummy variable ($l = -0.28$) is significant at one per cent level, which is indicative of the fact that the introduction of index futures might have made a difference in the volatility of BSE Sensex returns. The negative sign of the dummy variable coefficient is suggestive of the reduction in the volatility. This preliminary result supports the hypothesis that the introduction of index future has reduced the volatility in the BSE spot market, even though derivative turnover is quite low in BSE as compared with NSE.

The results reported in Table 1 presents estimate of the GARCH model coefficient for the pre-future trading and post-future trading periods. The coefficients reported in Table 1 support the findings of the Antoniou and Holmes (1995) and Bologna and Cavallo (2002). It shows that in the GARCH variance equation the $b1$ components have gone up and $b2$ components have actually gone down in the post Index-future period and these estimates are significant at one per cent level. The $b1$ component is the coefficient of square of the error term and the $b2$ represents the

coefficient of the lagged variance term in the GARCH variance equation. Both Antoniou and Holmes' (1995) and Bologna and Cavallo's (2002) papers have referred β_1 as the effect of 'recent news' and β_2 capturing the effect of 'old news'. Thus, in line with the findings in the UK and Italy, the result reported here supports the hypothesis that introduction of index futures have actually increased the impact of recent news and at the same time reduced the effect of uncertainty originating from the old news.

The Index futures were introduced only in the BSE Sensex and not in the other (*e.g.,* BSE-100, BSE-200 and BSE-500) indices available on the BSE. Moreover, futures trading was introduced in most of the scrips included in the BSE Sensex. Thus, if index and stock futures were the only factors instrumental in reducing the spot price volatility then the reduction in volatility is expected to be more in the case of the BSE Sensex in comparison to the other indices available in BSE. In an attempt to evaluate whether the introduction of futures was the only reason behind the reduction of volatility in BSE Sensex, the same GARCH model with the same dummy variable was used to evaluate the changes in volatility for the BSE-100, BSE-200 and BSE-500. Table 2 shows the estimated coefficients of the model where the dummy variable represents the inception of index future.

Table 2: Changes in Volatility after the Introduction of Index Futures

α_0	α_1	β_0	β_1	β_2	λ
For BSE-100					
0.07	0.13	0. 44	0.21	0.68	-0.15
(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
For BSE-200					
0. 08	0.13	0. 32	0.15	0.78	-0.08
(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
For BSE-500					
0. 08	0.11	0.28	0.14	0.81	-0.14
(0.11)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note : P-values are reported in parentheses.

The estimated λ coefficients of the modified GARCH model (which were significant at one per cent level) reported in column 6 of Table 2 are indicative of the reduction in volatility in the post-index future period. The GARCH results obtained for BSE-100, BSE-200 and BSE-500 are counterintuitive to the argument of index future being unambiguously responsible for the reduction in the BSE Sensex volatility in the post Index future period and indicative of the fact that it is more likely that the stock market and economy wide factors were responsible for the reduction in volatility of the BSE Sensex in the period under consideration.

In order to address the issue of whether introduction of index future has been the only factor instrumental in reducing volatility, we use the technique of Bologna and Cavallo (2002) where they included the returns from a surrogate index (in our case BSE-200) into GARCH equation to control the additional factors affecting the market volatility. The augmented set of equations is as follows

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_t^{BSE\text{-}200} + \varepsilon_t$$

$$\varepsilon_t / \varepsilon_{t-1} \sim N(O, h_t)$$

$$h_t = \beta_o + \beta_1 \varepsilon^2_{t-1} + \beta_2 h_{t-1} + \lambda D_f$$

The estimation based on the above-mentioned set of equations is provided in Table 3 below. The λ coefficient is significant but shows extremely low positive value. It suggests that under the augmented GARCH model, the so called "futures effect" (the reduction in the spot index return volatility after the introduction of future products) has disappeared in the case of BSE Sensex. However, a comparison of the results of the pre-futures and post-futures period in the new model shows that the β_1 and β_2 components have followed the same path as before. In particular, the importance of 'recent news' has increased in the post-futures period and the impact of the 'old news' has decreased. Moreover, the most noticeable factor here is that β_2 coefficient is not significant in the post index future period. This is in line with Antoniou and Holmes' (1995) result, which suggests that the introduction of

futures have improved the quality of information flowing to the spot market. The overall impact of index futures on the spot index volatility is ambiguous. The empirical evidence in this paper however strongly suggests that the stock market volatility in general has gone down during the post future period under consideration.

Table 3: Changes in the Volatility of BSE Sensex after Introduction of Index Futures (after controlling for movement in BSE-200 Nifty Junior)

a_0	a_1	a_2	b_0	b_1	b_2	I
Estimates for the Whole Period (after controlling for movement in BSE-200)						
-0.01	-0.02	1.02	0.01	0.09	0.90	0.01
(0.29)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Estimates for the Whole Period (after controlling for movement in Nifty Junior)						
-0.08	-0.01	0.66	1.36	0.11	0.03	0.05
(0.09)	(0.78)	(0.00)	(0.00)	(0.01)	(0.91)	(0.00)
Before the Introduction of Index Future						
-0.01	-0.03	1.06	0.62	0.17	0.80	
(0.54)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
After the Introduction of Index Future						
-0.07	0.03	0.82	0.30	0.22	0.01	
(0.01)	(0.11)	(0.00)	(0.00)	(0.00)	(0.92)	

Note : P-values are reported in parentheses.

It might be noted that the entire period under consideration was marked by subdued trends in the stock market. While the domestic stock markets have remained sluggish after the stock market scam, the international markets also remained depressed after the terrorist attack in US. At the same time, however the domestic markets witnessed rapid progress amidst in market microstructure. All the scrips listed on the BSE and the NSE are now under the orbit of compulsory rolling settlement. The rolling settlement cycle has been reduced to T+3 and further to T+2 for all the scrips in line with the best international practices.

Corporate governance practices have been made more stringent. Against this backdrop, the empirical results confirm that the overall volatility in BSE spot market declined in the post index future period. The extent to which it could be linked to the 'future's effect' however, remains ambiguous.

A number of studies concentrated only on the volatility changes of S&P CNX Nifty in post-futures period (Thenmozhi, 2002; Raju and Karande, 2003). Majority of the studies have concluded that the introduction of derivative products have resulted in reduction in the cash market volatility. In an attempt to evaluate whether the macroeconomic factors were primarily responsible for reduction in volatility in the NSE, which registers maximum turnover in the derivative segment, we consider the volatility changes in S&P Nifty index. Our empirical analysis in the case of S&P CNX Nifty also supports the earlier findings. As reported in Table 4 the coefficient of the dummy variable capturing the effect of the changes in market volatility after introduction of index future had negative sign (-0.30) and was significant at one per cent level. In an attempt to segregate the 'futures effect' from the other factors causing the decline in cash market volatility, BSE-200[1] was once more used as the surrogate index and the results of the augmented GARCH model are presented in Table 4 below.

Table 4: Changes in Volatility of S&P CNX Nifty after Introduction of Index Futures

a_0	a_1	a_2	b_0	b_1	b_2	I
Estimates for the Whole Period						
0.05	0.10	-	0.49	0.12	0.74	-0.30
(0.13)	(0.00)	-	(0.00)	(0.00)	(0.00)	(0.00)
GARCH Estimate (after controlling for movement in BSE-200)						
0.02	0.14	0.86	0.01	0.03	0.96	-0.01
(0.08)	(0.16)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GARCH Estimate (after controlling for movement in Nifty Junior)						
0.05	0.10	0.02	0.50	0.12	0.75	-0.28
(0.14)	(0.00)	(0.31)	(0.00)	(0.00)	(0.00)	(0.00)

Note : P-values are reported in parentheses.

The result shows that the dummy coefficient (-0.01) has taken negative value even after adjusting for the market factors and it is significant even though the magnitude of such effect has gone down considerably. This finding supports the earlier work for S&P CNX Nifty and shows that unlike BSE Sensex, futures trading has a significant role in reducing volatility of S&P CNX Nifty, over and above the market factors.

The empirical findings of this section could be summarised by saying that there has been reduction in the spot market volatility in the recent years (after June 2000), which could be attributed to macroeconomic changes. This is evident from the reduction in volatility documented in BSE-100, BSE-200 and BSE-500 indices where derivative products were not introduced. BSE Sensex also witnessed reduction in volatility. Though derivative products are available on BSE Sensex, the reduction in volatility in the post derivative period fades away when we control for the market movement through a surrogate index. These findings indicate that the change in BSE Sensex spot volatility was mainly due to the market wide changes and not due to the futures effect. However, an analysis in the same framework shows different results for S&P CNX Nifty. Even after controlling for the market movement through surrogate index for S&P CNX Nifty, the volatility in the cash market shows significant signs of reduction, which could be due to the "futures effect". The differences in the empirical finding between these two indices could be because of large turnovers in the derivative segment in the S&P CNX Nifty index as opposed to BSE Sensex, which makes the "futures effect" to be significant in the former index.

Section III

Conclusions

Using ARCH/GARCH methodology, this article evaluated the impact of introduction of derivative products on spot market volatility in Indian stock markets. We found that the volatility in both BSE Sensex and S&P CNX Nifty has declined in the period after index future was introduced. Recognising the fact that the decline in volatility is a

function of not only introduction of derivative products, but also certain market wide factors, we evaluated the volatility of BSE-100, BSE-200 and BSE-500 indices (where index futures have not been introduced) which showed a decline and indicated that the other market wide factors might have played an important role in the observed decline in volatility of BSE Sensex and S&P CNX Nifty. In order to control the market-wide factors, we used BSE-200 and Nifty Junior as surrogate indices in the GARCH model. Using this model, we found a reduction in volatility of S&P CNX Nifty even after controlling for market wide factors. The volatility of BSE Sensex, however, showed an increase, which is not in line with the expectations. This result indicates that the decline in volatility of BSE Sensex was mainly due to the overall decline in market volatility. S&P CNX Nifty, however, incorporated the contribution of both the 'market factors' as well as the 'futures effect'. This is due to increased impact of recent news and reduced effect of uncertainty originating from the old news.

In conclusion, the empirical results of this study indicate that there has been a change in the market environment since the year 2000, which is reflected in the reduction in volatility in all the BSE indices and S&P CNX Nifty. The impact of a derivative product, however, on the spot market depends crucially on the liquidity characterising the underlying market. This is evident from the differential results obtained for BSE Sensex and S&P CNX Nifty. It may be added, that turnover in the derivative market of BSE constitutes not only a small part of the total derivative segment, but is miniscule as compared to BSE cash turnover. Thus, while BSE Sensex incorporates only the market effects, the reduction in volatility due to "future's effect" plays a significant role in the case of S&P CNX Nifty.

Note

[1] We also used Nifty Junior as a surrogate index to capture the effect of macroeconomic factors on the spot price volatility of S&P CNX Nifty. The results reported in the last rows of Table 4 are in confirmation to the result obtained in case of BSE 200.

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Changing Pattern of Seasonality in Prices and Industrial Production in India

Ajit R. Joshi and A. K. Tripathi*

The changing pattern of seasonality reflects the changing structure of the economy. The analysis of the seasonal factors of the select variables has shown that overall seasonality has undergone a downward shift in almost all the selected economic variables. This is an indication that the economy is becoming less susceptible to the shocks during the year. Decreasing seasonal variations in prices indicate better supply management. Seasonal patterns of industrial production broadly reflect the busy and slack seasons. It is also observed that the seasonal variations in one industry are transmitted to other related industries through supply and demand channels. The pattern reflects the synergies across the industry groups.

JEL Classification: E 32, C 22

Keywords: Seasonality, Industrial Production, Prices.

Introduction

Background

The changing pattern of seasonality reflects the changing structure of the economy, technological improvements, changes in business environment due to increasing openness of the economy, changes due to maturity of the markets in the light of liberalisation and increase in competition from both domestic and foreign players. While seasonality of some of the variables is expected to decrease as an effect of these changes, the variation in some others might increase. Monthly seasonal factors for select macroeconomic time series are

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being regularly published in the Reserve Bank of India Bulletin (RBI, 2004) since 1980. These articles essentially present the seasonal factors estimated on the basis of 10 years of monthly data for over 60 variables.

Objective of the Study

This study focuses on two major aspects, namely, prices and industrial output, at different levels of disaggregation, viz., WPI - All Commodities, Food Articles, Manufactured Products; Index of Industrial Production - General, Basic Goods, Intermediate Goods, Capital Goods and Consumer Goods. An attempt is made to analyse the variations in seasonality in these variables. Data on both these variables are available for a sufficiently long period, with reasonably similar concepts and methodology across the time period. The seasonal patterns of WPI and its sub-groups and IIP are analysed for a period of two decades from 1982-83 to 2002-03. IIP - Use Based data series spans a period from 1990-91 to 2002-03. There are several methods for estimating the seasonal factors. A brief description of commonly used methods is provided in Annex I. In the present study, US Census Bureau's X-12 ARIMA method, which is one of the most popular one, is used.

The paper is organised in subsequent 4 sections. Section I provides a survey of relevant literature. Seasonal patterns in prices are discussed in Section II. Section II provides the seasonal patterns in industrial production. Concluding observations are given in Section IV.

Section I
Review of Literature

Rationale for Seasonal Adjustment

Time series is typically thought to be consisting of four components, viz., i) trend component, ii) seasonal component, iii) cyclical component and iv) error component. Of these, cyclical components have long periodicity ranging from 5 to 7 years. These components are attributed to business cycles in the economy and such

other cyclical factors. Seasonal components reflect the fixed effects due to specific time of the year. The factors responsible for these components are thought to be, demand / supply patterns due to weather conditions, festivals, holidays and other events with fixed annual schedule. Although the seasonal effects are often referred to as fixed effects, they are in fact known to change gradually over the period. Error components, as the name suggests, are random in nature.

According to Bell and Hillmer (1984), traditionally the reasons given for seasonally adjusting data have been rather vague but they have broadly followed three themes: (i) to aid in short-term forecasting, (ii) to aid in relating the time series to other time series, external events and policy variables and (iii) to achieve comparability of time series values from month to month. They have given a possible justification for seasonally adjusting time series as: "Seasonal adjustment is done to simplify the data so that they may be more easily interpreted by statistically unsophisticated users without significant loss of information."

For the purpose of forecasting using ARIMA etc., and other rigorous econometric analysis, generally it is possible to take care of seasonality in the data by way of various econometric procedures. Thus, in such cases, it may not be essential to obtain the seasonally adjusted data. In fact, some authors have noted that it will be more appropriate to use the seasonal adjustment as part of the model rather than adjusting the time series externally. On the other hand, the use of time series data by the policy makers and administrators gets greatly facilitated, if seasonally adjusted data are used. This is because; it is the non-seasonal component of the time series, which may be possible to be controlled by government's intervention. The seasonal components are sticky, at least in the short run, due to peculiarities of the seasonal and institutional structures.

Even in respect of forecasting, it is to be noted that in spite of availability of sophisticated statistical techniques for forecasting, several users with little or no statistical training find seasonally adjusted data more convenient for forecasting. Bell and Hillmer

(1984) have provided further justification for seasonal adjustment, by treating the problem as a signal extraction problem. They contend that if there is reason to believe that the observed data are generated as a combination of seasonal and non-seasonal components, and if we are interested in separately analyzing either one or both these components, then it is appropriate to estimate them. The only question then remains is how best to estimate these components.

Presenting a time series from which the seasonal movements have been eliminated allows the comparison of data between two months or quarters for which the seasonal pattern is different. Also seasonal effects on non-adjusted or original data make it difficult to make valid comparisons over time using these data, particularly for the most recent period. Presentation of data on a seasonally adjusted basis allows the comparison of the evolution of different series, which have different seasonal patterns, and is particularly pertinent in the context of international comparisons since countries may be in different seasons at identical periods of the year for example Australia and Europe (OECD, 1999).

Policy-maker often needs information about the economic trends in the short-run. Since the short-term variability of economic time series often exhibit seasonal patterns and is greatly influenced by them, it is only by removing seasonal factors that turning points can be promptly identified; they cannot be readily identified either by changes over the previous period calculated on the raw data (which are affected by seasonal factors) or by changes over the corresponding period of the previous year, which reveal turning points long after they have occurred, since they are affected by developments over the whole year (Sabbatini, 2003).

Sources of Seasonal Variation

Traditionally, seasonal fluctuations have been considered to be of not much welfare consequence and are not thought to be associated with policy issues. In general, reducing the amplitude of the seasonal fluctuations was considered to be desirable. However, research in

the field of business cycles brought forth a view that seasonal fluctuations are caused by technological change and shifts in preferences and hence they may represent efficient response to the these changes.

Braun and Evens (1994) and Chatterjee and Ravikumar (1992) extended real business cycle theory to the seasonal cycle. These authors showed that, by allowing seasonal shifts in tastes and technology, a real business cycle model produces seasonal variations consistent in many respects with the fluctuations observed. Exogenous shifts in technology may induce reallocation of production away from low productivity periods. Some commentators have suggested that policies to dampen the seasonal fluctuations might reduce welfare, as these would shift the economy from optimality to sub-optimal choices (Miron, 1990). The main idea of this approach is that concentration of economic activities may be due to synergies across agents, rather than to shifts in tastes or technologies.

Interaction of seasonal fluctuations with some distortions increases the effects of these distortions. Where these interactions are quantitatively important, stabilizing seasonal fluctuations might be an appropriate policy (Miron, 1990). Higher degree of seasonal fluctuations is also associated with high levels of unused capacity during the off-seasons. By stabilizing the seasonal variation in demand, the extent of under-utilization of resources could be reduced. Such policy can have desirable effects on output and welfare.

Seasonality also occurs due to synergy of various economic agents to concentrate activity at particular seasons, even when there is no significant variation in these seasons in terms of factors such as weather. This type of seasonality is not associated external factors such as shifts in preference or technology. Best example of such endogenous seasonality is the weekend. While such synergies tend to produce optimality in use of resources across the economic agents, the bunching may sometimes be excessive and might put strain on general capacities such as electricity, transport systems, over-crowding of holiday destinations etc.

Rather than relying solely on large shifts in technology or preferences, it may be more accurate to explain the magnitude of the seasonals as the result of relatively small seasonal shifts in preferences or technology combined with increasing returns or other synergies. These synergies can arise through a number of mechanisms. It may be desirable to produce at the same time as an upstream or downstream firm in order to avoid stockpiling raw materials or holding inventories of work in progress and finished goods. Firms may choose to close down completely so that maintenance or retooling can take place (Cooper and Haltiwanger 1996).

Empirical Observations in Other Countries

Beaulieu and Miron (1990a) have shown that seasonal dummies explain a large fraction of variation in aggregate output, suggesting that seasonal movements are highly correlated across sectors as well. They also showed that the seasonal patterns in consumption, investment, government expenditure, exports and imports, were strikingly similar to those in overall GDP, in the US economy.

Beaulieu and Miron (1990b) have studied seasonal cycles across several industrialized countries of northern and southern hemisphere. They demonstrate that there is a key role of the December retail sales in the production cycles across the countries. Last quarter peak and first quarter trough observed throughout the sample countries indicate that the role of weather is significantly less compelling in producing these seasonal cycles. They suggest that the synergies and increasing returns are the key factors that explain the seasonal variations. They also observe that output movements across sectors are highly correlated and nominal money moves together with the real output in these countries.

Blasio and Mini (2000) analysed the seasonal fluctuations of manufacturing production in Italy using 20 years data. The authors showed that seasonal fluctuations in manufacturing output in Italy

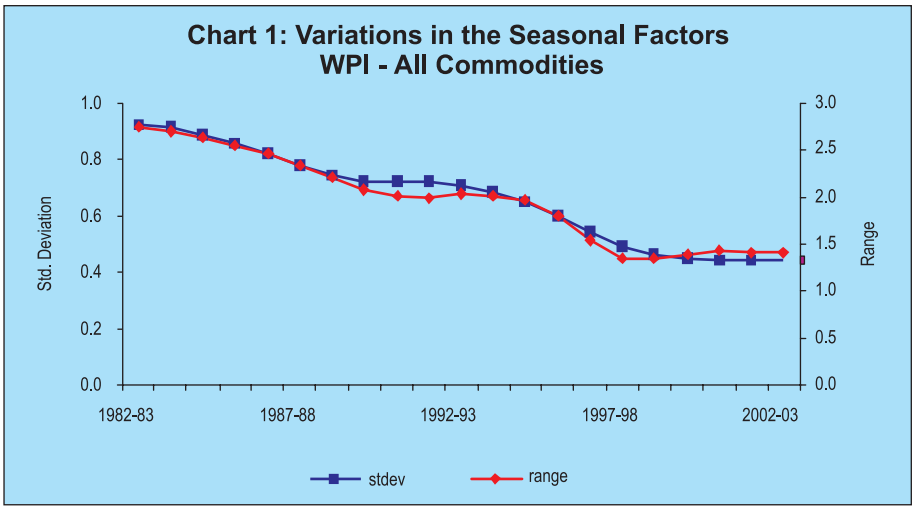
are extremely high when compared to its two most important trade counterparts - France and Germany. The authors also showed that the Italian seasonal pattern was characterised by a dramatic slowdown in August followed by a full recovery in September. They found similar pattern across different manufacturing indicators. A large part of seasonality is attributed to the synergies or strategic interactions. However, whether the high seasonality and the resulting excess capacity is too much or too little as compared to socially optimal level needs further empirical exploration according to Blasio and Mini. They have observed that the Italian seasonal patterns are fairly homogeneous across industries and across time series such as production, sales, orders, yet it is extremely high compared to the economies with similar fundamentals like France and Germany.

As seen from the literature there are two types of seasonality, viz., exogenous and endogenous. Exogenous seasonality is the seasonality resulting from changes in underlying technology and preferences. Endogenous seasonality represents the changes in economic activities that arise because of synergies across agents that make it optimal to concentrate activity in a particular season. Endogenous seasonality is potentially actionable by policy.

Section II
Seasonal Patterns in Prices

WPI - All Commodities

The seasonal variations of WPI- All commodities has been consistently declining over the past two decades (Chart 1). The seasonal variation (measured as standard deviations of the seasonal factors during the year), declined consistently from 0.92 in 1982 to 0.72 in 1990. From 1992 onwards the decline in the seasonal variations gained momentum and it reached the levels of 0.44 in the latter half of the 1990s. The seasonal variations have stabilized at this level in the past 5 years.

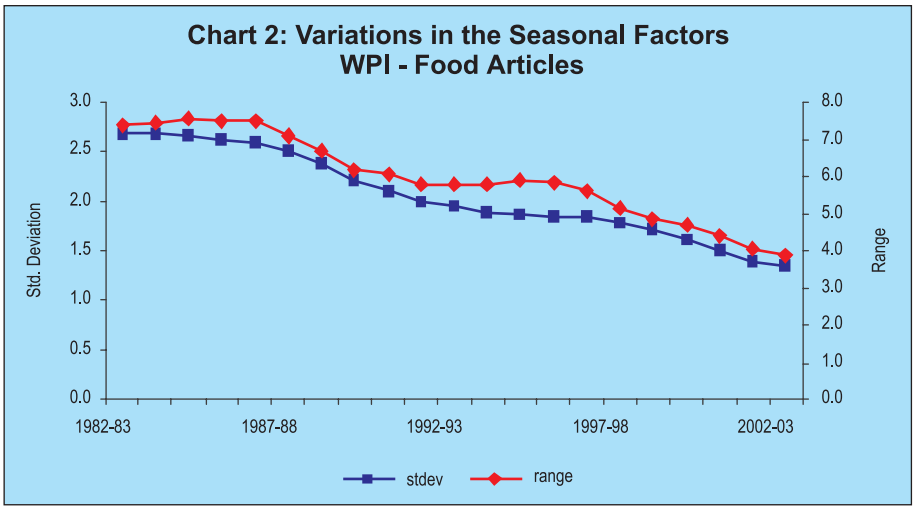


The peak period of the seasonal factors of WPI has been August or September during the years 1982 to 1996. As a result of stabilization in the seasonal variations in the seasonal factors, the peak period has shifted to October, although the seasonal values for this month remained at these levels for almost two decades. A clear picture, which has emerged in this case, is that in the post 1997 period all the months between April and November have the seasonal factors at above 100 levels, whereas, months between December and March witness a fall in these values. The seasonal factors during December to March remain below 100. The trough period of the seasonal factors of this series had been March during 1982 to 1997. From 1998 onwards there has been a shift in the trough month from March to February.

The low variations in the seasonal factors of WPI in recent years, also, indicate better supply management and proactive measures undertaken in the economy to prevent the supply shocks from translating into price rise.

WPI - Food Articles

The prices of Food Articles in India are prone to vagaries of rainfall. Seasonal variations of WPI- Food Articles, are in general higher than overall WPI, however, these variations have also been consistently declining (Chart 2). The seasonal factors of WPI-Food Articles varied



between 96.82 and 104.2 in the initial period. This range has, over the years, narrowed to 97.83 - 101.73. This indicates that even during off-seasons, the prices are stable, rather than rising gradually to a peak prior to the next crop. The drop in prices in the peak production season is to be expected, but this has also been moderated, due to better marketing opportunities as a result of reforms. The fact that the trough value of seasonal factor is moving close to 100 indicates that the producers are in a position to realize the price, which they had expected at the time of deciding to produce a particular crop.

In general it shows that the production / import of food articles is available throughout the year to adequately meet the demand, without sharp fluctuations in prices. Such factors indicate improved welfare of both the producer and the consumer, by reducing the levels of distress sales and shortages.

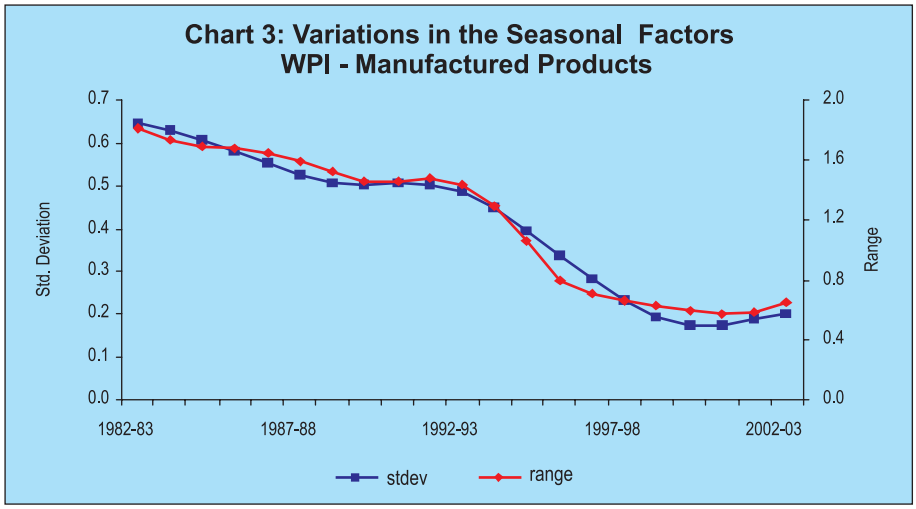
Peak month, of the seasonal factors, shifted from August to October, in 1999. The seasonal factor for August has consistently declined from above 104 to nearly 100 in the last 20 years, whereas the seasonal factor for October has remained stable in the range of 101-102. In this series also, in the recent years all the months from April to November remained at 100 or above, while December to March months witnessed a fall in the seasonal factors to levels below 100. In the initial years March remained the trough month. In fact

the values of March and April were very close up to 1991. The trough month in the recent years has either been February or March.

WPI - Manufactured Products

The seasonal variations of the WPI - Manufactured products have been low and these variations moved in the narrow range of 0.17 to 0.65, during the period under study (Chart 3). These variations after declining in the initial period remained stable at 0.50 during 1988 to 1991. Seasonal variations started declining further in the 1990s and have stabilized at a reasonably low level of 0.20 since 1998-99.

The peak of seasonal factors, in the case of prices of manufactured products, is not sharp. Seasonal factors of other months close to the peak months are also more or less the same. Therefore the peak month during the sample period has fluctuated between August and September. In a few cases the months- May, June and July also witnessed the peak values of the seasonal factors. Overall, the initial 7 months, viz., April to October, witnessed seasonal factors above 100, whereas November to March recorded values between 99 and 100. The trough months have been December and February. In most cases February has been the trough month. Overall, the prices of the manufactured products after a high in August/September start a downward movement from November onwards and reach the trough in February.



Relationship Between Inflation and Seasonal Variations

One of the major objectives of monetary policy is to have low and stable inflation rate. Low inflation rate indicates that there is low aggregate variation in prices, at least when compared with the corresponding period of the previous year. Although in theory, low inflation does not preclude high seasonal variation in prices, it is generally expected that in the time of low inflation, the demand - supply imbalances are on the lower side. With equilibrium situation in the commodity market, in the event of lower inflation rate, the transition in prices between seasons is also expected to be smooth resulting in relatively lower seasonal variation. This phenomenon can be observed in the following table (Table 1) where the inflation rate and the measure of seasonal variation have moved in tandem.

Empirical investigation of this relationship is presented in the form of equations below, which indicate that with the reduction in overall inflation rate over the years, the seasonal variations have also decreased considerably. The equations have been estimated

Table 1: Seasonal Variations and Inflation

Year	Inflation (%)			Seasonal Variations		
	AC	FA	MP	AC	FA	MP
1991-92	13.7	20.2	11.3	0.72	1.98	0.50
1992-93	10.1	12.4	10.9	0.71	1.94	0.49
1993-94	8.4	4.9	7.8	0.68	1.88	0.45
1994-95	12.5	12.7	12.2	0.65	1.86	0.40
1995-96	8.1	8.4	8.6	0.60	1.83	0.34
1996-97	4.6	12.4	2.1	0.54	1.83	0.28
1997-98	4.4	3.0	2.9	0.49	1.78	0.23
1998-99	5.9	12.7	4.4	0.46	1.71	0.19
1999-00	3.3	3.8	2.7	0.45	1.61	0.17
2000-01	7.2	3.0	3.3	0.45	1.50	0.17
2001-02	3.6	-0.8	1.8	0.45	1.40	0.19
2002-03	3.4	1.1	2.6	0.45	1.35	0.20

AC : All Commodities. FA : Food Articles. MP: Manufactured Products.

for WPI Overall, WPI - Primary Articles and WPI - Manufactured Products.

Equation 1: Seasonal Variation in WPI - AC (SVWAL) and overall inflation (OVP)

SVWAL = 0.3639 + 0.0268 OVP …1
t- values 9.22 5.35
R^2 = 0.74 , DW = 1.82

Equation 2: Seasonal Variation in WPI - FP (SVWFP) and Inflation - FP (FPP)

SVWFP = 1.5167 + 0.0263 FPP … 2
t- values 23.34 4.00
R^2 = 0.61 , DW = 1.57

Equation 3: Seasonal Variation in WPI - MP (SVWMP) and Inflation - MP (MPP)

SVWMP = 0.1316 + 0.0288 MPP … 3
t- values 4.00 6.14
R^2 = 0.79 , DW = 1.80

Thus in all the three cases it is observed that periods of low price rise seem to be associated with less seasonality.

Seasonality in Prices - Policy Relevance

Developing countries experience high volatilities in prices and production due to structural rigidities in the economy. In India it is observed that the structural aspects related to supply shocks have eased over the years. This, in turn, has led to a phase in the Indian economy characterised by stability in overall price level with low seasonal variations. Monetary policy formulations in the scenario of stable inflation and low seasonality in price variables has certain advantages. The uncertainties over achieving the set targets become minimal with the incidence of reduced seasonality in prices.

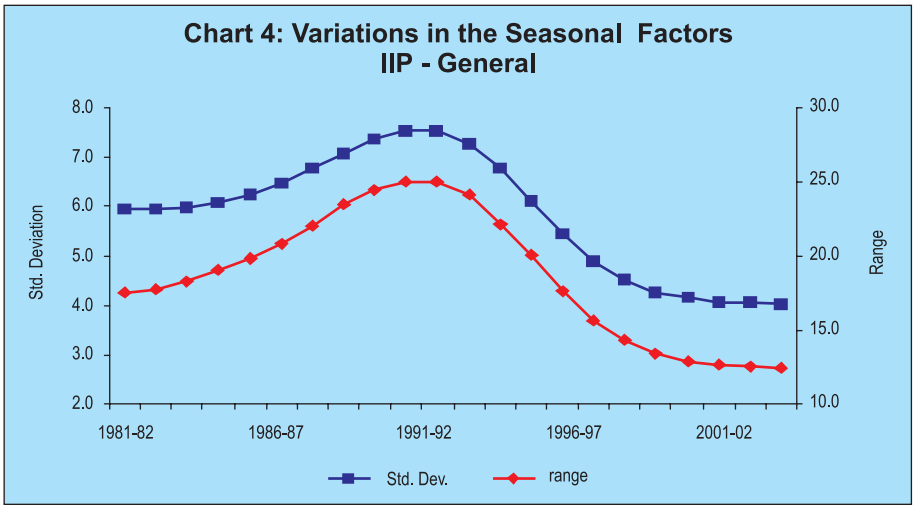
Section III

Seasonal patterns in Industrial Production

In India the industrial production is greatly influenced by the performance of the agricultural sector. The impact works through both the supply and demand channels. Substantial part of the industry depends on agricultural output for its input needs. The income generated in the agricultural sector influences the demand for manufactured goods particularly consumer goods and agricultural capital goods. These factors affect the seasonality in the production series. The industrial production normally picks up after the harvest of Kharif crop. The seasonal variations in this series and its sub-groups are analysed in this section.

Overall -IIP

The seasonal variations in the industrial production rose during the 1980s. This reflected the changing pattern of production in the Indian economy. However, after reaching the peak in 1991-92 the seasonal variations started declining. This perhaps could be attributed to gradual liberalization of foreign trade in the post economic reforms period.



The peak month of the seasonal factors remained unchanged throughout the reference period as March. The trough month in the last decade remained as June. However, in the years before 1993, troughs in the seasonal factors were observed in the months of August, April and May.

An interesting pattern observed in the seasonal factors was that after remaining at low levels during April-October, it showed a steep rise in the months of November and December. The seasonal factors remained stable during January, but declined in February before rising to its peak level in March.

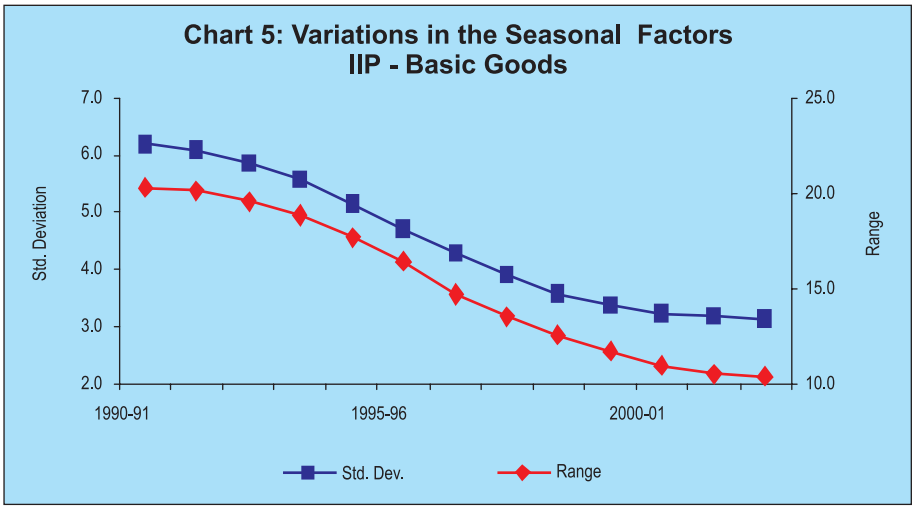
Another point worth noting is that, the seasonal factors after reaching the peak levels in March decline steeply in April. The fall is generally more than 10 per cent. Thus a smooth transition in the seasonal factors is not observed in the production series. Such steep declines are also found in other countries in their industrial production, as noted in Section II. While the pattern of seasonal variations has remained unaltered, the amplitude of seasonal cycles has been declining consistently since 1990-91.

In the following paragraphs the seasonal patterns of various industry groups are discussed. As these data are available since 1990, the discussion is restricted to the sample period. In general a consistent decline in the seasonal variations during the period under study is observed for all the industry groups.

IIP-Basic Goods

This group comprises of most of the infrastructure industries. Therefore, it is one of the important groups influencing the future course of overall production. The seasonal variations of this group have been worked out from 1990-91 onwards. It can be seen from the Chart below that the seasonal variations have declined from 6.18 in 1990-91 to 3.1 in 2002-03.

The movements in the seasonal factors are in-line with the movements in the IIP-General. March witnessed the peak values of

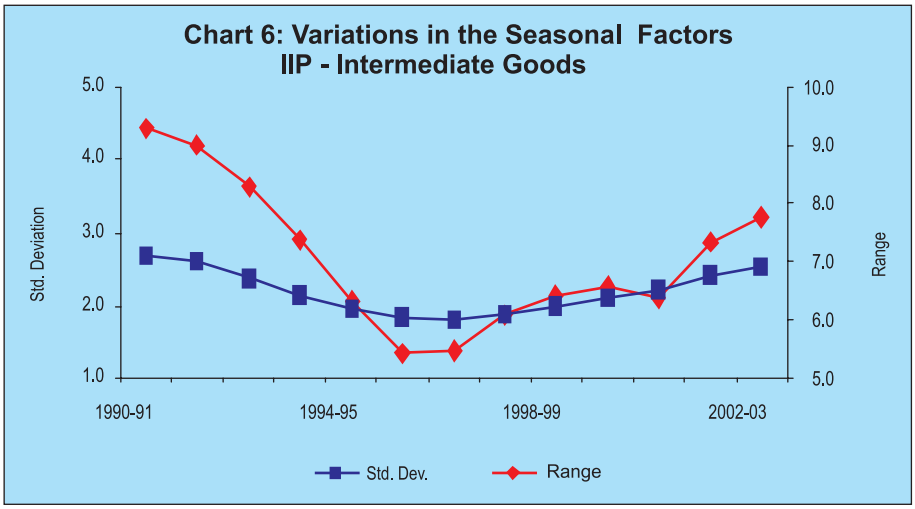


the seasonal factors of this series also. This was followed by a trough in April. Overall, reduction in seasonal factors in this category indicates consistent demand for the basic goods throughout the year.

IIP-Intermediate Goods

This group is most stable in terms of seasonal variation. Slight increase in the seasonality in the recent years is observed (Chart 6).

The peak levels of the seasonal factors were observed in the month of March. This observation is consistent with the pattern

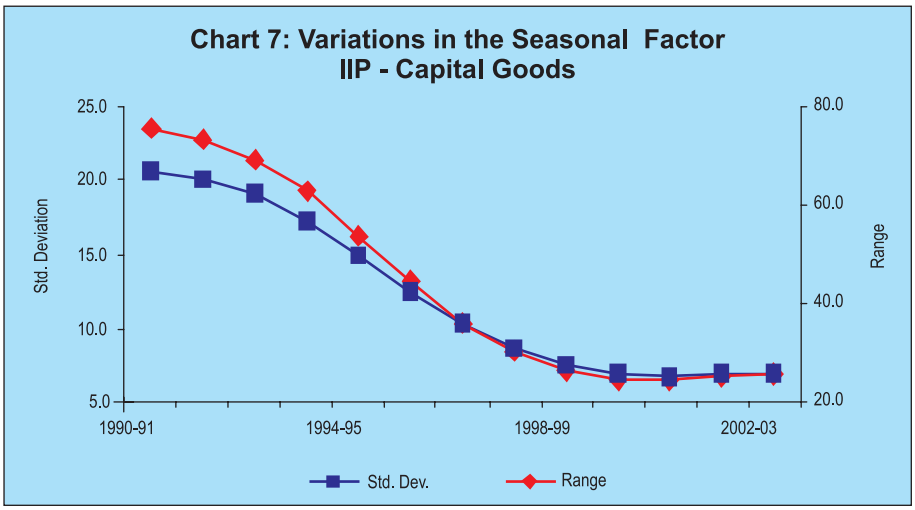


depicted by the overall IIP and IIP-Basic Goods. However, the transitions in the seasonal factors of this series appear to be different than the other two series mentioned above. The troughs were observed in the months of November and February. That is in the last five months of the financial year, high fluctuations are observed in the seasonality of this series.

IIP-Capital Goods

The series was highly seasonal in early 1990s. Substantial reduction is observed in the seasonal variations over the last decade (Chart 7).

The trough was as low as 82 in the initial years of 1990s and the corresponding peak was more than 150. In the year 2002-03, the corresponding values are 95 and 120 respectively. The troughs in the seasonal factors of this series were observed in the months of May, April or June. Thus virtually the first three months observed low seasonal levels. The production of capital goods also follows the same pattern as that of overall IIP, however the fluctuations in seasonality is higher in the case of former.



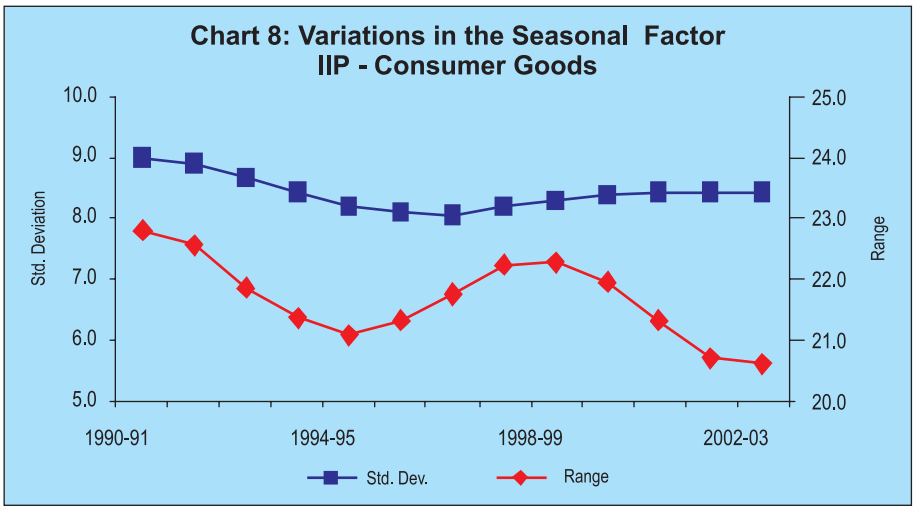
IIP-Consumer Goods

The production of consumer goods is expected to follow a certain seasonal pattern depending on the income patterns of the households in the rural and urban areas. The seasonality of IIP Consumer Goods is higher than Basic and Intermediate Goods, but it was substantially lower than IIP Capital Goods in early 1990s. Of late the seasonal variation of Capital and Consumer Goods is of the similar order. Over the period, the seasonal variation has been more or less stable (Chart 8).

The seasonality in the series follows the expected patterns. During the period June to October it remains at low levels. Coinciding with the Kharif harvest, the seasonal factors rise steeply in the month of November. Thereafter again it registers a steep rise in December and remains at this level until the end of the financial year, i.e., up to March. Here unlike the other industry groups the transition from trough to peak and vice-versa, is smoother. The seasonal factors are also reflective of the busy season and lean season in the Indian economy.

Synergies in Various Industrial Sectors

As discussed earlier the seasonal variations in one industry are transmitted to other related industries through supply and demand channels. The amplitude of seasonal variations differs across industries, but the pattern essentially reflects the synergies across the industry



groups. To examine the empirical validity of this hypothesis we worked out the correlations between four sets of related industrial sectors.

Seasonal factors of "Metals" and "Machinery" show a very high correlation coefficient of 0.81, while the correlation coefficient between the seasonal factors of "Metals" and "Transport Equipment" is 0.75. "Mining" and "Non-Metallic Minerals" show a correlation of 0.70 and the "Basic Goods" and "Intermediate Goods" show a correlation of 0.67. These observations are in line with the experiences of the other countries, cited in section II. The seasonal variation of related industrial sectors are highly correlated confirming the hypothesis that the seasonal variation arises out of synergies among the upstream and downstream industries.

Section IV
Concluding Observations

Seasonal variation in prices has decreased considerably during the last 20 years. The reduction had been particularly noticeable in mid 1990s and the seasonal fluctuations have stabilized to reasonably low levels. This could be attributed to better supply and demand management and also opening up of the economy. This has provided opportunities to mitigate the shortages and excess supply situations by resorting to import / export. In addition to the actual trade, the exposure to competition from the external sector in respect of demand and supply also has a stabilizing effect on the prices between different seasons.

Seasonal patterns of industrial production broadly reflect the busy and slack seasons. Traditionally the Indian economy was agro based and the agricultural production, which is harvested after the monsoon provided the impetus to the industry. As the structure of the industry has undergone change over the years, the overall seasonal variation has narrowed down. Among various industrial sectors, the food products sector has the maximum seasonal variation, which bears out this fact. Seasonal factors of the various sub-groups of the manufacturing industry at 2-digit level indicate that there is high correlation between the seasonal variations of various industry groups.

The analysis of the seasonal factors of the select variables has shown that overall seasonality has undergone a downward shift in almost all economic variables. This is an indication that the economy is becoming less susceptible to the shocks during the year and it has become more robust to weather the rough conditions like droughts, spurt in oil prices, etc. Monetary policy formulations in the scenario of stable inflation and low seasonality in price variables has certain advantages. The uncertainties over achieving the set targets become minimal with the incidence of reduced seasonality in prices. In the case of production it is necessary to unravel the underlying links of the various industrial groups, which enhance the synergies among them to maximise the output. To sum up, the scenario of reduced seasonality in prices and greater seasonal linkages among various industries, make the process of setting targets for attaining price stability with growth becomes more effective.

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Annex I: Estimation of Seasonal Factors

Ratio to Trend Method: There are several methods for estimating the seasonal factors of a time series. Methods differ in approaches as well as complexity. One of the simplest method is the "Ratio to Trend" method. In this method, a trend line is fitted to the time series by choosing an appropriate functional form. Then the data are expressed as percentage to the trend values, by assuming a multiplicative model. These percentages contain seasonal, cyclical and irregular (random) components. The cyclical and random components are wiped out by averaging the percentages over the different years, for a given month (or quarter). Either arithmetic mean or median can be used, but median is preferred, as extreme values do not affect it, which could be essentially due to random factors. Finally the seasonal factors are normalized by adjusting the total to 1200 for monthly data (or 400 for quarterly data) by multiplying them with an appropriate correction factor.

Ratio to Moving Average: An improvement over the "Ratio to Trend" method is the "Ratio to Moving Average" method, in which moving average (12 monthly for monthly data) is calculated to eliminate the seasonal movements. The moving average values give estimates of trend and cyclical movements. Then the original data (after eliminating data for first and last 6 months for a monthly series) are expressed as percentage to the moving average values. These percentages represent seasonal and irregular components. After averaging these parentages over the years, irregular component is eliminated and an estimate of seasonal factors is obtained. Finally the seasonal factors are normalized to the total of 1200 or 400 as the case may be.

US Census Bureau's X-12 ARIMA: The X-12-ARIMA seasonal adjustment procedure is an advanced version of the X- 11- ARIMA. The main new improvement in X-I2-ARIMA is the extensive set of time series model building facilities known as RegARIMA. RegARIMA provides some in- built regressors for removing non- stochastic term. After adjustment of such non-stochastic effects, best ARIMA model is used to extend the data series at both the ends and then usual X-11 procedure follows for seasonal adjustment.

Assuming multiplicative model, the original time series *(O_t)* can be expressed in the following form.

$$O_t = C_t S_t I_t$$

where C_t is the trend-cycle component, S_t is the seasonal component, and I_t is the irregular component.

1. Iterations are performed in the subsequent three steps. These provide estimates of the seasonal, trend-cycle and irregular components. Each, iteration refines estimates of the extreme values in the irregular components. After extreme values are identified and then modified, final estimates of the seasonal component, seasonally adjusted series, trend-cycle and irregular components are worked out.

2. Following are the three sub-steps in step 2.

   a) A centered 12-point moving average is applied to the original series O_t to provide a preliminary estimate C_t of trend-cycle. Next a preliminary estimate of $S_t I_t$ is obtained by $S_t I_t = O_t / C_t$.

   b) A moving average is then applied to the $S_t I_t$ to obtain an estimate S_t of the seasonal factors. $S_t I_t$ is then divided by this estimate to obtain an estimate of I_t-the irregular component. Next, a moving standard deviation is calculated from the irregular component and is used in assigning a weight to each monthly value for measuring its degree of extremeness. These weights are used to modify extreme values in $S_t I_t$. New seasonal factors are estimated by applying a moving average to the modified value of $S_t I_t$. A preliminary seasonally adjusted series is obtained by dividing the original series by these new seasonal factors. A second estimate of trend-cycle is obtained by applying a weighted moving average to this seasonally adjusted series.

   c) The same process is used to obtain second estimates of seasonally adjusted series and irregular component. This irregular component is again modified for extreme values and used to provide refined weights for identification of extreme values.

3. Using the same computations a second iteration is performed on the original series that has been adjusted by weights of irregular components developed in the first iteration. The second iteration produces final estimates of the weights of irregular components.

4. A third and final iteration is performed on the original series that has been adjusted by weights of irregular components computed during the second iteration. During this iteration, final estimates of seasonal factors, seasonally adjusted series, trend cycle component and irregular component are computed.

Use of Seasonal Dummies: Seasonality is also viewed as phenomenon, where the economic time series display dramatic differences in their mean values across seasons, and these differences persist over decades. A simple formulation of a time series X_t is given below.

$$X_t = \Sigma \alpha_i d_t^i + \eta_t$$

Where α_i is a coefficient, d_t^i is the seasonal dummy for the season i, and η_t is any stationary stochastic process. The seasonal dummy model is likely to be a good approximation for many economic time series, since a number of significant phenomenon are likely to produce seasonal dummy type variation in some economic time series. Seasonal dummy type models however, may not be appropriate when the seasonality is showing a shift over a time period.

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Rural Income : Some Evidence of Effect of Rural Credit During Last Three Decades

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The growth of the rural economy is an important driver of the economy as a whole. Sectoral demand matrices substantiate the importance of the rural demand to boost other activities. The present study tries to have some idea about the dynamics of the rural income, primarily caused by the availability of funds. The debate on the cost of rural credit is avoided because the availability of funds as well as the cost of funds during the period of study (1971-72 to 1999-2000) might be conceived as target variables. Simple models tested indicate evidence towards the supply leading approach to rural finance. However, it might be advocated that let the market be encouraged gradually to allocate the rural finance, banking upon the sound rural production base caused by broad activities and rural finance, significantly contributed by the institutional initiatives.

JEL classification : F360

Key Words : rural income dynamics, rural credit, supply leading and demand following

Introduction

The growth of the rural economy is the important growth driver of the economy as a whole. The variation in rural income causes variations in the demand for products of the industrial as well as services sector. A recent study based on sectoral demand matrices indicated that in 1993-94, one unit rise in agricultural output was likely to increase the demand for industrial products by 0.297 unit (*i.e.*, more than three times as compared to 1968-69), while demand

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for services sector increased by around 0.149 unit in 1993-94 as against 0.035 unit in 1968-69.

The present study tries to analyse the dynamics of the rural income, primarily caused by the availability of funds. The debate on the cost of rural credit is avoided because the availability of funds as well as cost of funds might be considered as target variables. The study is divided into three sections. Section I tries to present some information regarding the Reserve Bank of India's initiatives towards the flow of funds to the rural sector, till the creation of the NABARD in 1982. Thereafter, the NABARD has been deeply involved in facilitating rural credit availability. Section II covers some discussion on developments of key macro variables of the rural sector during last three decades namely, rural nominal income, the Reserve Bank's assets as loans and advances for the rural sector, institutional credit for agricultural and allied activities, crop area and crop yields. Section III provides results of empirical tests in order to have some evidence of effects of rural credit and other factors on the rural income dynamics during 1971-72 to 1999-2000. Simple regression models are attempted. Concluding observations are given in section IV.

Section I
The Reserve Bank's Initiatives towards Rural Credit : An Historical Perspective

As a key sector of the Indian economy, Reserve Bank of India has historical allocated a key priority to the agricultural credit delivery. The Reserve Bank of India Act, 1934 envisaged a special developmental role for the Reserve Bank in the sphere of agricultural credit with responsibility, in particular, for financing seasonal operations and the marketing of crops.

The Rural Banking Enquiry Committee (Thakurdas Committee, 1950) stressed the importance, for an efficient system of agricultural finance, of a sound co-operative credit structure capable of developing close relations with the Bank. The Reserve Bank followed up the Rural Banking Enquiry Committee with the informal conference.

Following the conference's recommendation, the Reserve Bank decided to organise a Rural Credit Survey and constitute a Standing Advisory Committee on Agricultural Credit.

The All-India Rural Credit Survey, commissioned in August 1951, covered seventy-five districts around the country. Eight villages in each were chosen for the survey, which was based on a sample of fifteen households from each of the selected villages, with a view to recommend practicable policies for the future on rural credit. The survey was completed during November 1951 - July 1952, under the committee of Direction, headed by A. D. Gorwala. Dr. D. R. Gadgil was one of members of the committee. The Report was submitted in August 1954.

The survey was struck by the utter insignificance of co-operatives in providing rural credit. 'Positive and deliberate' measures rather than 'small administrative, functional or other changes' were required to ensure the success on co-operative credit institutions and enable them to become self-supporting. The State's tendency in the past had been to 'over-administer and under - finance' the co-operative movement, but the Report pointed out the need for an integrated system of co-operation and rural credit. The Report envisaged a key role for the Reserve Bank of India in coordinating the proposed network of co-operative institutions and for its Agricultural Credit Department in over seeing their functioning. The Reserve Bank would occupy a 'strategic position' in the co-operative credit sector, while other principal participants would play a major role in rural co-operation, *viz.,* co-operative economic activity and the training of co-operative personnel.

Since cooperative credit institutions depended on the banking system for a number of services, there was a need for positive State association with a defined sector of commercial banking. The Report thus recommended the creation of the State Bank of India through the statutory amalgamation of the Imperial Bank of India and the major State associated banks to undertake an expeditious programme of banking expansion, particularly in the rural areas. The Reserve

Bank was expected to manage the Imperial Bank's passage to State ownership.

The Reserve Bank prepared a draft-bill, approved by the Board in February, 1955, which among other things, authorised it to make long-term loans to State Governments to subscribe to the share capital of co-operative institutions and to central land mortgage banks, and set up the proposed special funds. The bill also provided for a third Deputy Governor to have exclusive responsibility of rural credit. The bill was passed into law on May 8, 1955. The National Agricultural Credit (Long-term operations) Fund was created in 1955 and the Reserve Bank was authorised to specify from time to time, the purposes for which, it would make medium-term loans. Over the years such loans were made to finance a wide range of investments relating to the rural sector.

The State Bank of India was created in July 1955 in order to give a boost to direct flow of funds of the banking system into certain neglected, but important, sectors of the economy such as agriculture and allied activities and spread banking facilities in rural areas. The flow of funds to the rural sector increased over the years. However, the demand for productive investment in the rural sector was not fully met.

In 1960, the Committee on Co-operative Credit (Vaikunth Lal Mehta Committee) advised examining the possibility of using P. L.480 funds to finance long-term productive investment in agriculture. Consequently, the Reserve Bank and the Government began to think to create a specialised agency to finance agricultural investment. It was thought that the demand for agricultural credit might require the establishment of some specialised institutions, which would ultimately relieve the Reserve Bank of its function so far as rural finance and agricultural credit was concerned. The Agricultural Refinance Corporation Bill, 1962 received the President's assent in March 1963. The Corporation under the chairmanship of D. G. Karve, the then Deputy Governor, started its operation in Bombay on July 1, 1963. The Corporation took up a wide range of activities of the rural

sector for refinance / direct loans / subscriptions to fully guaranteed debentures of eligible institutions covering central land mortgage **banks,** State cooperative banks, scheduled commercial banks (share holders of the corporatives), and co-operative societies under the approval of the Reserve Bank.

The High-Yielding Varieties Programme (or HYVP) was launched during *Kharif* 1966-67, as part of the new agricultural strategy towards achieving self-sufficiency in food by 1970-71. The Bank, for its part, assured the State Governments that the programme would not be allowed to suffer. Special credit limits would, if necessary, be sanctioned to co-operative banks. However, the demand for credit was poor and was found to be mainly due to cultivators' resistance to new practices, lack of proper motivation and orientation amongst extension staff, and reduced operational efficiency of central co-operative banks and primary societies.

In July 1966, the All India Rural Credit Review Committee (Venkatappiah Committee) was formed to review the progress made in the supply of credit for intensive agricultural production and marketing from all the institutional sources including commercial banks, working of the crop loans system, progress of rural branches of commercial banks and coordination between different agencies involved in rural credit. The Committee submitted its report in July 1969 and admitted that co-operatives would have to be strengthened but it had no hesitation in highlighting that they should be all the better, and the farmer would be better served, if other institutions coexisted with them in healthy competition. In other words, the adoption of the multi-agency approach as the most feasible and appropriate response to the credit requirements of agriculture and allied activities was recommended.

The adoption of 'social control' as a policy measure in 1968 helped the Reserve Bank to motivate the commercial banks into the area of agriculture and rural credit on a significant scale. The National Credit Council, constituted in December 1967 recognised the importance of the commercial banks' role as complementary to co-operative initiatives.

The nationalisation of the 14 major commercial banks in July 1969 helped the orientation of commercial banks lending policies and procedures to meet the requirements of the priority sectors of the economy with due to attention to the financing needs of the small farmers. The multi-agency approach covered the Lead Bank Scheme, which provided, boost to the improved flow of funds to agriculture sector through the organised credit channels. Agriculture sector got the place of importance in the priority sector lending. Realistic targets for deposits for central cooperative banks were attempted. The borrowing needs, consequently from the Reserve Bank were met at differential rates of interest (concessional rate usually being a few basis points below the Bank rate). By mid-1977, the scheme of financing primary agricultural credit societies was in operation in 12 States, 24 commercial banks through 604 branches had taken over 343 societies for financing, however, over the years, it was found that the experience with the working of the scheme was in general not satisfactory.

In the context of the large finance gap, the commercial banks, Regional Rural Banks (RRBs) and co-operatives were deeply concerned during late 1970s. The system of district credit plans was introduced to meet the credit needs by different agencies. The commercial banks were geared up to fulfil priority sector targets and the target was raised to 40 per cent of their outstanding advances by March 1985. Another target was the attainment of 60 per cent of credit deposit ratio by the banks by March 1985 in respect of rural - semi urban branches separately.

The Reserve Bank of India appointed a Committee to Review Arrangements for Institutional Credit for Agriculture and Rural Development, chaired by B. Sivaram, former Secretary of the Ministry of Agriculture, Government of India in 1979. The report was submitted in 1981 and recommended the setting up of a National Bank for Agriculture and Rural Development (NABARD). The NABARD came into existence in July 1982. All major rural credit related works from the Reserve Bank of India were shifted to the NABARD. Works relating to the urban-cooperative banks remained with the Reserve Bank. A

new Department as Rural Planning and Credit Department (RPCD) was set-up in the Reserve Bank, to look into the broad rural credit policies of the Reserve Bank as a part of over all monetary management of the economy for price stability with sustainable growth of the economy.

The Reserve Bank so, far devoted its attention to provide necessary credit to rural sector for boosting agricultural growth directly and indirectly through many institutions. It might be indicated that the Reserve Bank of India provided short-term and medium-term loans to State co-operative banks, for agricultural production and marketing activities. medium-term loans were provided out of the National Agricultural Credit (LTO) Fund. Long-term finance was provided to the State Governments and Land Development Banks through LTO Fund for contribution to the share capital of cooperative societies and to rural debentures of Land Development Banks (LDBs). Reserve Bank also contributed to the ordinary debentures of LDBs by way of general funds. Besides, the Reserve Bank contributed to the resources of agriculture refinance corporations.

Section II
Some Quantitative Analysis of Rural Credit

After the creation of NABARD, attempts were diverted effectively to consolidate the multi-agency flows of funds to the rural sector for generating effective use of funds to the growth of the agricultural sector (Table 1).

Table 1 : Select Growth Indicators : Average

	1980-81 to 1989-90	1993-94 to 2002-03
1. Real GDP (% change)	5.80	6.00
2. Agricultural Production (% change)	5.2	0.4
3. Foodgrains production (million tonnes)	146.5	203.23

Source: Annual Report, 2002-03, RBI.

It would be useful to indicate the dynamics of the gross domestic product contributed by the agriculture and allied activities over a long period. Rural income in nominal terms increased significantly over the years of latest three decades (Table 2).

National Rural Credit (Stabilisation) Fund and National Rural Credit (LTO) Fund were earlier designated as National Agricultural Credit (Stabilisation) Fund and National Agricultural Credit (LTO) Fund, respectively, and were maintained by the Reserve Bank of India prior to the formation of NABARD on July 12, 1982. These Funds were transferred to NABARD on September 10, 1982. Balance as on August 14, 1981 was Rs. 1025 crore in NRC (LTO) Fund and Rs. 365 crore in NRC (stabilisation) Fund. However, NABARD's resources are augmented by the line of credit from the Reserve Bank of India - the facility which was enjoyed by the Agricultural Refinance and Development Corporation (ARDC), before the creation of NABARD. The Reserve Bank's assets in the form of loans and advances to State co-operative banks were Rs. 306 crore in 1971 and raised to Rs. 891 crore in 1982. After the creation of NABARD, financial needs of State co-operative banks were mainly attended by the NABARD.Some flow

Table 2 : Gross Domestic Product
(At current prices : New Series Base : 1993-94)

(Rs. '000 crore Rounded)

Year	Agriculture and Allied Services	Agriculture	GDP at factor	Agriculture and Allied Services as % of GDP
1970-71	19.5	18.4	42.7	47.00
1974-75	31.6	29.5	71.3	–
1979-80	40.2	36.6	108.9	39.00
1980-81	50.6	46.3	130.2	–
1981-82	56.9	51.8	152.1	–
1984-85	78.3	71.3	222.3	–
1989-90	136.9	124.4	438.0	30.0
1990-91	159.8	145.7	511.0	–
1994-95	278.8	255.2	917.1	–
1999-2000	462.0	422.4	1762.0	26.00
2000-2001	478.5	435.1	1917.7	–
2001-2002	522.6	473.4	2094.0	–

Source : Handbook of Statistics on the Indian Economy, RBI, 2002-03.

of credit to the state co-operative banks from the Reserve Bank of India however, continues. In 1983, loans and advances outstanding to the State co-operative banks were only Rs. 57 crore and over the years, the amount declined to nil in 1998 before rising further to Rs. 35 crore in 2002. RBI's loans and advances outstanding to ARDC / NABARD were Rs. 95 crore in 1976 and increased significantly to Rs. 1,152 crore in 1983. The outstanding loans and advances of NABARD increased to Rs. 6,500 crore in 2002 (Table 3).

Institutional credit (direct and indirect credits from co-operatives, Scheduled Commercial banks, RRBs and Rural Electrification Corporation) for agriculture and allied activities increased many folds during the last three decades. Loans outstanding (short-term and long-term) were around Rs. 2,235 crore at the end of 1971-72 and increased to Rs. 8,252 crore at the end of 1979-80. During this period, institutional credit to rural sector increased by around Rs. 4,580 crore on an annual basis. At the end of 1980-81, loans outstanding were around Rs. 10123 crore and increased to Rs. 35,353 crore at the end of 1989-90. On an annual average, loans outstanding increased by Rs. 21,156 crore. At the end of 1990-91, loans outstanding were around Rs. 37,408 crore and increased to Rs. 10,9816 crore at the end of 1999-2000. On an annual average basis, loans outstanding increased by Rs. 69,777 crore. On annual average basis, loans outstanding increased by 15 times during 1971-72 to 1999-2000. (Table 4).

Table 3 : RBI's Assets

(Rs. crore)

	Loans and Advances to State Co-operative Banks	ARDC / NABARD
1971	306	–
1976	459	95
1982	891	360
1983	57	1152
1998	–	4994
2002	35	6500

Source : Handbook of Statistics on the Indian Economy, RBI, 2002-03.

Table 4 : Institutional Credit For Agriculture and Allied Activities

(Rs.crore)
(Rounded figures)

Year	Loans outstanding
1971-72	2,235
1974-75	3,539
1979-80	8,252
1980-81	10,123
1984-85	19,035
1989-90	35,353
1990-91	37,408
1994-95	66,346
1999-2000	1,09,816

Note : Institutions cover co-operatives, scheduled commercial banks, Regional Rural Banks and Rural Electrification Corporation Ltd. Loans outstanding cover short-term and long-term credit direct as well as indirect.

Source : Handbook of Statistics on the Indian Economy, RBI, 2002-03.

It may be noted that the rural nominal income as well as the flow of funds to the rural sector increased significantly during last three decades. The financial support to financial institutions for rural lending from the Reserve Bank of India also increased significantly during the same period.

It might be added that during the last three decades, yield per hectare of foodgrains increased from 872 kg / hectare in 1970-71 to 1704 kg/ hectare in 1999-2000, nearly two times the growth. Area under cultivation of foodgrains increased from 124.32 million hectare in 1970-71 to 131.16 million hectare in 1983-84. Area with some variations in between over the years was around 123.10 million hectare in 1999-2000. The variations in the area of cultivation of foodgrains might indicate some supply response from the non-food grains cultivation. All crop yield index (Base 1981-82) increased by around 1.6 times, while all crop production index increased by nearly 2 times during 1971-72 to 1999-2000. Primary commodity price index (1970-71 = 100) increased by around 10 times while the wholesale price index increased by around 6 times during 1971-72 to 1999-2000. The present exercise is now devoted to get some econometric evidence that the availability of funds also matters to the growth of the rural income in India.

Section III

Empirical Results

Dr. H.T. Patrick in mid 1960s, advocated a distinction between the 'demand-following approach' and the 'supply-leading approach' to financial development, in other words, the causal relationship between finance (credit) and growth (income/output). Demand following thinking stresses that finance is an input subject to potential growth of the sector. Growth / potential growth of any economic activity creates the demand for funds/credit. On the other hand, the availability of funds / credit stimulate / motivate an economic agent to take up the economic activity. This line of thinking advocates the importance of supply leading approach in the nexus between growth and finance. Empirically, the question of causality between funds and growth of the economy / sector is still lively (Misra, 2003). However, in the initial phase of development, in view of the weak role of market, the supply leading approach might be effective to growth proposals. Thus, in this study, the causal relationships between funds and growth are hypothesised in the line of with the supply leading approach. Simple models are specified, considering finance effect, real factors effect, price effect on the rural sector's income and stated below.

$$X = f\ (RBLA)$$

$$X = f\ (ICRS)$$

$$X = f\ (RBLA, ACAI / ACYI)$$

$$X = f\ (RBLA, ICRS, ACAI / ACYI / ACPI / WPI / PCI)$$

Where X stands for Rural Income (RNY)

RBLA	=	RBI 's accommodation to rural sector
ICRS	=	other institutions' accommodation to rural sector
ACAI	=	real factor *i.e.*, area of cultivation all crops
ACYI	=	another real factor *i.e.*, yields all crops
ACPI	=	another real factor *i.e.*, production all crops
WPI / PCI	=	price factor : whole sale price index / primary commodity price Index

All these models are tested by Ordinary least square (OLS) method. Granger's causality test is not attempted. Data cover the period from 1971-72 to 1999-2000. Growth variable is measured by the nominal gross domestic product from agriculture and allied activities. (1993-94 series at current prices). Availability of funds are measured by the Reserve Bank of India's accommodation to rural activities *i.e.* the RBI's assets in loans and advances to State Co-operative Banks and ARDC / NABARD. Institutional credit for agriculture and allied activities is measured by loans outstanding by co-operatives, scheduled commercial banks, RRBs and Rural Electrification Corporation Ltd. Cropping area is measured by the index of area under cultivation of all crops at base, triennium ending 1981-82 = 100. Yield of all crops is measured by index of yield at base, triennium ending 1981-82 = 100. Same type of Index for production is also considered.

Pearson Correlations : Period 1971-72 to 1999-2000

	WPI	PCI	RBLA	ICRS	ACPI	ACYI
RNY	0.857	0.991	0.961	0.996	0.919	0.894

Notations: RNI = Rural Nominal Income, WPI = Wholesale Price Index

PCI = Primary Commodity Price Index RBLA = RBI 's Loans and Advances for Rural Sector,

ICRS = Institutional Credit to Rural Sector,

ACPI = all crop production ACYI = All Crops Yield Index

It could be observed that Pearson Correlations between Rural Income (RNY) and other variables (financial, real and price) separately are almost all statistically significant. Thus, some models were tested on OLS in level. However, the following model seems to be statistically and also in economic perception for key variables (finance and price), significant.

Empirical Models (Multiple Variables) during 1971-72 to 1999-2000

Model A :

RNY = 88967.942 + 10.198 RBLA + 3.097 ICRS
(3.188) (1.791) (5.565)

- 1090.539 ACYI + 132.492 PCI
(-3.507 (1.716)

Adjusted R Square = 0.994 Durbin - Watson = 1.904

Note : Bracketed figures refer to t values

Model B :

RNY = 70419.803 + 6.1555 RBLA (-1) + 2.807 ICRS
(2.620) (1.069) (4.686)

- 954.542 ACYI + 183.239 PCI
(-3.129) (2.264)

Adjusted R Square = 0.994 Period : 1971-72 to 1999-2000
Durbin - Watson : 1.728

Note : Bracketed figures refer to t values

Model C :

RNY = - 4072.627 + 3.609 ICRS + 67.439 PCI
(- 0.425) (6.037) (1.035)

Adjusted R square = 0.992

Durbin - Watson : 0.800

Note : Bracketed figures refer to t values

It might be highlighted that finance variables (RBLA, ICRS) and price variable (PCI) had statistically and in economic perception also significant effects on the dynamics of rural sector income (RNY) during 1971-72 - 1999-2000. However, the effect of real variable is puzzling.

Thus, results of some two variable models during 1971-72 to 1999-2000 are reported below.

RNY = - 17434.271 + 70.254 RBLA
(- 1.526) (17.994)

Adjusted R Square = 0.920

RNY = 5271.444 + 4.223 ICRS
(1.633) (59.357)

Adjusted R Square = 0.992

RNY = - 348799.9 + 3951.017 ACPI
(- 8.339) (12.133)

Adjusted R Square = 0.839

Note : Bracketed figures denote t values

RNY = - 56537.203 + 458.160 PCI
(- 9.171) (38.886)

Adjusted R Square = 0.982

It might be highlighted that finance variables (RBLA, ICRS) and price variable (PCI) had statistically and in economic perception also significant effects on the dynamics of rural sector income (RNY) during 1971-72 - 1999-2000.

Section IV
Concluding Observations

The Reserve Bank of India's initiatives towards the flow of funds to the rural sector till the creation of the NABARD in 1982 had boosted the base of the supply of rural credit and consequently, helped positively the dynamics of the rural sector's income.

The causal relationship between rural credit and rural income during 1971-72 to 1999-2000 might be cited through partial analysis, which indicates evidence towards the supply leading approach to rural finance. However, it is advocated that let the market be encouraged gradually to allocate the rural finance banking upon the sound rural production base and contributed by the institutional initiatives.

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Inventory Investment Behaviour - Evidence from a Panel of Indian Firms

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The paper augments production-smoothing specification with cash flows and monetary policy variables in its application for the Indian data. Several interesting findings emerge from the analysis. However, the results obtained need to be viewed with the limitation of non-availability of quarterly data for the Indian firms. Given that our empirical analysis is based on annual data at the level of firm, it is unlikely to pick up the short run responses to sales shocks that are so important to aggregate analyses with monthly or quarterly data.

Key words :

JEL Classification :

Introduction

Inventory investment is highly volatile and is found to have strong relationship with recessionary declines in GDP. Understandably, this importance has led to a considerable research effort into the behaviour of inventories both at macro level and micro level. However, evidence on inventory behaviour of the Indian firms is scanty. In this paper, an attempt is made to analyse the inventory investment behaviour and its determinants using a panel data on Indian manufacturing firms. The stylised facts on inventory behaviour as observed for firms in US and other developed countries are also examined.

The paper is structured as follows. The next section of the paper briefly surveys empirical issues raised in inventory investment and describes the linkages between the internal finance and inventory investment. Section-III briefly describes the data and its source. Empirical evidences on stylised facts in inventory investment

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literature are studied in relation with inventory formation in Indian context in Section-IV. Section-V lays out the standard production adjustment model for inventory investment. Section-VI presents the empirical results on determinants of inventory investment. The robustness of the estimates generated for total inventory investment has been examined by disaggregating the total inventory investment to the stage of production process. In addition, the stability of estimated parameters relating to total inventory investment and its components is examined by estimating inventory equation in three sub-periods separately. Finally, in Section-VI, we summarise the main findings and conclude. Construction of variables is presented in data appendix.

II

Review of Literature

After lying dormant for much of the 1960s and 1970s, empirical research on inventory expenditure has found a renewed interest with a recognition that inventory fluctuations are highly correlated with business cycles. Microeconomic theory on inventory investment tells that business inventory investments may be held for a wide variety of reasons. These include smoothing production in face of fluctuating sales and to minimise possibility of stock-outs. Other reasons for holding inventories include to use them as hedge against asset price fluctuations, to reduce delivery lags, to improve production scheduling, to reduce inventory acquisition costs by bunching to get bulk discounts and save transport costs, to signal credibility against order book by displaying inventories or simply as outcome of unavoidable pipeline. These reasons may appear to be of a second order importance, but greater evidence is now available to show that they could critically alter the investment behaviour of a firm. While there is considerable scope of extending the literature on these lines, two main microeconomic theories that have established presence in the literature in this area are the production smoothing or the buffer stock model and the (S,s) model of inventory behaviour.

The production-smoothing model/ buffer stock model was developed by Charles Holt, Franco Modigliani, John Muth and Herbert Simon in 1960. The underlying logic of the model is that if firms face convex production costs and sales that vary over time, a cost minimization strategy would be to smooth production relative to sales[1]. The fact that firms face stochastic demand gives rise to the reason that inventories need to be held as a buffer stock. It explains why firms hold stocks of finished goods they have produced. This production smoothing/buffer stock hypothesis treats inventories as a stabilizing factor to fluctuating sales by acting as a buffer stock. Using the linear quadratic approach to optimisation, Lovell (1961) came out with the empirical specification of this hypothesis as stock adjustment model. If sales vary over time with rising production costs, a firm's cost minimising strategy is to equate the marginal costs of production in different time periods subject to the cost of holding inventories[2]. The theory also implies that the speed of adjustment depend on the real rate of interest. It further suggests that we should expect negative response of inventory investment to changes in the interest rates.

The production smoothing/ buffer stock model has, however, faced many empirical challenges, First and the foremost, the model's prediction that production should be less variable than sales fails frequently with the data (Blinder (1986)). Blinder (1981) and Blanchard (1983) provide industry-level evidence for the US data on this aspect. West (1986) and Eichenbaum (1989) provide strong formal evidence rejecting the model. Furthermore, Miron and Zaldes (1988) demonstrated that seasonal variations in manufacturing output closely match the seasonal variations in sales implying that inventories play insignificant role in smoothing seasonal fluctuations. The coefficients estimated in this model are found to indicate that firms close the gap between their actual and desired stock of inventories at an implausibly slow rate (Blinder (1986)). Feldstein and Auerbach (1976) find difficulties with the adjustment rates that vary from months to years to adjust to sales shocks. Maccini and Rosana (1984) and Blinder (1986) show that the result is not due to

any biases in econometric specifications. However, Christiano and Eichenbaum (1987) show that aggregation biases may provide some explanation for low adjustment speed, though even after adjusting for this factor the speed of adjustment remains implausibly low. Blinder and Maccini (1991) argue that production may vary more than sales if firms follow (S,s) inventory models. Kahn (1987) shows that uncertain demand combined with costly stockouts helps explain the behaviour of inventories. Carpenter, Fazzari and Peterson (1995) focus on capital market imperfections to account for this excess volatility. They argue that capital market imperfections limit the firm access to external finance, forcing them to rely mainly on internal finance. Since cash flow is procyclic, fluctuations in internal finance should affect inventory investment.

In a standard stock adjustment model, desired inventories are a function of expected sales (accelerator motive and buffer stock motive), interest rates and the inflation rates (expected holding gains or losses). The key buffer stock motive of the model has been rejected in many econometric investigations of inventory investment. Also, inventory investment in many empirical studies, is found to remain insensitive to changes in real interest rates. However, it must be said that empirical evidence on production smoothing has been by and large from the US data and there is little verification of the theory from other parts of the world, especially developing countries. One needs to see if the so-called puzzles of US inventory behaviour in which production has higher variance than sales is a global phenomenon or a stylised fact for the US economy alone.

Bo (2002), in his study on Dutch inventory investment uses firm level data on Dutch firms over the period 1984-1995. His results on the basis of Lovell model augmented with financial variables show that capital market imperfections are relevant to explaining inventory behaviour and provide evidence that the firms likely to be financially constrained respond much more sharply to cash flow shocks than firms that are likely to be unconstrained.

Carpenter, Fazzari and Peterson (1995) estimate within-firm regressions for a standard inventory stock adjustment model augmented with financial variables on quarterly firm-level panel data. They conclude that cash flow fluctuations explain a substantial amount of inventory fluctuations for the US firms. They find strong support for the existence of financing constraints due to adverse selection and moral hazard problems in debt and equity markets generated as a result of asymmetric information between firms and potential suppliers of external finance. They predict that investment depends primarily of internal funds because of limited availability of debt.

Louri (1991) examined the effect of monetary policy on inventory investment in Greek manufacturing industry. Using time series data from the annual accounts of Greek firms for the period 1958-85, they find interest rate and inflation rate expectations exercise a significant influence on inventory investment but in opposite direction. He also finds that interest rate coefficient is significant and has a negative sign in case of total inventory investment and raw materials, though in case of finished goods they have a negative sign but an insignificant coefficient. Like our results, he also concludes that different types of inventories behave differently, showing diverse responses to price and quantity variables. He also observed that expected inflation was having a positive and highly significant relationship with inventory investment, suggesting speculative motive for holding inventories. However, the study was not based on panel data, but on aggregate time series data.

Hay and Louri (1994), however, find for a panel of UK firms for the period 1960-85 that microeconomic factors matter much more and that interest rates were not a significant determinant of inventory investment. Acceleration effects as reflected in sales coefficients are found to be important in explaining inventory behaviour in all the cited studies. While Carpenter, *et.al.* (1995) did find cash flows to be a significant determinant of inventory investment for some classes of firms and for some periods, there were cases where cash flow turned out to be insignificant.

III

Data

Annual data are drawn from Company Finances Divisions' files of RBI based on uniform method of analysis of audited and published accounts of non-financial, non-government public limited firms have been used for this study. The firm-wise data are available from 1971 onwards. The data frequency is annual[3]. The panel consists of 1,800 listed firms and covers the period 1971-72 to 1999-2000. The original number of firms in the data set was much higher than 1,800 but firms with fewer than nine consecutive years of data are deleted from the data set. The average firm in the dataset has 16 years of data. Firms with zero inventory investment and non-positive sales are also excluded, since zero inventory investment or sales may indicate a temporary shutdown or other disruption in the firm's economic activities. This sample selection criterion generated 28,527 observations. As such, it is amongst the largest dataset used in such studies.

For the sample of manufacturing firms, analysis of inventories is carried out at disaggregated level with inventories broken down into finished goods, work-in-progress, raw materials and supplies and others. 'Others' includes *inter-alia* stores and spares. Availability of internal funds represented by cash flow variable proxies for the constraints in financing inventories. Given that inventory equation is specified in levels and there are large differences between the firms in terms of size, all the variables (other than interest and inflation rates) are scaled by the real total assets to control for heteroscedasticity.

In order to reduce the likelihood of introducing trends that might dominate cyclical movements in data, the long panel is split into three sub-panels covering periods 1972-73 to 1979-80; 1980-81 to 1991-92 and 1992-93 to 1999-2000. These panels consist of 10,626, 12,849 and 5,052 observations respectively. Each of three sub-panels is unbalanced and excludes firms with zero inventories. However, even a firm is excluded from one panel, it may enter others.

IV

Inventory Investment in India- Some Stylised Facts

In view of numerous reasons to hold inventories, inventory formation is found to be difficult to explain. One standard explanation for holding inventories, as pointed earlier, is that they are used to smooth production in presence of fluctuating demand since it is costly to change production. In order to minimize cost, firms facing variable demand for their product reduce inventories whenever sales exceed production and vice-versa. In other words, firms draw down and build up their inventories as necessary to limit fluctuations in production. As production decisions are made in advance, firms use inventories as a buffer stock. Lovell's (1961) stock adjustment model implies that production should be smoother than sales and that sales and inventory investment move in opposite directions[4]. However, it is generally found that production is typically more variable than sales and inventory investment and sales are positively correlated in contrast to the view that firms are attempting to smooth production against fluctuating demand.

The key buffer stock motive of the model has therefore been rejected in many econometric investigations of inventory investment. Blinder and Maccini (1991), in their comprehensive survey of the inventory investment literature enumerate three stylised facts on inventory behaviour as:

(1) The most volatile components of inventory investment are inventories of raw materials and supplies;

(2) The variance of production exceeds the variance of sales; and

(3) Sales and changes in the stocks are not negatively correlated.

The mean and variance of inventory investment

Based on de-tren]ded inventory investment data, Blinder and Maccini (1991) had observed that finished goods stocks were the least volatile component of inventories, while raw materials in the

form of material and supplies were the most volatile component. Table-1 below reports the means and variances of real inventory stock and the investment for the Indian manufacturing firms that are further broken down into its components.

Table 1: Mean Real Inventory Levels and Variance of Real Inventory Investment

(in '000s)

	Mean inventory stock	Percen -tage of total	Mean inventory investment	Percen-tage of total	Variance of detrended inventory investment	Percen-tage of total
Total inventory	1723.27	100	167.42	100	20267.74	*
Finished goods	560.61	32.53	57.97	34.63	3606.58	17.79
Raw materials and supplies	522.6	30.33	46.33	27.67	3002.99	14.82
Work-in-progress	292.33	16.96	30.56	18.26	674.99	3.3
Stores and Spares & others	347.74	20.18	32.55	19.44	712.95	3.5

* not adding to 100 as the covariance terms are not reported.

If inventory investment is a constant share of output and output is growing, the variance could simply reflect the increasing size of the production activity. In other words, trend growth in real level of sales can disguise smoothing. If sales are trending up (down), then production will also trend up (down). If firms smooth production annually, and adjust the target value of smoothed production each year, then the variance induced by the trend growth will also distort the smoothing measure. To remove any distortion of the results from possible trend movements, inventory investment has been de-trended in calculating the variance in the above table. For this, first log values of inventory levels were regressed on a constant and time trend. The exponential of the fitted value was then subtracted from the actual value to produce a de-trended levels series.

The table above reveals some results in contrast with the trends observed for the firms in the United States. First, while finished goods account for largest component of stocks and flows of inventories for the Indian firms, the work in progress and not

the finished goods inventories constitute the smallest component of total inventories. Second, and more importantly, unlike the US firms, Indian firms have finished goods as the most volatile component of total inventory investment. Ignoring the interactions captured by covariance, it accounts for about 18 per cent of the variance in total inventories. Blinder and Maccini show that for the US firms it accounts for about 12 percent of the total inventories of the manufacturing firms. So while overemphasis on finished goods stocks in understanding changes in inventory levels may be misplaced in the context of the US economy, it may not quite be the case for the Indian economy. In contrast, work-in-progress is a stable component of inventory investment in India. While for the US manufacturing firms it accounted for a fifth (20.7 percent) of the total variance in total inventories, for the Indian firms it accounted for about three percent. Raw materials constitute the most volatile component of inventories for firms in advanced countries, but it was the second most volatile component for the Indian firms accounting for 14.8 percent of the variance of inventories in contrast to 43.7 percent in case of the US manufacturing firms.[5] While raw materials are volatile component of inventories, the stores and spares constitute a stable component of inventories for the Indian firms.

Variance of Sales and Output

Typically, inventories are thought to be held by the firms so as to avoid stock outs or to minimise costs by smoothing production process amidst fluctuating sales. However, the production smoothing argument for holding inventories is questionable, as it has not found much empirical support. Here, we examine this question in the context of inventory behaviour of the Indian firms. In order to provide some descriptive evidence on this issue of production smoothing, variance of sales and production are calculated for the sample of Indian firms after de-trending both by procedure explained in the previous sub-section. Variance ratios are then calculated. The empirical evidence so obtained is presented in Table 2 below.

Table 2: Variance of Real Sales and Real Output, Industry-Wise

	Variance of De-trended Sales (S)	Variance of De-trended Output (Y_1) where Y_1=S+ ΔN_1	Variance of De-trended Output (Y_2) where Y_2=S+ ΔN_2	Var (Y_1)/ Var (S)	Var (Y_2)/ Var (S)
All industries	160497.3	181244.1	189043.4	1.13	1.18
Tea	519787.5	535743.6	537475.7	1.03	1.03
Sugar	2348248	3543859.8	3556335.5	1.51	1.51
Textiles	79421.2	76625.8	76867.6	0.96	0.97
Engineering, of which	320137.1	373488.3	378726.1	1.17	1.18
Electrical Mach., apparatus,appliances, etc.	1462514.3	1523107.6	1605176.1	1.04	1.1
Machinery other than transport and electrical	739631.5	726689.9	743177.3	0.98	1
Chemicals, of which	353011.3	412616.5	444594.2	1.17	1.26
Medicines and pharmaceuticals	389703.4	423730.8	441328.6	1.09	1.13
Basic Industrial Chemicals	1316313.9	1347333.8	1484917.5	1.02	1.13
Cement	11036462	11360923	11479025	1.03	1.04
Rubber and Rubber Products	6299944.5	6485939.5	6513454	1.03	1.03
Paper and Paper Products	449121.5	466815.7	466729.4	1.04	1.04
Construction	1879416.1	1880407.9	1913448.9	1	1.02
Trading	4712723	4846455	4855475	1.03	1.03
Shipping	1346514.1	1346609.9	1377428.5	1	1.02

ΔN_1=change in finished goods inventory; ΔN_2 change in inventories of finished goods and work-in-progress.

Data on production can be readily calculated by adding current period sales to the change in inventory from last period. If production exceeds (is less than) sales in a given period, then the difference must go to increasing (decreasing) inventories. In other words, A variance ratio (ratio of variance of production to variance of sales) more than one implies that production is more volatile than sales and therefore contradicts the smoothing hypothesis. However, a negative correlation between sales and change in inventory investment may be insufficient to produce a lower variance in production than in sales. We consider two alternative measures of output for computing the variance ratios. First, we add only finished goods inventories to sales to arrive at a measure of output of finished goods. Second, we add work-in-progress to finished goods inventories to arrive at a measure of total output of the firm. With both these measures, the variance

ratio exceeded unity for the full sample, implying that the variance of output exceeded variance of sales. In fact, the ratios of 1.13 and 1.18 for the two measures of output, respectively, is somewhat higher than Blinder and Maccini's corresponding ratios of 1.09 and 1.13, respectively, for the US firms. This indicates that inventories were not a stabilising factor in India too.

Similar ratios were computed for 11 major industry groups for the Indian firms. Almost for all industries, the two variances ratios measures exceeded one.[6] The variance of output exceeded that of sales considerably in case of sugar, engineering and chemicals. In case of basic industrial chemicals, the work-in-progress inventories apparently were a major volatile component. In sum, the industry-wise evidence weighs heavily against the production-smoothing motive for holding inventories.

Correlation Between Sales and Inventory Investment

The commonly held belief that inventories are held as a buffer stock requires that inventories are drawn down with rising sales, while they are accumulated when sales decline. This is the basis on which the inventories are used to explain cyclical behaviour in economic activity.

Blinder and Maccini (1991) have, however, dismissed this idea as it does not fit in the empirical analysis for the US firms. Evidence on this issue for the sample of Indian firms is presented in Table-3 below. Four alternative measures of inventories were considered. First, as the most narrow measure, *viz*., finished goods inventories were considered. Next, two other main components of inventories, *viz*., raw materials and work-in-progress were taken. Finally, total inventories were used. The correlation coefficient of the de-trended series of each of these with the de-trended series of sales was computed at all industry level as well as for each of the 11 main industries. Two alternative data series were considered for each of these variables/measures. First, the correlation was computed between the average of all firms for each variable/measure and the average sales. However, such a measure would suffer from scale effects with small number of large firms dominating the sample. To

Table 3: Correlation Between Real Sales and Real Inventory Investment, Industry-Wise

	Correlation between detrended Sales (S) and detrended inventory investment component (ΔN_i)							
	$Cor(S,\Delta N_1)$ i=1: finished goods		$Cor(S,\Delta N_2)$ i=2: Raw materials		$Cor(S,\Delta N_3)$ i=3: work-in-progress		$Cor(S,\Delta N_4)$ i=4: Total inventories	
	(*)	(**)	(*)	(**)	(*)	(**)	(*)	(**)
All industries	0.55	-0.30	0.38	0.11	0.57	-0.38	0.60	-0.24
Tea	0.47	-0.10	0.66	-0.07	0.17	0.01	0.7	-0.08
Sugar	0.83	-0.61	0.18	0.31	0.47	0.21	0.83	-0.58
Textiles	-0.07	-0.46	0.25	0.28	0.04	-0.46	0.21	-0.08
Engineering, of which	0.52	-0.15	0.26	0.15	0.29	-0.31	0.56	-0.09
Electrical Mach.,	0.22	-0.16	0.41	-0.18	0.30	-0.09	0.34	-0.24
Apparatus,appliances,etc.								
Machinery other than transport & electrical	-0.47	-0.01	0.16	0.04	0.12	-0.21	-0.03	-0.13
Chemicals, of which	0.48	0.15	0.15	-0.22	0.42	-0.01	0.44	-0.1
Medicines and pharmaceuticals	0.4	0.46	0.44	0.4	0.38	0.43	0.46	0.38
Basic Chemicals Products	0.25	0.17	0.16	-0.08	0.52	-0.15	0.46	0.02
Cement	0.32	0.27	0.16	0.32	0.1	0.16	0.27	0.1
Rubber & Rubber Products	0.05	0.2	0.31	0.03	0.15	0.06	0.25	0.26
Paper and Paper Products	0.27	0.2	0.58	0	0.25	0.13	0.5	0.16
Construction	0.32	-0.17	-0.1	0.32	-0.17	-0.12	-0.15	-0.17
Trading	0.34	0.42	0.33	0.34	0.29	0.37	0.47	0.29
Shipping	0.55	0.36	0.18	0.52	0.43	0.19	0.37	0.21

Note: * denotes correlation between average of aggregate real sales of all firms and average of aggregate of component of real inventory investment for all firms.

** relate to correlation between average of (real sales/real total assets) of all firms and average of (real inventory investment/real total assets) for all firms.

neutralize this scale effect, the second data series was generated by deflating all variables/measures by total assets before calculating the correlation on their averages. For all-industries the correlation coefficient of sales and finished goods inventories was 0.55. When deflated by total assets the correlation coefficient not only dropped, but changed sign to negative and turned out to be –0.30, implying that large firms may have a higher correlation between sales and inventories. Similar results are obtained for other components of inventories and for total inventories, though in case of raw materials the sign remains positive when deflated by assets. The correlation between sales and total inventories for all-industries is, in fact, still stronger than that of finished goods, with

correlation coefficients of 0.60 without deflating and -0.24 when deflated by total assets. At the disaggregated level of industry groups, positive correlation was obtained for most industries, with construction and machinery other than transport and electric being the two industries as notable exceptions of having negative correlations even when scale effects are not removed. The results on the whole decidedly contradict the buffer stocking explanation for inventory holding. Firms rather than running down stocks of inventories with rising sales, actually tend to build them up. Similar results were obtained by Blinder and Maccini (1991) for the US firms and Flood and Lowe (1993) for the Australian firms.

The evidence obtained in the case of Indian firms on the "stylised facts" of Blinder and Maccini (1991) reaffirm that the production smoothing/buffer stock motive for holding inventories has problems in explaining inventory behaviour of the Indian firms. However, unlike their results, we find that finished goods are a volatile component of inventories.

V

Determinants of Inventory Investment – an empirical exercise

The stock adjustment model whose background is the production smoothing or buffer stock hypothesis has been used intensively in empirical inventory research for estimating inventory investment. Blinder and Maccini (1991) in their survey paper writes "*production smoothing has not only been the model of choice of almost all theorists who have tried to model inventory behaviour, but also underlies the stock-adjustment model, which dominates econometric work on inventories*".

The production-smoothing model predicts that higher expected sales in the next period would lead firms to build inventories in the current period to avoid higher marginal costs of production when sales increase subsequently. This accelerator motive links today's inventories to tomorrow's expected sales. For finished goods inventories, for instance, this dependence comes from a stock-out

motive. As expected sales rises, the probability of a costly stock-out increases, inducing firms to hold more finished goods in inventory. The higher are expected sales, the greater the advantages of holding stock. The 'stock adjustment' relates the change in inventories to the gap between target inventory stocks and actual beginning of period stocks. The lagged level of inventories is also included on the conventional basis that a higher initial level of inventories will tend to reduce the returns from accumulating additional inventories. The coefficient on lagged inventory stocks is a measure of the adjustment speed with which the inventory shortage is corrected gradually so long as inventories remain below the targeted inventory level. Hence production adjusts in case of the gap between the actual and the expected sales with inventories acting as a buffer stock and smooth production so as to avoid stock-outs.

The financial health of firm may also affect its ability to smooth production. The firm that can show good prospects not only for sales but also for expected cash flows, may have easy access to external funds. Besides it may be in better position to run down its own cash-flows to finance inventory accumulation in case, it faces premium on external funds, in particular, in presence of capital market imperfections. The presence of capital market imperfections may not allow firms to finance the accumulation of inventories when demand falls. Similarly, when demand increases, the improvement of the firm's balance sheets may make the firms' access to external finance easier and less expensive leading to increase in inventories. Given that inventories are likely to have relatively low adjustment costs compared with fixed investment or investment in research and development, inventory investment bear the impact of any adjustment arising from a fall in cash flow if the firm is financially constrained. If firms do have a hierarchy of finance in view of capital market imperfections, then the investment, particularly inventory investment of some firms will be constrained. So the level of inventory investment undertaken will be determined by the availability of cash flow. Therefore, to improve upon the fit of the model and in order to test for the relevance of capital market imperfections, cash flow variable

has also been included. It is expected that the coefficient on this value will not be different from zero if firms face no information asymmetries. It may also be the case that cash flow may happen to be significant if it contains information about expected investment opportunities not captured by controls for investment demand. However, we assume that current sales included in all our regressions should be a good control variable for short run inventory demand.

Interest rate has been explicitly included in our model as it is expected to have an important bearing on inventory behaviour of a firm.[7] There is the opportunity cost of the funds invested in the inventory that depends on the level of nominal interest rates. Whilst we have increasing inventories with increasing expected sales, we have decreasing inventories with increasing carrying costs. Inventory holdings have to be financed by some source or the other. Generally in India, inventories are known to have been bank-financed by corporates in an essentially bank-dominated financial system. However, even if inventory financing is internal to the firms, they nevertheless bear an opportunity cost that can be proxied by the market interest rates. Higher the interest rates, the costlier are inventory levels. Therefore, interest rates would influence inventory accumulation. Since inventories are typically carried over the short and medium-term and are generally financed by borrowings of such tenures, it is useful to test for the interest sensitivity of inventories using an appropriate short-term interest rate.

There are two opposing effects on inventory decisions due to changes in prices. An increase in prices can cause producers to expect higher prices in the future, which leads them to increase inventories in order to take advantage of higher future prices. On the other hand, a price increase encourages producers to sell inventories immediately in order to profit from the current high price. Similarly, a decrease in price may induce producers to hold inventories in hopes of higher future prices. On the other hand, falling prices may lead producers to dispose of inventories because of the fear that prices will continue to fall in the future. There is appreciation (or depreciation) in the price of good while it is held in inventory. These inventory profits (losses)

reduce (increase) the per unit financial inventory carrying costs. Inflation rate is included in the regression equation to reflect the possibility that inventory behaviour is affected by expected holding gains or losses. The price expectations are formed autoregressively, which means that price variable is assumed to be a distributed lag function of current and past actual levels of inflation rate.

This stock adjustment inventory model based originally on Lovell (1961) model augmented with cash flow, price expectations and interest rates, has been used to examine inventory formation in Indian private corporate sector with a view to an improved understanding of inventory behaviour of Indian manufacturing. The final inventory investment is estimated with the following equation:

$$\Delta N_{it} = -\lambda N_{i,t-1} + \varphi S_{i,t} + \mu S_{i,t-1} + \phi r_{it} + \delta_0 PE_t + \delta_1 PE_{t-1} + \delta_2 PE_{t-2} + \theta_1 CF_{it} + \theta_2 CF_{it-1} + \varepsilon_{it} \quad \text{.....(7)}$$

where r_{it} is the real interest rate, PE_t is price expectations and CF_{it} is the measure of current cash flow for firm i and represents the marginal cash flow effect. The first three variables in above equation are the outcome of production smoothing model. These quantity variables act like controls, allowing us to test the importance of price variables and internal finance after controlling for the accelerator (sales) and stock adjustment effects. The cash flow terms are the main focus for our study that reflect the impact of internal finance on inventory investment implied by the literature on financing constraints.

Because the sample is panel, there are most likely problems of heteroscedasticity. To overcome this, we estimate the coefficients by within group OLS and use white heteroscedasticity consistent estimator of the least squares covariance matrix.

Table-4 reports summary statistics of the sample. Inventory stocks are, on average, 25 per cent of sales whereas cash flows are only 6 per cent of total sales. Inventory investment is on an average less than 3 per cent of sales. Inventory stocks and inventory investment as share of sales show a declining trend over the years, perhaps reflective of improved inventory investment by the firms.

Table 4: Key Statistics of Sample used in Estimation of Inventory Investment

	Full Period 1972-73 to 1999-2000	Panel I: 1972-73 to 1979-80	Panel II: 1980-81 to 1991-92	Panel III: 1992-93 to 1999-2000
Number of Firms	1,800	1,441	1,800	881
(No. of observations)	-28,527	-10,626	-12,849	-5,052
Mean(Total Assets) (in Rs. crore)	76.91	7.66	39.05	202.94
Mean (Inventories Stocks) (in Rs. crore)	13.15	2.69	9.64	28.88
Mean (Sales) (in Rs.crore)	61.21	9.18	38.83	146.81
Mean (Cash flow) (in crore)	4.31	0.46	2.27	11.21
Inventory stocks / total assets (in %)	25.78	35.08	26.77	15.01
Inventory investment / sales (in %)	2.6	3.13	2.95	1.55
Inventory stocks / sales (in %)	25.17	29.66	25.53	20.14
Cash flow / sales (in %)	6.02	5.13	5.51	7.69

Table 5: Key Statistics of Variables used in Inventory Investment Regressions

Variable	Mean	Standard Deviation	Minimum	Maximum
Inventory investment (t)/ Total Assets(t-1)	0.0322	0.1075	-0.6182	3.9405
Inventory stock(t)/ Total Assets(t-1)	0.3093	0.1730	0.0002	4.4270
Sales(t)/Total Assets(t-1)	1.3743	1.1482	0.0005	47.0501
Cash Flow(t)/Total Assets(t-1)	0.0643	0.1201	-1.9127	2.6877

VI

Estimation Results

Ordinary least square with group dummy panel estimation of the basic inventory equation modelled on lines of Blinder and Maccini (1991) shows evidence in favour of lagged inventory adjustment. Current and lagged sales and current cash flows are found to be important determinants of inventory investments of the Indian firms. In addition, interest rate and price expectations influence inventory investment

behaviour implying that monetary policy has an impact on inventory behaviour of the firms (Table 6).

Table 6: Estimates of Inventory Investment and its Components: 1972-73 to 1999-2000

Dependent Variable →	Inventory Investment in							
	Total Inventories		Finished Goods		Raw Materials		Work-in-Progress	
Explantory Variables ↓	Coeff.	T-Stat	Coeff.	T-Stat	Coeff.	T-Stat	Coeff.	T-Stat
N_{t-1}	-0.222**	-15.0	-0.308**	-11.0	-0.313**	-23.4	-0.228**	-7.4
S_t	0.038**	4.9	0.019**	3.3	0.012**	5.7	0.002**	3.1
S_{t-1}	0.003	0.4	0.003	0.7	0.001	0.8	0.001*	1.9
CF_t	0.144**	7.0	0.049**	4.3	0.066**	10.3	0.008	1.2
CF_{t-1}	0.018	1.4	0.016*	2.0	0.005	1.1	-0.005	-1.2
$SBIINT_t$	-0.001**	-5.0	-0.001**	-4.0	-0.001**	-6.0	0.000	0.1
PE_t	0.002**	7.7	0.000	-0.4	0.001**	8.3	0.000**	4.3
PE_{t-1}	0.001**	3.1	0.001**	3.8	0.000**	-2.9	0.000	1.4
PE_{t-2}	0.000*	1.8	0.001**	3.7	0.000	-0.9	0.000	0.8
Implied □	0.186		0.072		0.042		0.014	
Implied ϒ	0.003		0.003		0.001		0.001	
Deg of freedom	26718		26718		26718		26718	
Adjusted R^2	0.13069		0.12247		0.13332		0.14415	

Notes:

(1) : N=stock of respective inventory component; S=Total sales; CF=Cash Flow; SBINT=State Bank of India advance rate; PE=Price expectations proxied by adaptive framework using inflation rate based on GDP deflator; Neg= Negligible coefficient values.

(2) : Firms' level variables, viz., N, S and CF are deflated by total assets to neutralise scale effects of dominance by large firms.

(3) : time subscript *t* denotes annual time period with lags of one and two years denoted by *t-1* and *t-2*, respectively.

(4) : table value for t–statistics for large degrees of freedom is 1.645 for 5% level of significance and 2.326 for 1% level of significance.

(5) : to overcome the problems of heteroscedasticity in the panel of firms, the coefficients are estimated by within group OLS and using white heteroscedasticity consistent estimator of the least squares covariance matrix.

(6) : Implied ß (beta) is calculated as the ratio of sum of sales coefficients to coefficient on inventory stock. Implied g (gamma) is calculated as the ratio of the coefficient on lagged sales to coefficient on stock inventory multiplied by accelerator effect ß plus one.

Given that annual data are being used, one could expect the coefficient on lagged dependent variable to be minus unity, indicating complete adjustment within that time period. The obtained results, however, show that buffer stock adjustment is relatively fast for the raw materials and finished goods inventories, with an adjustment of about little over 30 percent per annum, while it is lower for total inventory investment

with an adjustment of 22 percent per annum of the desired inventory stocks. Inventory adjustment for work-in-progress is by far the slowest, with an annual adjustment of 23 percent. The coefficients obtained for the total inventory investment for period 1971-72 to 1999-2000 could be interpreted as being somewhat lower than what is generally obtained in the literature for advanced economies[8]. The coefficient on lagged inventory stocks is a measure of the speed with which the firm adjusts to the desired level of inventories. The relatively lower adjustment speed may partly reflect the better speedier response of firms in advanced economies, but could also be the result of data limitations arising from lack of quarterly or monthly data. This impact of time aggregation lowering the coefficients of adjustment speed has been noted by Carpenter, *et. al*. (1994). The low adjustment speed for total inventories may also reflect the result of clubbing of different inventory components of finished goods, raw materials, work-in-progress and stores and spares, each of which may have different inventory behaviour and cycles. This argument has been advanced earlier by Blinder (1986) in the literature. There is very little evidence even in the case of advanced economies on speed of adjustment for different components of inventory investment separately. However, such evidence improves our understanding of how business investments respond to gaps between actual and desired inventory stocks. Therefore, determinants of inventory investment are analysed at the total as well as for the three major components of inventory investment. The results of the estimated equations provide documentation that raw materials and finished goods have a speedier adjustment response than raw materials. The coefficient for raw material is distinctly smaller than what has been obtained in case of developed countries. In developed countries raw material adjustment is much faster than finished goods stock adjustment. But for the Indian firms these two components have roughly the same value.

The contemporary sales coefficient for total inventories and its components (finished goods, raw materials and work-in-progress) obtained for the Indian firms are positive and significant. These coefficients reflect a combination of stock accelerator effect arising from rising sales and the buffer stock effect arising from stochastic demand. Since the former is expected to cast a positive influence on

inventory investment, while the latter is expected to be negatively related, the total impact is indeterminate *a-priori*. We, however, obtain a consistently positive sign and coefficients significant at 1 percent levels for total inventories and all its components, implying that the accelerator impact is dominant. This means that the Indian firms inventory formation is dominated by expectations of future sales. Lagged sales coefficients are found to be insignificant. In studies on advanced countries with monthly or quarterly data, higher number of lags of sales are found to be positive and significant because lagged sales are positively correlated with expected sales following the accelerator effect. This reflects the positive dependence of target level of inventories with lagged sales, leading to a positive coefficient of lagged sales in a regression determining inventory investment. However, with annual data, the results show insignificance of lagged sales for the Indian firms, though the signs are positive for the first year lag.

The composite coefficients φ and μ have values of 0.038 and 0.003, respectively for total inventories. The implied β equals 0.186. The implied γ is near zero implying perfect foresight in expectation formation of sales. The estimate of long-run inventory to sales sensitivity captured by accelerator coefficient β is positive for all types of inventory investment that supports the stock-out avoidance motive.

Contemporaneous cash flows are found to have a significant impact on inventory investments with high t-ratios for total inventories and all the inventory investment components, except work-in-progress. The lagged cash flows are, however, not significant for all the components of inventories, except for finished goods inventories, which is significant at 5-per cent level of significance, but not at 1-per cent level. The positive coefficient for cash flows indicate that firms build-up inventories at times when internal funds are available with them, but offset declines in cash flows by reducing their stock of inventories. This is evidence for presence of some financing constraints.

Traditionally research on inventories of the firms has devoted considerable attention to cyclical impact, but still underplayed the

role of monetary policy variables such as interest rates and price expectations. Bhole (1985), Louri (1991) and Hay and Louri (1994), however, devote considerable attention to this aspect. Examining the inventory investment of Indian public limited companies for the period 1951-76, Bhole (1985) find that real rate of interest proxied by the real SBI advance rate was negatively related to real inventory investment and its components and the coefficient was significant at the 1 percent variable. The interest rate variable captures the cost of short-term loans, mainly bank borrowing. For a panel of Greek firms for the period 1958-85, Louri (1991) also find that interest rate coefficient is significant and has a negative sign in case of total inventory investment and raw materials, though in case of finished goods they have a negative sign but an insignificant coefficient. Hay and Louri (1994), however, find for a panel of UK firms for the period 1960-85 that microeconomic factors matter much more and that interest rates were not a significant determinant of inventory investment. Our empirical results for the panel of Indian firms for 1971-72 to 1999-2000 reveal that real interest rate was an important determinant of total, finished goods and raw material inventory investments, though not for the work-in-progress. Its coefficient had a consistently the expected negative sign. This reflects the behaviour of building up finished goods and raw material inventories if carrying costs were low, but depleting them if carrying costs rise.

Regarding price expectations, the current and lagged inflation rates are included in the equations explaining inventory investment because these variables reflect the possibility that inventory behaviour is affected by expected holding gains or losses. It also reflects the losses that are incurred on nominal assets. Bhole (1985) argues that inventories may often be held out of the speculative motive. Following Bhole (1985) and Louri (1991) in our model, inflation expectations are hypothesised to form by an adaptive expectations process. We find considerable impact of inflation expectations generation process with contemporaneous inflation rate turning out to be highly significant for raw material investments and work-in-progress. Some persistence was also observed for the impact of inflation expectations

on inventory investment with lags of up to two years being significant for total inventory investment. We find that firms hold inventories with a speculative motive and past inflation generates expectation of future inflation. This prompts companies to build up inventories to reap capital gains and to hedge against future inflation. In contrast, current inflation rate being high induces firms not to make new inventory investments.

Determinants of Total Inventory Investment during sub-periods:

The panel period in the above exercise spans nearly three decades. Since underlying inventory behaviour may have changed during this long period, it is of interest to examine the relationship for shorter panels as well. It is done by splitting the total sample period into three time periods, viz.: *1972-73 to 1979-80, 1980-81 to 1991-92 and 1992-93 to 1999-2000.*

The first period essentially covers a period of rapid branch expansion by commercial banks and a regulated interest rate regime that may have had an impact on the inventory holding and inventory financing of the Indian corporate sector that is quite distinct from that for the other two periods. This was also a period that was characterised by high inflation for the three-year period 1972-73 to 1974-75 due mainly to the OPEC induced oil price shock. The second period was characterised by beginning of the transformation from a banked-based financial system to a more market oriented system. The initial years were characterised by high inflation due to second oil price shock and balance of payment difficulties, while the terminal year witnessed severe credit compression to combat the external payments crisis. The third period marked the liberalisation and reforms of the financial system, enabling firms to raise financial resources liberally using a wide array of new instruments. Inventory investment equation was estimated for each of these periods for total inventory investment, as also for three of its components, viz., finished goods, raw materials and work-in-progress. The empirical results are reported in tables-7, 8, 9 and 10 respectively.

Table 7: Estimates of Total Inventory Investment

(Dependent Variable- Total Inventory Investment)

	Period –1 : 1972-73 to 1979-80		Period –2 : 1980-81 to 1991-92		Period –3 : 1992-93 to 1999-00	
	Coeff.	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
N_{t-1}	-0.338 **	-10.6	-0.297 **	-16.5	-0.461 **	-15.9
S_t	0.061 **	4.7	0.022 **	3.1	0.034 **	5.1
S_{t-1}	0.011	1.2	0.009	1.5	0.045 **	6.7
CF_t	0.179 **	3.6	0.174 **	7.2	0.058 **	3.4
CF_{t-1}	0.011	0.4	0.032 *	1.8	0.039 **	3.0
$SBIINT_t$	0.001 *	2.4	-0.109 **	-3.4	0.001	0.3
PE_t	0.004 **	11.5	-0.107 **	-3.3	0.004 *	2.0
PE_{t-1}	0.001 **	6.4	-0.001 **	-2.1	0.003 *	2.1
PE_{t-2}	0.000	-1.4	0.000	0.8	-0.002	-0.9
Implied □	0.213		0.105		0.172	
Implied □	0.010		0.009		0.042	
Degree of freedom	9176		11040		4162	
Adjusted R^2	0.1990		0.1179		0.2277	

Notes: As in Table-6.

Table 8: Estimates of Finished Goods Inventory Investment

(Dependent Variable: Finished Goods Inventory Investment)

	Period –1 : 1972-73 to 1979-80		Period –2 : 1980-81 to 1991-92		Period –3 : 1992-93 to 1998-99	
	Coeff.	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
N_{t-1}	-0.380 **	-7.0	-0.392 **	-15.2	-0.620 **	-14.5
S_t	0.041 **	3.7	0.008 *	2.5	-0.001	-0.1
S_{t-1}	0.005	0.7	0.008 *	2.4	0.034 **	7.6
CF_t	0.050 *	1.9	0.067 **	4.4	0.023 *	2.5
CF_{t-1}	0.028	1.5	0.022 *	1.8	0.004	0.5
$SBIINT_t$	0.000	0.3	-0.117 **	-5.1	0.002	1.1
PE_t	0.001 **	4.2	-0.115 **	-5.0	0.001	0.8
PE_{t-1}	0.001 **	5.8	-0.003 **	-7.0	0.000	0.5
PE_{t-2}	0.000	0.5	0.000	0.5	-0.002 *	-1.9
Implied □	0.123		0.041		0.054	
Implied □	0.005		0.008		0.033	
Degree of freedom	9176		11040		4162	
Adjusted R^2	0.1728		0.1066		0.2500	

Notes: As in Table-6

Table 9: Estimates of Raw Material Inventory Investment
(Dependent Variable: Raw Materials Inventory Investment)

	Period –1 : 1972-73 to 1979-80		**Period –2 : 1980-81 to 1991-92**		**Period –3 : 1992-93 to 1998-99**	
	Coeff.	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
N_{t-1}	-0.530 **	-16.7	-0.403 **	-19.7	-0.524 **	-16.9
S_t	0.009 **	3.0	0.009 **	3.3	0.025 **	8.9
S_{t-1}	0.007 **	3.0	0.001	0.7	0.009 **	3.4
CF_t	0.126 **	9.4	0.055 **	6.2	0.026 **	3.9
CF_{t-1}	0.023 *	1.8	0.014 *	2.0	0.021 **	3.3
$SBIINT_t$	0.001 *	1.7	0.007	0.4	-0.001	-0.8
PE_t	0.002 **	11.9	0.007	0.4	0.001	1.3
PE_{t-1}	0.000	1.5	0.001 **	4.3	0.002 *	2.1
PE_{t-2}	0.001 *	-2.1	0.000	-1.3	0.001	1.2
Implied □	0.030		0.027		0.065	
Implied □	0.007		0.001		0.009	
Degree of freedom	9176		11040		4162	
Adjusted R^2	0.2171		0.1574		0.2187	

Notes: As in Table-6

The speed of adjustment coefficient for inventory stocks is found to improve significantly with disaggregation of time period implying that the somewhat lower coefficient for full period may have been not just on account of aggregation of different types of inventories and lower frequency of the data, but also due to the long time period under consideration. Total inventory investment is found to adjust to the desired level at a rate of 30-46 percent per annum, while that of finished goods investment adjusts at a rate of about 38-62 percent per annum. The raw material inventories adjusted at an annual rate of about 53 percent, though the rate was somewhat lower in the 1980s at 40 per cent. The speed of adjustment remained the least for the work-in-progress in the range of 29-40 percent. The speed of adjustment for finished goods stock appears to have improved after the

Table 10: Estimates of Work-in-Progress Inventory Investment
(Dependent variable: Work-in-Progress Inventory Investment)

	Period –1 : 1972-73 to 1979-80		**Period –2 : 1980-81 to 1991-92**		**Period –3 : 1992-93 to 1998-99**	
	Coeff.	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
Nt-1	-0.290**	-4.0	-0.339**	-9.2	-0.404**	-6.6
St	0.003*	1.9	0.002*	2.0	0.001	0.6
St-1	0.001*	1.8	0.001	1.6	0.003*	2.1
CFt	-0.008	-0.4	0.021**	3.8	0.007	1.5
CFt-1	-0.019*	-1.7	-0.005	-1.0	0.011**	3.2
SBIINTt	0.0004	1.5	-0.008	-0.9	0.000	0.6
PEt	0.0002**	2.9	-0.008	-0.9	0.002*	2.4
PEt-1	0.0002*	1.8	0.000	-1.1	0.000	0.4
PEt-2	0.000	-0.9	0.000*	1.9	-0.001	-1.1
Implied □	0.016		0.009		0.009	
Implied □	0.001		0.001		0.003	
Degree of freedom	9176		11040		4162	
Adjusted R2	0.1536		0.2032		0.1751	

Notes: As in Table-6

liberalization and reforms initiated in mid-1991, with the adjustment process being completed in less than two years.

This indicates that the business is more responsive to carrying and other associated costs of holding finished goods stocks and may be making a better assessment of shifts in market trends and also making use of better inventory management techniques. Structural bottlenecks impeding the movements of goods may also have come down as a result of improved thrust to transportation and other infrastructure.

Current sales had a positive sign and were significant, except for the third period for the finished goods and the work-in-progress. The estimate of long-run inventory to sales sensitivity captured by accelerator coefficient β are positive in all three

periods for all types of inventories, which supports the stock-out avoidance motive. It decreased from 0.213 in the first period to 0.105 in the second period, but rose again to 0.172 in the reforms period for total inventories. This trend was generally observed for components of inventory as well, though in case of raw material inventories β increased sharply from 0.027 in 1980-81 to 1991-92 to 0.065 during 1992-93 to 1999-00 suggesting that accelerator effects were stronger for the raw material acquisitions. Interestingly, even in the 1990s the accelerator effects dominate buffer stock effects in spite of better inventory management that has been supported by new innovations, including information technology and supply chain management. Rising aggregate demand in the economy may have supported these trends. The accelerator effect is also seen from the positive and significant coefficients of lagged sales in almost all the cases for inventory investment and its components for all the sub-periods, specially so in the 1990s. The implied γ is also seen to increase markedly in the period 1992-93 to 1999-00 and its positive value implies under-reactions in the expectations formation of firms. In other words, this implies that firms underestimate sales when sales are increasing in time and overestimate them when sales are decreasing in time.

The cash flow coefficients were large and had the expected sign for the total inventories and its components. Sub-period analysis indicates that cash flows continue to have a significant impact on inventory investment during the post-reform period, though the size of the contemporary cash flow coefficient has somewhat decreased. This may mean that easier access to external finance has to some extent reduced firms' dependence on internal resources, but cash constraints continue to affect inventory investment. This could be the result of financing hierarchies, in which firms have to pay external financing premium.

The monetary policy variables, viz., interest rates and expected inflation, by and large, had a varied impact on inventories during the period under study. The interest rate coefficient for total inventories

was found to be highly significant during 1980-81 to 1991-92, but turned out to be insignificant during the post-reform period 1992-93 to 1999-00. This may be on account of the reduced relevance of SBI advance rate with a shift in bank lending from short-term loans to term loans and emergence of alternative financing sources that are also reflected in reduced significance of the cash flow variable. The significant impact of interest rate for total inventories, during 1980s was largely on account of financing of finished goods inventories, but generally interest rate was not found to matter for raw material and work-in-progress inventory investment. Current and lagged inflation rate had generally positive sign. For total inventories and all its components it was significant during 1970s. One may recall that 1970s included three years of double digit inflation following the first oil price shock and also a double digit inflation in the terminal year as a result of second oil price shock. This could have encouraged firms to build up inventories to beat the high inflation. Annual data on inventories confirms the hypothesis of inventory build up in these years. In the 1980s, however, the coefficient carries a negative sign and turns out to be significant for total inventories and finished goods. It is difficult to find any convincing explanation for the same. With low and stable inflation in the 1980s one would generally expect the price expectation coefficient to be insignificant. The price expectation coefficients for the total inventories again turned positive and was significant at 5 percent level for the period 1992-93 to 1999-00.

VII

Conclusions

The paper augments production-smoothing specification with cash flows and monetary policy variables in its application for the Indian data. Several interesting findings emerge from the analysis. However, the results obtained need to be viewed with the limitation of non-availability of quarterly data for the Indian firms. Given that our empirical analysis is based on annual data at the level of firm, it is unlikely to pick up the short run responses to sales shocks that are so important to aggregate analyses with monthly or quarterly data.

Firstly, we find that finished goods account for largest component of stocks as well as flows of inventories for the Indian firms. Unlike the firms from developed countries, the work in progress and not the finished goods inventories constitute the smallest component of total inventories. Secondly, unlike the US firms, Indian firms do have finished goods as the most volatile component of total inventory investment. Thirdly, variance of production for the Indian firms is found to exceed that of sales, indicating that like in other countries, the production smoothing argument for holding inventories is not strong in case of the Indian manufacturing firms. Fourthly, at the disaggregated level of industry groups, positive correlation is found between inventory investment and sales for most industries. This result contradicts the buffer stocking explanation for inventory holding. Fifth, the investment behaviour of finished goods, raw materials and work-in-progress show diverse responses to price, quantity and financial variables. Panel data estimation indicates that coefficients on lagged inventory stock variable are always negative and highly significant. The estimated speed of adjustment from the actual to the desired inventory stock was the fastest for finished goods inventories, while it is lower for total inventory investment. The speed of adjustment to targeted total inventories is estimated at 22 percent per annum for the full period. However, this has a downward bias arising from time aggregation. Disaggregated analysis for sub-periods shows that Indian firms adjust inventories exceeding 30-46 percent annually in all the three sub-periods. The adjustment is faster for finished goods at a rate of around 62 percent per annum during the post-liberalisation period 1992-93 to 1999-2000. The results reveal that the speed of adjustment for inventories of the Indian firm at 30-46 percent obtained for shorter time spans of around a decade in the three sub-periods is not very different from the 33-36 percent for the Dutch firms as reported in Bo (2001) and 27-30 percent for the US firms as reported in Carpenter, et.al. (1994). However, the speed of adjustment for Greek corporations as obtained by Louri (1991) was higher at 63 percent. While for the Greek firms raw material adjustment was faster at a speed of 83 percent in comparison of 28 percent for finished goods, we find that the adjustment speed at 31

percent was same for these two components of inventories for the Indian firms.

Sixth, a consistently positive sign and significant coefficients on sales obtained imply that the accelerator impact is dominant. Seventh, real interest rate was found to be an important determinant of total, finished goods and raw material inventory investments, though not for the work-in-progress. Eighth, price variables are significant, but quantity variables viz. lagged inventory stock level and sales are much more important.

Lastly, while stock adjustment has a large influence on inventories, one robust result of the analysis of inventory behaviour in this paper is that cash flow is found to be an important determinant as well. The cash flows continue to significantly impact inventory investments in the post-reform period beginning 1992-93 implying that external financing premium may continue to exist in spite of the emergence of alternative sources of financing for the firms from the stock markets or elsewhere. Availability of internal finance amidst financial market imperfections, therefore, does cause fluctuations in inventory investments.

Data Appendix

Total Inventories Stock, Finished Goods Inventory Stock, Raw Materials Inventory Stock, Work-in-Progress Inventory Stock: The balance sheet data report the book value of total inventories, finished goods, raw materials, work-in-progress and 'others'. Firms value their inventories either by LIFO methods or FIFO methods. Indian firms are known to apply FIFO method generally to evaluate their inventories, the governing rule being "lower of cost or market value". To remove the inflation bias from FIFO firms', the inventory stocks are deflated by the index for change in stocks.

Total Inventories Investment, Finished Goods Inventory Investment, Raw Materials Inventory Investment, Work-in-Progress Inventory Investment: Total inventory investment and its components are the annual changes in the stocks of total inventory stock and

respective stocks of its components. For FIFO firms, the change in inventories will be overstated if there is a positive inflation rate because the end-of-period value will include the nominal inflation of the stocks. To remove the inflation bias from FIFO firms' inventory investment variable, the stocks are deflated by the index for change in stocks before computation of change in inventories.

Sales: Sales are net sales adjusted for excise and cess and excludes other income. To construct a real measure of sales, implicit GDP price deflator deflates reported nominal value of sales.

Internal Finance: The measure of internal funds is defined as cash flow relative to beginning of gross fixed assets. Cash flow is defined as income (or loss) from operations (net profit) plus depreciation, depletion and amortization of property, plant and equipment. The implicit GDP price deflator deflate cash flow to construct real measure of cash flow.

Short-term Interest Rate: Real short-term interest rate is calculated as the State Bank of India advance rate less the percentage change in the GDP deflator.

Price Expectations: The price expectations are formed autoregressively and are assumed to be a distributed lag function of current and past actual levels of inflation rate based on wholesale price index.

Notes

1 In practice, apart from the rising marginal costs the firms also face costs for changing levels of production reflected in say search and contract costs for additional labour or other inputs that may be needed or settlement costs for firing workers or exiting out of existing contract arrangements for other inputs. While these are not generally explicitly introduced in literature, these costs reinforce firms to smooth production.

2 Marginal cost of holding inventories consists of the cost of finance as well as storage costs, the risk of obsolescence etc. and the marginal benefits of holding inventories.

3 A drawback of using annual data is that one can miss some of the cyclical variation that characterizes inventory behaviour. However, higher than annual frequency of data on inventories or its breakups are not available for Indian firms. However, change in stocks at aggregative level is available from unaudited quarterly results from the year 2000 onwards.

4 Since production (Y_t) = Sales (S_t) + change in the stock of inventories(ΔN_t), $Var(Y_{it})=Var(S_{it})+Var(\Delta N_{it})+2Cov(S_{it},\Delta N_t)$, $[Var(Y_{it})/Var(S_{it})] < 1$ requires that $Cov(S_{it},\Delta N_{it}) < 0$.

5 Raw materials were also found to be the most volatile component for the Australian manufacturing firms accounting for 39.3 percent for the de-trended variance of total inventories (Flood and Lowe, 1993).

6 Only in case of textiles the ratio was the variance marginally less than unity for both the variance ratio measures. Also, in case of the sub-component of machinery other than transport and electric the first ratio was marginally less than unity.

7 Apart from the interest costs, inventories also attract carrying costs in the form of storage, decay and obsolescence.

8 For instance, Carpenter, et al. (1993) obtain coefficients that imply an estimated speed of adjustment of the actual to desired inventory stock in the range of 14 to 26 percent per quarter for the US firms depending upon different time periods and depending upon whether the firms were small or large.

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Global Acquisitions: Strategic Integration and the Human Factor by Stan Lees, Palgrave McMillan, New York, 2003, pp.275, US $ 45

Mergers and acquisitions (M&As), joint ventures (JVs) and other forms of strategic alliances have recorded a tremendous growth in recent years. Acquisitions have become a generic strategy for many companies. Today 50 large multi-nationals, as an outcome of multiple acquisitions, drive the global economy and control around 25 per cent of total U.S. corporate assets. There are life cycle reasons behind acquisitions to seek specialised partner for growth, achieve expertise of a large firm diversification, *etc*. However, numerous studies across an enormous range of performance parameters, industries and countries show that more than 50 per cent of all M&As, JVs and alliances have failed. More disturbingly, the studies indicate that the rate of failure has not declined over the previous three decades. In this context, the book by Stan Lees assumes importance as it deals with the issues relating to personnel management and national culture, which have recently been held responsible for the corporate merger failures by many studies.

In a pre-M&A deal process, special emphasis is often placed on the strategic and financial goals, while the psychological, cultural and social implications do not receive much attention. The purpose of the book is to delineate the dynamics of socio-cultural processes inherent in global M&As and to discuss their implications for the management of post M&A situation. The book provides a selected blend of theory and practice, research and experience woven together to provide some essential frameworks to guide the integration of mergers and acquisitions. It addresses the issue of how best to approach and manage the merger of firms to achieve desired goals.

International experience shows that majority of the merger cases have failed to deliver the full value added as per the promises. In fact, in most cases, M&As have destroyed shareholders' value than add to it. These have been found applicable for small as well as large MNCs.

Generally, takeovers are supposed to improve economic efficiency and protect investors' interest but due to wide dispersal of share holding,

in some cases, corporate executives have used their broad discretion benefiting their own interests than those of the small investors. A very few merged companies have performed as per the theoretical predictions of high returns, higher efficiency, synergies and capability transfers.

A range of studies has shown a consistent pattern of poor long run performance in both acquiring firm and target firm. The acquisition history points towards harder efforts needed for retaining the market share than to buy, managing and developing know how after buying it, and turning a competitor into a collaborator, *etc.* These problems are equally faced in the case of horizontal and conglomerate mergers. The reasons behind value destruction may be flawed strategy, business life cycle reasons or fundamental weakness in both the theory and practice. Weak strategy may be on account of decisions taken in isolation by the top management without taking into confidence the senior executives who have to carry out the strategies.

The author emphasises upon the ability to integrate acquisition and alliances speedily and effectively as a competitive necessity, as size and barriers to entry can no longer be the only tools for the survival strategy. The small firms can beat even the giants and gain some advantageous position by showing greater integrating capabilities. In case of cross-border mergers, human factor extends into national culture and includes the task of interfacing very different management styles and work place expectations in different countries. Therefore, financial, commercial and economic considerations are necessary but not sufficient condition, for a successful merger. Human and organisational conditions are rarely emphasised, which in fact are necessary for a successful merger.

The author provides different measures to evaluate the degree of success of M&As *viz.*, financial measures, economic measures, strategic measures, executive measures and regulatory measures. These measures assess different aspects in the post merger phase. The often raised question, "whether takeovers bring benefits to shareholders", has been concluded negatively on the basis of a survey of studies based on thousands of takeovers across the world, and such poor post-

acquisition performance has been observed mainly during the decades of 1980s and 1990s. Similarly, not a single large-scale investigation has concluded that takeover and mergers are profitable and supports the view that size does not matter much. The reason cited is that economies of scale are accompanied by human diseconomies, which are generally ignored before the merger deals.

The author accepts that both economic theory and finance theory are inadequate to predict accurately the prior conditions necessary for a successful acquisition at the firm level. Instead, theory of organisation and managerial behaviour can better explain the inefficiencies of size and under-performance in the post acquisition period. The strategy, considered as a critical variable affecting acquisition performance, is found to have a loose relationship with performance and varies from case to case. The historical record reveals that till 1950, M&As were mainly of horizontal and vertical nature and then subsequently, the strategy was to achieve conglomerate bigness and diversification. Although, strategy thinking changed across the periods but acquisition performance did not. So what really needed is not the strategy but the capability to make a choice strategy happen and deliver the desired outcome.

The post-merger value destruction of the companies has been attributed to twelve factors relating to managerial mindset, *i.e.*, how managers perceive, how managers interpret, how managers think and how do they act in an acquisition context. In most cases, lack of pre-deal organisational audit and tracer thinking, over emphasis on forecasting models to arrive at real value of acquisition and synergy, political and personal motives of managers, lack of industry knowledge, and naive behaviour lead to value destruction. Top-down strategy has got to be matched with a detailed bottom-up business plan of how the acquisition is to generate value. This is the only way, managers down the line can know what they are expected to deliver.

Similarly, for a successful acquisition deal, potential gains depend upon a long-term interaction between markets and hierarchies. Every acquisition deal needs a commercial manager and an integration manager who need to work hand in hand, right from the beginning of

deals. Another aspect generally ignored before the deal is the proper auditing of the inner organisational working. This requires a strategic mindset through which acquisitions are viewed. This aspect needs to be focussed upon as dishonest presentations are very common in the post-acquisition period. The merged companies should have the clear crystal idea about the key responsibility holders before negotiations.

Another factor responsible for the poor post-merger performance described in the book is attempt by acquirer to standardise the functions of the merged entity into its own format irrespective of the strategic logic, which may bring comfort for the acquirer. The author provides six possible models to integrate the structure after the M&A deals. The decision to adopt a model through cost-benefit analysis is quite crucial as these have their own gains and losses. As wrong choice often turns synergies illusory or trivial and acquirer must focus upon removal of barriers to synergy.

One part of the book has been exclusively devoted to discuss human resource strategy in M&As after deals. The response of employees of the acquired firm is often seen in the form of shock, rivalry among the managers of both entities, fear of job loss leading to stress, brain drain and building up of different scenarios by those at the low level of management left with the information vacuum. Therefore, the author emphasises the need for a co-ordinated and integrated effort on many fronts, not only at top management level, but also at middle and low levels of management too, particularly in the case of hostile bids to achieve best of the human resources. The author suggests an integration by adopting coherent programme of action, generating a sense of commitment and providing flexibility of thought.

The author emphasises on the three stages of commitment building. First is commitment at the top level during negotiations, *i.e.*, chemistry at the top level with common philosophy and honest discussion. The second stage is reducing fear and securing commitment among the mangers and staff on both sides before the deal, which is rather difficult as compared to commitment at the top due to involvement and participation of a large number of people. The third stage is to enhance the sense of commitment in the post-merger period and avoid drifting

of good people by giving them opportunity of being heard seriously. Otherwise, the author warns that behaviour related problems might bedevil integration.

The author also lists factors important for shaping the environment congenial for implementation of M&As. These are communications of honorable rhetoric, (*i.e.*, sticking to the promises), clear vision, winning the commitment of the workers, enhancing credibility and respect among the acquired firm's staff, perceived business benefits for seller, devising of incentives strategy based on performance, and proper interface at managerial level. In the absence of these factors, successful and smoother implementation of M&As cannot be ensured.

The scope of merger is generally downgraded when cultures of two organisations are found to be incompatible. Although it is not possible to separate out natural culture from organisational climate (culture), it has to be managed through engineering the norms of the work place in the interest of strategy and the commercial imperative. A cross- cultural comparisons can give real role model firms whose practices can be observed and aspired. Managing national culture in two autonomous organisations after a global merger is largely an issue relating to personnel management, which can be handled by selecting key boundary positions who can mentally budge the differences and build cohesive teams around them. Otherwise, in case of two different firms merging structurally have to design new systems and practices, which are acceptable to both sides, *i.e.*, within parameters legitimated by two different national cultures. To reinforce cultural change, leadership and communication are essential and it has to start essentially from the top. Human resources practices if focused towards integration and acquisition goals can immensely contribute to cultural change. These core practices are of selection, appraisal, reward and development. These human resources practices can bring two cultures closer and together. There is such a diversity of national difference in each of the global deals that there can be no general presumption to ensure success of the deals. In short, the common problem among the M&A failures is neglect of human factor but the solution varies across the countries depending upon cultural, political and economic variability.

The issue raised by the author is well recognised as an ILO Report also noted that inspite of the vast scale of M&A activities during the last decade, two-thirds of M&As failed to achieve their objectives, despite the often massive job losses and organisational restructuring they entailed. The Report also cited reduced job security, anxiety and stress as the factors, which can impinge on the performance of companies after M&A. Therefore, the main point emerged from the ILO Report is neglect of the human factor as a frequent cause of failure of M&As. Despite the historical record of reported failures of M&As on several fronts, a large number of M&As have taken place in the recent decades. This paradox remains unanswered by the author.

Although the book attributes much of the foundering of M&A expectations to shortcomings in dealing with the human resource fallout of redundancies, which may seriously undermine operational capabilities and employees morale, but the message by the author to mitigate and manage the human resource crises in a better way is not very explicit but general. The author rightly touches upon an important but often ignored issue of culture. A KPMG study also confirmed that M&A deals are 26 per cent more likely to be less successful if, cultural issues are not attended properly particularly in the case of global M&As. The intention of the author seems to be to put an emphasis on increased social dialogue between top management and the staff of both the merged firms throughout the M&A process to dispel uncertainty as merger implementation involves sensitive management and personal issues with far reaching impact on workers' rights and their vision about the organisation. The workers' involvement can decisively contribute to successful achievement of the merger's objectives. The author seems to believe that mergers are not just about balance-sheets; cash flows and marketing synergies; these are about the people making the synergy real and this is what the book is all about.

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Privatisation and Public Regulation: The Indian Experience by Simrit Kaur, Macmillan India Ltd., New Delhi, 2003, Page 276, Price Rs. 385

The first four decades since independence witnessed an impressive growth of Public Sector Enterprises (PSEs) as they were envisaged as a matter of policy to assume the 'commanding heights' of the economy. The generally poor performance of PSEs in relation to expected goals radically altered the perceptions about the role of PSEs in the last decade and a half, and a persistently weak fiscal position brought to the fore the need for reforming the PSEs. Privatisation aimed at enhancing competition and efficiency figured prominently in the initiatives launched to reform PSEs - a trend that is commonly observed now in many developing countries. But is the private sector a complete paragon of virtue? If yes, what should be the modality for privatisation? And what role should Government play in such a scenario? These are the issues, which have been extensively debated both at the national and international levels. Though the efficacy of privatisation is still being debated at the theoretical levels, there is a growing consensus in favour of privatisation among policy makers. The present book essentially reviews this debate, further reaffirms the broad consensus and analyses the various divesture and non-divesture options for privatisation.

Listing out the usual cases of market and non-market/ Government failures, the author contends that the issue is not to choose between Government and the market, but to explore the effective combination of the two, that would be economically and socially desirable. In this context, the author has emphasised the need for the State to reduce its role as a producer of goods and services and to expand its role as a regulator, facilitator and provider of welfare services and merit goods. The author further underscores the need to reform the PSEs either *via* privatisation or effective public regulation. Privatisation can take the form of: (a) Ownership transfer, where by the assets are privatised, fully or partially *via* disinvestment, (b) Management transfer, where by the assets are either subcontracted,

leased or franchised or (c) Marketisation (Greenfield Privatisation), where by private sector participation is encouraged in areas, hitherto reserved for public sector. Public regulation, on the other hand, tries to privatise the 'public style of management' by enforcing performance contracts. Besides analysing the operation of each of these modes in the Indian context, the author has also empirically examined the relationship between (a) ownership and efficiency, (b) competition and efficiency and (c) Memorandum of Understanding (MoU) signed between the Government and the management of the PSEs and its associated impact on the performance of PSEs.

Assessing the performance of public sector in India (using the input output analysis), the author has opined that, PSEs, despite their poor financial performance *vis-a-vis* the private sector, have played an important role in laying down the India's industrial base and diversifying the industrial structure *via* its linkages with the rest of the economy. However, in the present day context, taking an ideological stand on the issues involved in PSE reforms could be grossly out of sync and there is a need to improve their efficiency so as to enable them to compete effectively with the private sector, which is well equipped today to undertake the production of all commodities, including infrastructural services. Against this backdrop, the author has analysed the *modus operandi* adopted for PSE disinvestments in India during the period 1991-2001 and has then, listed out the various divestiture options according to the hierarchy of political desirability and capital market sophistication of a country. On top of the author's list is public offering, which is the most preferred choice in view of the desire to spread ownership widely. Next in the list is employee buy outs, followed by private and overseas trade/strategic sales. The author, however, has not discussed what is today an appropriate method for India - is it strategic sale or public offering – the question that attracts the attention of the policy makers. While many support 'strategic sale' on the ground that it is revenue enhancing, others oppose it as a means to practice crony capitalism. The Disinvestment Commission is of the opinion that if the Government has a role to play in the sector in which the PSE is functioning, then in Initial Public Offering (IPO) route is to be adopted. This would enable the Government to

retain ownership, while allowing the presence of outsiders to act as a check. If the Government's presence is not mandatory, then the ideal route would be the strategic sale. While adopting this route, the Government may sell enough to improve the quality of management, thus ensuring better market valuation, before selling the entire stake. The option of management employee buy outs that falls second in the hierarchy list of the author is attractive as it tackles both employment and divestment issues. However, it may be noted that we are still not up to the mark with regard to this approach. Employees have normally been put at par with strategic partner. Hence, there is a need to devise new systems, where by employee not only benefits but is also treated differently from the strategic partner.

The author has also tried finding an answer to - how far the PSE's shares subsequent to disinvestment are traded on the stock market, so that prices of these shares can be looked upon as an indicator of the management performance. The author observes that PSE stocks, which have been divested through public route/participation tend to be more liquid and more actively traded as compared with the dull stocks, divested directly through institutions and hence, he has favoured greater private/retail participation. It needs mention here that there has been a marked change in the mindset of the Government since the late 1990s. Earlier it was selling to institutional investors, while now it is trying to attract retail investors *via* various incentives-larger reservation for retail investors/employees, offering greater discounts, no lock-in period for employees, *etc*. The response of retail investors to Maruti issue in June 2003 was quite successful though it was not up to the mark in the March 2004 public issues, mainly because of bunching of too many issues and financial year ending compulsions.

The book also lists out certain cases of strategic sale of PSEs by Government such as BALCO, MFIL, Laganjute, CMC and Air India. The case of BALCO has been analysed very critically bringing out all the relevant issues/controversies and certain lessons to be learnt which are important from the policy angle. These include: (a) standardisation of the method of valuation and division of stake of power between the State and the Centre prior to disinvestment

decision, (b) legal aspects concerning transfer of land and other assets to private management to be sorted out at the earliest and, (c) employees, concerns to be taken care of *via* an assured Voluntary Retirement Scheme. The author has raised very valid concerns here. Modality for transfer of land and other assets to private hands obtained on lease/low rent from State/Centre are the issues to which policy makers are still in search of solutions.

Continuing his analysis of different modalities of privatisation in India, the author has devoted one full chapter to the 'Greenfield privatisation' approach used extensively in the field of infrastructure. The author points out that unlike many other developing countries, where an aggressive policy of privatisation involving transfer of ownership from the public to private hands has been adopted as a part of liberalisation of infrastructure sector, India's 'Greenfield privatisation' approach has prompted private industrialists to venture into areas earlier reserved for public sector, such as power, aviation, telecommunications, roads and railways. The author has then elaborated upon the progress so far on the privatisation of infrastructure - sector wise (transportation, telecommunication and power), drawing heavily from Rakesh Mohan's India Infrastructure Report, 1996. The author observes out that as a result of enhanced private participation, the share of private sector investments in infrastructure will soon touch the 45 per cent mark, as envisaged in the Report and will help to enhance efficiency in the sector.

Having discussed some of the privatisation modalities adopted in India, the book makes an attempt to address the fundamental issue as to whether ownership or competition is more important for efficiency. Although empirical literature so far provides mixed results, the author has provided overwhelming evidence to support that efficiency is ownership neutral and it is competition, which alone matters. To prove his point, he has examined a diverse group of public and private enterprises in terms of growth in productivity (using the translog index) over the period 1988-89 to 1994-95. Results showed that both the groups, *i.e.* public and private companies performed equally well, as the average annual growth rate of their productivity

was almost the same, thus, proving his point that efficiency is ownership neutral. In order to estimate the effect of competition (rather than ownership) on the efficiency of the firm, an attempt has been made to compare the average growth rate in total factor productivity of PSEs operating under monopoly market environmentwith the PSEs operating under competitive market conditions. The author has shown that PSEs operating under monopoly environment have experienced a negative average annual growth rate over the period 1988-89 to 1994-95; while competitive PSEs, on an average, experienced a positive growth rate of 1.5 per cent during the same period. Thus, the author has established the primacy of competition over ownership and hence, has emphasised the need for a policy shift away from an overriding concern from transfer of ownership to private sector towards ensuring a more competitive environment. There is no denying the fact that whether it is public or private sector, they function well in a competitive environment. However, it needs mention that the author's analysis is debatable, on both technical and theoretical grounds. First, the author has used the combined translog index, though the individual industry - wise break up portrays a different picture, enunciating the need for a case by case evaluation. Secondly, does the author's analysis mean that PSEs be allowed to function if competition is promoted? The answer could be 'yes' only if a lot of other complementary factors associated with ownership change also work at the same time. More than efficiency, ownership matters for companies for ensuring a level playing field with their private sector counterparts in terms of access to capital markets while avoiding the political interference and imposition of non-economic objectives on PSEs. The pressures under which a private firm operates such as - shareholders monitoring, threat of liquidation and take over - get diluted for PSEs. Infact, there is a whole host of literature now, that says that competition without privatisation might be difficult to sustain in the long run. Hence, the choice between privatisation and competition could be more about sequencing rather than exclusive use of one over the other.

Irrespective of the results obtained from ownership *vs* competition analysis, some PSEs will continue to remain in the public sector.

According to the author, for such PSEs, Government has to attempt an improvement in efficiency, within the existing ownership pattern by effectively regulating the PSEs *via* use of performance contracts. In this context, the author has attempted a very logical and unique way of analysing the role of MoUs as a regulatory device, with first questions and concerns clearly specified and then empirical exercises carried to find out the answers. The author has indicated that MoUs in India suffer from the problem of soft targeting, and hence, there is a need to make it more effective either by providing monetary incentives linked to MoU system and factor productivity improvement as in countries like, Pakistan and South Korea or *via* other innovative methods.

To conclude, the choice between 'privatisation' and 'public regulation' or between the different modalities of privatisation is far from being simple and straightforward. While some of the author's conclusions are debatable, yet she has been successful in portraying a clear picture on many aspects / issues related to privatisation. The book indeed marks an important contribution to the ongoing debate on the economics of privatisation. The author's analysis of role of competition and that of MoUs are quite unique and interesting. The analysis of the disinvestment policy for the Government, however, remains incomplete. Readers could have been well served by a discussion on a range of conceptual and micro issues related to privatisation/disinvestment, which are being publicly debated more recently. Which route to adopt while privatising/divesting PSEs? Whether profit - making PSEs/Navaratnas should be treated differently from loss-making ones? Whether restructuring, both organisational and employment, should be taken up prior or post to disinvestment? What should be the strategic timing of an IPO sale? Whether to follow bidding route or market valuation route? How to ensure effective retail participation? How best to tackle legal issues? These are some of the dilemmas- the answers to which would go a long way in providing direction to the current Government policy. Nevertheless, the theme of the book is highly topical and relevant in the present context.

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Determinants of Adoption of HYV Rice in West Bengal by Anamitra Saha* Published by K. P. Bagchi & Company, Kolkata, 2004, Page: 200, Price Rs. 300

The history of agriculture is the history of intensification. Intensification follows successful innovations. It was innovation in the yields that is Green revolution in the mid-sixties, that catalyzed a metamorphosis from the conditions of food shortage to one of self-sufficiency and beyond- making India in the process, a world leader in the number of agricultural commodities. Agricultural growth witnessed a sharp turnaround in the immediate post-green revolution phase, largely driven bay the growth in yields. In India, the growth in agricultural output has been largely yield driven with the contribution from marginal acreage being only minimal. Today, while India is a world leader in the production of number of agricultural commodities, its yield levels for most of the crops are nowhere near comparable with what some of the other countries of have achieved. One of the main attributes for the low levels of yield attained in India is the unsatisfactory spread of new technological practices, including cultivation of High Yielding Varieties (HYV).

Placed in this perspective, the book under review – an outcome of the author's Ph. D work mirrorsa brilliant exposition of typical case of rice cultivation and the persistence of incomplete adoption new technology- HYV in West Bengal. The study gains a sharp focus when seen in the context that the last two and a half decades have been an eventful era in the West Bengal countryside. The study at the outset, begins with a historical voyage, tracing the temporal changes in the institutional/agrarian structure of West Bengal- rural discontent and peasant uprisings in the mid-sixties, culminating in

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the launching of *"Operation Barga"* in the late seventies, and consequent realignment of balance of rural power and agrarian relations leading to a higher growth trajectory in agriculture during the eighties. With the advent of institutional changes in the agrarian structure, West Bengal moved away from a situation of stagnancy to one of the highest growth performances among the States of India. Agriculture in the State witnessed a sharp rebound in the 1980s, recording a growth of 6.4 per cent, which was impressive compared with a mere 2.8 per cent growth attained in the preceding decade. To a large extent, this growth was fuelled by rice production owing to more efficient use of resources, driven by the incentives embedded in the land reforms. The growth, however, could not be sustained in the 1990s, with rice production sliding down to a mere 2.2 per cent from the high of 6.3 per cent in the earlier decade. The inadequate spread of new technology imposed binding constraints on the sustainability of growth process. It is in the context of historic change in the forces of production in the West Bengal agriculture, that the importance of present book is rooted.

The present study makes an earnest endeavor to examine these developments by exploring the underlying pattern of adoption of HYV technology in *aman* rice (principal crop) production. Drawing upon the farm level cost of cultivation data, for the late 1980s and early 1990s, the author undertakes a microscopic detailed empirical analysis of role of learning, uncertainty, risk and liquidity constraints, which influence the farmer's adoption behaviour. While data on some of the aspects like education, occupational status, access to credit, household consumption and assets- were compiled from the original survey of schedules, painstakingly by the author himself, the richness of the data so compiled allowed the author to test for alternative explanations of adoption behaviour- the explanations that could not be explored in the earlier literature, owing to the constraints of data availability.

The book represents a skillful demonstration of rigorous econometric modeling. While the concepts like risk, uncertainty, learning, and liquidity constraints are relatively easy to model theoretically by specifying alternative values of the relevant parameters, their identification in an empirical framework could be rather challenging, the author has successfully circumvented this challenge.

Alluding to the existing micro-theoretic models of farmer's adoption behaviour, which ascribe four factors responsible for sub-optimal rate of adoption of modern technology, *viz*., preference for output derived from traditional technology, risk aversion tendency, incomplete learning and fixity of inputs or working capital, the author goes a step ahead in adding that, institutional structure for dissemination of new technology, agrarian structure including distribution of assets, structure of markets and the availability of other inputs like credit concurrently act as crucial determinants of farmer's adoption behaviour.

While having conducted the preliminary analysis of cost of cultivation data, the author delineates three broad patterns, typical to the HYV rice cultivation in West Bengal-the dominant influence of agro-climatic factors on the process of diffusion of HYV cultivation in *aman* season; widespread use of fertilisers despite the lower adoption of HYV cultivation; presence of higher proportion farmers with irrigation facility among HYV cultivators. Contrary to the general perception that the availability of irrigation is a precondition for cultivation of HYV rice, the author asserts that adoption of HYV cultivation even in the absence of irrigation could be profitable relative to the cultivation of traditional rice, if the rainfall is normal.

The author has applied the alternative forms of heteroskedastic models to quantify the risk of HYV technology. Having estimated the stochastic yield function in three stages using non-linear

regression techniques, the author demonstrates that cultivation of rice involved higher variability and hence, higher risk as well as higher mean yield compared to traditional rice, while other inputs including fertilisers were largely risk neutral. One, however, needs to see higher variability in conjunction with the presence of other complementary factors such as rainfall/irrigation, topology and the soil nutrient conditions, *etc.*, as HYV cultivation by itself does not entail higher risk. The concept of dispensable inputs and non-dispensable inputs is dealt with by means of an innovative specification of production functions, which allows for positive outputs even when one or some of the inputs are equal to zero.

Another important area of policy intervention, touched upon by the author is the impact of binding liquidity constraint on farmer's degree and intensity of adoption of HYV cultivation. Although, limited access to working capital is perceived to be a barrier to the process of diffusion of technology, the existing literature remains mute on the suitable methodology to test it empirically in the process of adoption. It is in this context, the present study scores over the extant literature.

To identify the liquidity constrained and unconstrained farmers, the author has cleverly deployed the advanced econometric models of switching regressions with endogenous sample separation. The estimated coefficients of two regimes indicated that greater availability of liquidity or funds had a positive impact on utilization of funds for productive purposes per unit of land, while greater requirement for consumption reduced such expenditure. For the unconstrained farmer, on the contrary, expenditure per unit of land was influenced by factors such as the degree of adoption, agro-climatic environment and wage rate. Thus, the author's exercise in this context supports the general intuitive conjectures.

The author adduces that the institutional credit per unit of gross cropped area in the State remained abysmally low as compared to other major States. In this context, it could be observed that there is also a case for *bi-directional causality*- demand driven approach of Joan Robinson-*"Where enterprise leads, finance follows" i.e.,* the areas, endowed with better topological conditions, irrigation, adoption of modern technology, *etc*, attract more credit. For instance, States like Haryana, Punjab and UP have performed better on this count. Lending to agriculture in these States becomes relatively a safe proposition as these States being in the Indo-Ganjetic plains, are well endowed with favourable topological conditions and perennial rivers, which has facilitated the adoption of modern technology in turn, reducing the downside risk perception associated with such credit transactions (Binswanger, Khandker and Rosenzweig, 1989)*

The author has developed a unified empirical methodology to examine the factors that influenced the farmers' decisions pertaining to allocation of land and input between the traditional and HYV rice. Having arrived at the estimates in a simultaneous equation framework, he concludes that all the three factors, *viz.*, liquidity constraint, risk aversion and social learning had significant impact on these decisions. While highlighting the importance of social learning, he pin points that farmer's adoption decisions are crucially influenced by the decisions taken by others in his close vicinity. As per the findings of the study, there was no significant impact of farm size on the intensity of fertiliser usage, while the impact of farm size on the degree of adoption (HYV) was weakly significant, which appears to be counterintuitive

* Binswanger Hans P, Shahidur R. Khandker and Mark R. Rosenzweig, How infrastructure and Financial Institutions affect Agricultural Output and Investment in India, *Working paper, World Bank*, 1989.

as large farms have the tendency of using more fertilizers and HYV in view of their easy access to the resources.

The author ascribes the slow progress of HYV cultivation in the 1980s, to the failure of public policy to circumvent agro-climatic barriers of adoption and also to the failure of State extension service system. The author recommends that any process of rural development must address the issue of removing technological barriers in the form of imperfections and distortions in the market and put in place an efficient network of distribution. The study, however would have enriched itself, if it had delineated some specific policy measures to be initiated in the above context. Morever, one tends to be doubtful over the author's contention that poor institutional mechanisms for introducing suitable varieties was responsible for some of the non adopting villages and not the resource constraint or favourable agro-climatic factors or ignorance of the farmers, While as a matter of public policy, it is important to concentrate on strengthening the institutional mechanisms for providing extension services and distribution networks, the possibility of interplay of above factors cannot be ruled out.

While an integrated approach ensuring availability of storage/ marketing, improved technical, economic and infrastructural services could be more useful in augmenting the farm productivity, there is no denying the fact that intensive agriculture in the face of constrained extension necessarily calls for the adoption of new technological practices, which alone can increase the productivity even while the farm size decreases. Viewed from this angle, the study indeed represents an important micro level farm investigation, that too at a time, when such topics hardly attract the attention of young researchers.

The present book in toto, mirrors an excellent demonstration of quality empirical work supported by rich theoretical models and micro level data. The book re-kindles a deep insight into decision making and

behaviour at the farm level under credit constraints. The specific issues analysed in the book may vary across different crops depending upon the typical agro-climatic conditions, presence of other complementary factors and State specific conditions, nevertheless, the approach and analysis of the present study could indeed be of help to the scholars grappling with the problems of agricultural and rural development today.

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Rural Credit and Class Differentiation - West Bengal under Left Interventionist Regime By Sudipta Bhattacharyya, K.P. Bagchi & Company, Kolkata, 2003
pp xvi +216, Rs.450

Indebtedness of peasantry is considered as the root cause of backwardness in agriculture, which in turn gives rise to class differentiation. One of the most important reasons for indebtedness/ miseries among the peasants of rural India is the dependence on the usury capital. In order to give relief to the indebted peasantry from the burden of high interest rates, banks were nationalised in 1969 and 1980. Regional Rural Banks (RRBs), also came into being in 1975 in order to facilitate institutional credit for the rural sector. Institutional credit now occupies the dominant position in respect of agriculture sector. Hence, it is pertinent to ask the question as to what extent the small and marginal farmers have really been benefited from the institutional credit. Most importantly, after the recommendations of the Narasimham Committee, the nature of banking activities has undergone a drastic change. Earlier, the major objective of the banking system was to provide credit to different sectors in such a way that the economy could achieve high growth with stability. However, after the Narasimham Committee Report, the main aim of the banking system has been to maintain sound health of the banks, which was earlier neglected. Therefore, there is a dichotomy between the objectives of maintaining growth with stability, on the one hand, and sound health of the banking system by providing credit in a restrictive manner, on the other.

Against this backdrop, it is worth noting as to how far the institutional credit helped the small and marginal farmers to facilitate the production process in the country. The book entitled "Rural Credit and Class Differentiation – West Bengal under Left Interventionist Regime" by Sudipta Bhattacharyya has addressed this issue. It has tried to relate the role of institutional credit in a differential structure characterised by the inequality in the structure of asset, irrigation, output and marketed product.

The book has six chapters in total. At the outset, it has outlined the recent growth experience of West Bengal agriculture in the theoretical framework of agriculture-led development theorised by Bukharin and Kalecki. The main thrust of such concept is that if there is no scope for

a radical land reform in a mixed economy, agricultural growth can still be possible by means of a reform within the system, which could curb the power of feudal landlords and moneylenders. In the following chapter, it has been verified, whether the agricultural credit flow assists the process of agriculture-led development in the State. A brief history of the evolution of rural credit from the colonial period to the Left Front period in West Bengal has been explained. The chapter deals as to how the usurious capital in Bengal was born and flourished with the introduction of the differentiation of the peasantry during the colonial period. It has argued that the factors like de-industrialisation, commercialisation, subinfeudation, demographic change contributed to the process of differentiation on the one hand, and rise and growth of moneylenders, traders and landlords on the other. It has opined that while in India, the bulk of credit injection after the bank nationalisation has gone with the decline in the growth of capital formation and stagnant agricultural growth during the 1980s, in case of West Bengal a much higher growth was observed. It has been claimed that West Bengal has shown a egalitarian pattern of distribution of agricultural credit. The rural credit flow in West Bengal is found to be positively related with the agriculture-led development in the State.

In the following chapter, it is stated that with the advent of the capitalist relation in agriculture, the peasant society got bifurcated into two broad classes in the State *viz.*, bourgeois and proletariat. While the labour hiring household, accounting for 29 per cent of the sample households, corners about 60 per cent or more of productive resources, 39 per cent of total households belonging to the exploited classes have nearly 11 per cent of resources. However, credit market appeared to be more of egalitarian pattern. It has been observed that compared to all classes of exploited and self-employed, the labour hiring classes registered nearly double the yield level. It is against the populist view that family labour based farms are more efficient in respect of high yield than hired labour based farms implying a capitalist pattern of production. The author argues that substantial tenancy reforms through Operation Barga in West Bengal has provided a conducive environment in agriculture sector, which has led to the increase in investment in agriculture by the small and middle peasants in the State, unlike other States. On the credit front, it is shown that although there has been

substantial improvement in institutional credit, this has gone in favour of the labour hiring classes, while the exploited classes are still largely dependent on the non-institutional credit. It is argued that inadequacy of institutional credit keeps the private money lending classes still alive in the State in particular, and India in general.

Further more, it is shown that labour hiring classes obtain the major share of loan at lower rates of interest. This is because, this class has sufficient amount of property, which can be kept with the moneylenders as the mortgage. The picture is quite different in case of the poorer classes who have little assets and hence, unable to provide adequate collateral. That means the average rate of interest has an inverse relationship with the ascending economic classes and size groups. It is observed that wealthy labour hiring classes who have the ability to provide high-value collateral can sense the low interest loans, which is mainly used for unproductive purposes. On the other hand, due to their inability to provide adequate collateral, the poorer class do not get this facility. Hence, they are forced to borrow from the local moneylenders for survival. Therefore, a typical method of usurious exploitation is used against this class through this process. The author has further shown that labour-hiring classes, mostly belonging to the recorded tenants cornered a higher proportion of both institutional and non-institutional credit.

Finally, the author argues that although institutional credit has been able to lift the landless class above the poverty line, labour hiring classes has been benefited more than the marginal farmers. It has been observed that a large proportion of borrowers waived under Agricultural and Rural Debt Relief Scheme, 1990 (ARDRS,1990), belongs to the labour hiring class. It is observed that while the reason behind the default was poverty in case of the poor farmers, it is the willful default or unproductive use in case of the large farmers. The author concludes that if the free market related interest is adopted in case of institutional credit, large farmers will take the control of institutional credit, which would jeopardise the system in the long run.

Although the author argued that land reform in West Bengal has led to the emergence of a substantial proportion of hired labour using tenants who captured the substantial proportion of rural institutional

credit, he did not make any distinction between the tenants using hired labour and landlords who are basically supplying usurious capital to the rural poor. The author claims that the land reforms in the State was successful but land lords are still dominant in the State and exploiting the poor class. This seems to be contradictory. The author has shown that in the advanced region where capitalist form of structure has developed, the labourers are better off due to their high wage, while they are worse off in the backward region, because of low wage and demand for labour. In the case of self-employed class this is just the reverse. The author has made the capitalist structure in the advanced region responsible for this state. This seems to be not true. Here the role of the Government is important. Some sort of parity has to be brought in wage rates between the advanced and backward region of the State by adopting proper wage legislations in order to reduce the inequality. On the other hand, so far as self-employed class is concerned it is not the question of capitalist structure because of which they are worse off in the advanced region. It is the land holding pattern, which is responsible for its weak condition. The size of land holding perhaps is not viable, which needs to be looked into. Of course, institutional credit does have an important role to play. But this is also true that due to large number of defaulters as has been shown in the study, banks are skeptical in providing credit to the farmers specifically after the reforms took place in the banking sector. However, micro finance with the help of Self-Help Groups (SHGs) can play a major role in this respect. This aspect has not been discussed in the study.

Overall, the book is very interesting and worth reading. The author rightly touches upon, how the peasant class was developed in the State and how this structure is related to credit structure of the State. From this angle it has thrown a new light in the area of agricultural credit in West Bengal.

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