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RESERVE BANK OF INDIA

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Measures for Financial Services : A Review with Special Reference to Banking in India

Achintya Kumar Srimany and Kaushik Bhattacharya*

The paper provides a critical survey of the method of estimation of nominal and real output of the financial sector, with special reference to banking in India. The paper discusses some common approaches of measurement of real output of the banking sector. It shows that in the Indian context, direct application of these approaches would not be meaningful because of certain peculiarities of the banking sector in India. The paper suggests some modifications of the existing techniques. It compares the empirical performance of the proposed indicators vis-a-vis the traditional ones used in the national accounts statistics. The possibility of constructing more broad-based indices for banking services is also discussed.

Introduction

The problem of construction of short-term service indices has been addressed by several institutions.[1] In spite of the strong growth of the services sector in the market economies, so far very few short term service indices have been compiled.[2] The primary purpose of such indices is to assist in analyzing trends and cyclical fluctuations of the services sector.[3] These indices often complement the price and output indices of the 'goods' sector. They also satisfy the information needs of enterprises of the services sector that wish to compare their own performance vis-à-vis that of the whole industry. These indices are also useful for government departments responsible for policy formulations and for trade unions, consumers and investors.

The services sector in India contributes approximately half of the gross domestic product (GDP). With economic growth and devel-

opment, its contribution is likely to increase in the future.[4] The problems of measurement of this sector are, therefore, pertinent. The scope of this paper is somewhat limited because it does not address the general problem but concentrates on a part. The paper restricts its attention on the problem areas of an important component of the services sector, viz., financial intermediation services.

Currently, financial intermediation services constitute approximately 16 per cent of the value added from the services sector as a whole. The measurement problems in this sector are somewhat peculiar and deserve special attention. Moreover, in India, a discussion of the role of the services of this particular sector is now all the more relevant in the context of the on-going financial sector reforms. The reform process has initiated many structural and technological changes in the banking sector and has introduced a host of new financial instruments. In order to evaluate the effect of the reforms on the performance of this sector, it is important to know the turnover of this sector and also the extent to which the growth in turnover is due to changes in production alone and that to changes in prices.[5]

In regard to financial intermediation services, it is often difficult to present a break-up of turnover into prices and output because (i) many of the financial services are jointly produced and prices are typically assigned to a bundle of financial services and (ii) a large part of the financial services is apparently 'free' in nature. As a consequence, revenue of a financial institution typically understates the value of the financial services sold. Moreover, when conceiving a system of such indices, two major constraints have to be taken into account : (i) comparability of the indices with that corresponding to the goods sector and (ii) compatibility of the indices with the National Accounts Statistics (NAS). The first constraint implies that the indices of services sector should be analogous to that of the goods sector. The second constraint requires benchmarking these indicators to annual GDP by industry data.

The purpose of this paper is twofold. It provides a comprehensive survey of the existing approaches of estimation of nominal and real

output of financial intermediation services, with special reference to banking in India. It also discusses the applicability of the methods to India and shows that in the Indian context, a straightforward application of any of these approaches may not lead to a meaningful solution. Accordingly, the paper proposes certain modifications. The empirical part of the paper illustrates the proposed methods with some numerical examples. It computes some of the proposed indices under some simplifying assumptions and compares them with the implicit price and quantity indicators of the banking sector used in the national accounts statistics. It also explores the data requirements for a full possible construction of these indices based on those modifications.

The plan of the paper is as follows : Section II of the paper reviews the method of estimation of nominal output of the banking sector and Section III describes the same for real output. Section IV proposes the modifications. Section V illustrates the modifications with numerical illustrations. Section VI explores the data requirements for a full construction of the indices. Finally, Section VII offers some concluding observations.

Section II
Measurement of Nominal Output of Banking Services

The units which render intermediation in the financial services sector are mostly commercial banks. The services rendered by banks can be divided into two categories : those for which explicit charges are made and those for which they are not. Nowadays, financial intermediaries are increasingly tending to provide various kinds of auxiliary services of the first kind, e.g., activities like currency exchange, advice on investment, purchase of real estate or taxation. The output of such services is valued on the basis of the fees or commissions charged, in the same way as other services. The measurement of the production and consumption of these services poses no special conceptual or practical problem.

However, the activity which is the major source of earnings and profit of the banks is loan intermediation. Banks render services to

the customers in the form of maintaining their accounts. In return for this, customers are charged a nominal amount which is substantially smaller than the expenses incurred. On the other hand, banks provide loans and advances the returns of which are much higher than the payments made to depositors. This net return accruing to banks is large enough to meet their expenses and to earn them a profit. However, the usual procedure for estimating value added for the banking sector produces very small or negative value added. This is because in the national accounts, value added by a firm is defined to include net interest payments (interest paid minus interest received), which is commonly a negative figure for banks. The crucial problem in defining output and value added of banks lies in determining the exact part of interest payments that should be allocated to intermediation services.

To avoid spurious measures of output, the System of National Accounts (SNA), 1993 recommends the use of financial intermediation services indirectly measured (FISIM). The SNA defines FISIM as "the total property income receivable by financial intermediaries minus their total interest payable, *excluding the value of any property income receivable from the investment of their own funds,* as such income does not arise from financial intermediation" (italics added). Thus, the total output of the banking industry includes FISIM plus the value of services for which an explicit charge is levied.

The SNA 93 recommends that the FISIM should be recorded as intermediate consumption by enterprises, final consumption by households, and exports to non-residents. The allocation of FISIM among different categories is equivalent to reclassifying certain parts of interest payments as payments for services. This reclassification has important consequences for the values of certain aggregate flows of goods and services as also the measurement of total gross domestic product (GDP).

In practice, however, it is difficult to arrive at a suitable method of allocation which is conceptually satisfactory and for which all the requisite data are available. The 1968 version of SNA recom-

mended to treat the whole of the output as intermediate consumption of a 'nominal' industry. This convention makes total GDP for the economy as a whole invariant to the size of the estimated output of the banking sector. SNA 93, however, acknowledges that some flexibility in the allocation of this total output should be allowed. Regarding the allocation of output, it suggests the use of a "reference" rate of interest. The reference rate may be the one from which the risk premium has been eliminated to the greatest extent possible. Typical examples of such rates are treasury bill rates or the central bank lending rate. The allocation then should be based on the difference between the actual rates of interest and the reference rate of interest. Alternatively, FISIM could be allocated using different indicators like the proportion to the total financial assets and liabilities.

Section III
Measurement of Prices and Quantities of Banking Services

Measurement of the services provided by banks in real terms is difficult because the activities of banks are not directly countable. In many cases, they are jointly produced and consist of a sequence of barter transactions, the 'pricing' of which are extremely difficult. While there is no consensus on how to measure them, two measurement questions are common to the large literature on the subject. First, how are these types of financial services sold? Are they attached to the financial instruments accompanying the transaction or are they attached 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.[6] 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. This type of indices have been applied to measure productivity of the banking sector. In the U.S., labor productivity in the banking industry is generally measured by following the activity approach — bank output includes counts of loan and deposit activities (such as loan applications processed and cheques cleared). On the other hand, some researchers have felt that the amount of financial services sold by a bank can

be more appropriately measured by the money balances of various products.[7] This approach is particularly convenient when one attempts to examine the changes in the set of 'prices' of various products offered by a bank.

Another important question is : which financial services are relevant to the measurement of output; whether 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 intermediation process and are used for production of loans and investment while on the other, they are like output as a host of 'final' services (e.g., maintenance of money, free cheque facilities etc.) are attached to them. There is, therefore, no consensus regarding the status of demand deposits.

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. This type of 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 any single aspect related to the sector, concentrating on a simple ratio-variable.

Till the end of 80's, 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. Outputs for subsequent years were calculated by extrapolating the benchmark value by a factor based on the 'number of persons engaged in production', assuming no labor productivity growth in banking. The estimates showed very small real output growth in the banking sector, raising a concern that the method underestimated real output of this sector (Fixler, 1993). In spite of its defect, some other countries also adopt similar method (SNA 93, page 397).

The conversion factor used in the 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 current year and the base year and the wholesale price index (WPI). The volume of activity is measured by the ratio of aggregate deposits. To obtain the quantity index, the ratio of deposits for the two years is deflated by WPI.

Note that the 'quantity index' of banking used in the NAS in India although somewhat better than the one used by the BEA during the 80's 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 output 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 services move parallel to that of the goods sector, 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. While examining economies of scale in banking, researchers have estimated explicit multi-output production or cost functions. Typically, such functions include financial inputs and outputs, and the usual capital, labor and material inputs.

In the literature, three distinct approaches, viz., the asset approach, value added approach and user cost approach, have been discussed. Each of these approaches possesses certain advantages and limitations depending upon the purpose of inquiry. The process of generation of output and the role of demand deposit in these approaches are different.

Asset Approach

The asset approach does not estimate the prices and the quantities separately, but concentrates on the measurement of nominal output.

In the asset approach, the researcher determines *a priori* the activities that can be considered as the output of a bank. Other activities are simply deemed as financial inputs. Since bank liabilities have some characteristics of inputs as they provide 'raw material' for investible funds, they are considered as inputs. On the other hand, since bank ·assets are the ultimate uses of funds that generate the bulk of the revenue of banks, they are considered as outputs (Sealy and Lindley, 1977; Mester, 1987). Because only bank assets, and not bank liabilities, are specified as outputs, this approach is usually termed as the 'asset' approach. Sometimes it is also referred as the 'intermediation' approach.

The asset approach is equivalent to the services approach in the national accounts literature. It implies that banks buy and sell funds, in much the same way as any other specialized merchant. For some large banks that primarily purchase their funds (with interest payments) from other banks and large depositors and turn these funds into loans, the asset approach may be an adequate description of bank output. However, most banks do more than mere purchasing — they also provide substantial bartered services to depositors, but these services are not counted as output under the asset approach. Another criticism of the asset approach is that its groupings of inputs and outputs is arbitrary – the choice made by some researchers are disputed by others and the approach admits no mechanism for resolving such debates.

Under the current institutional arrangements, application of the asset approach to measurement of banking output often leads to contradictions. For example, consider a bank that produces deposits and sells virtually all its funds to a second bank, which makes commercial loans with these funds. If the two banks merge, *ceteris paribus,* there is no change in the bank output. However, under the asset approach, if both commercial and inter-bank loans are considered to be outputs, then measured output would be diminished by the merger because there would be no more inter-bank lending. If only commercial loans are considered to be output, then the bank that sells funds has no measured output although the post services created by it have been valued by the purchasing bank.

The Value Added Approach

Value added approach has been a commonly used method to measure labor productivity of banking services. The approach differs from the asset approach in that it considers all liability and asset categories to have some output characteristics. It is also called 'production approach' or 'activity approach'. Under this approach any bank activity that absorbs real resources is considered as output. The categories having substantial value added, as judged by using an external source of operating cost allocations, are considered as important outputs. Others are treated as representing mainly either unimportant outputs, intermediate products, or inputs, depending on the specifics of the category.

The measurement of outputs identified using value added approach should ideally use a set of aggregate transaction flow data on 'major deposit and loan services, such as the number of receipts and withdrawals from different accounts and the number of money transfers taking place through the banking sector.[8] Unfortunately, in many cases, these flow data are not available. The problem is therefore resolved in two different ways :

- The deflated values of deposit and loan balances may be used as outputs for individual banks. However, this is tantamount to the assumption that the real deposit and loan balances are proportionate to the underlying transactions (Berger and Humphrey, 1992).

- Since activities related to services in a bank mainly involve transactions between different pairs of accounts, one may assume that they can be summarized by the numbers of different types of accounts (Benston et al, 1982). Thus, an increase in the number of account of a particular service from the base year, would imply an increase in the 'quantity' of service of this sector. To construct an index of relevance, the ratios of different types of accounts in a bank may be aggregated.

If the second approach is considered, the problem then reduces to the construction of a suitable weighting diagram for such an index.

Ideally, the weights should be in proportion to the revenue from each type of instrument. It is, however, difficult to construct an indication of 'price' from this approach. As a substitute, one can construct the weights from the data on expenditure, provided it meets certain standard. In this case, we need to know the expenditure on each financial instrument. These figures are available for some developed countries. The Federal Reserve in USA collects these data from a survey called the Functional Cost Analysis (FCA) program. The FCA sample includes about 400-600 banks each year. The FCA is a cost allocation system that assigns direct and joint costs to a number of banking functions based on expert information and accounting rules of thumb. Such types of data are not easily available in India.[9]

Using the data on cost management of banks and invoking the aggregation theory of index numbers, Benston *et al* (1982) has proposed a divisia index for bank output. Benston *et al* has considered the second approach. For the simplest case, the divisia index for bank output specified by them reduces to the simple sum of the number of accounts. However, since the quantity structure and unit costs for deposit and loan accounts vary from bank to bank, the simple measure needs to be corrected.

Let the simple sum of number of accounts of different financial instruments at bank i ($i = 1,2,..., m$) be

$$Q_i = \sum_s n_{si} \tag{3.1}$$

where

n_{si} = the annual average number of accounts of service s at bank i

s = principal banking services reported in the data.

If the quantity shares $(n_{si}/\sum_s n_{si})$ and unit costs (c_s) are equal across all banks for each of the services provided, then the Divisia index reduces to the simple sum measure Q_i. For the more general case, the Divisia index can be derived as follows. First, when the quantity shares are unequal across banks, (3.1) may be generalized to

$$Q_i = (\sum_s n_{si} / \sum_s \bar{n}_s) \bar{Q} \qquad (3.2)$$

where the bars above the variables represent geometric averages. When unit costs are also unequal across banks (3.2) can further be generalized to

$$Q_i = \prod_s (\bar{n}_s / n_j)^{c^*_{si}} \bar{Q} \qquad (3.3)$$

where $c^*_{si} = \frac{1}{2}(c_{si} + \bar{c}_s)$ is the average operating cost share for the s-th service at the i-th and the average bank.

Here, $c_{si} = \dfrac{n_{si} \, c_{si}}{\sum_s n_{si} \, c_{si}}$ and $c_s = \dfrac{\sum_i c_{si}}{m}$ and $\sum_s c_{si} = \sum_s \bar{c}_s = 1.0$

In the absence of the figures on revenue, this is an intuitively appealing way to aggregate service functions of different banks. The method places greater emphasis on those accounts which contribute the most to total operating costs. Since cost shares may be different across banks, these differences are also taken into account.

The measurement of bank output by the Bureau of Labor Statistics (BLS) is slightly general as it also considers the number of transactions in different types of accounts. The output measure in BLS is based on the number of transactions for three major banking activities : time and demand deposits, loans and trusts (fiduciaries). Each major activity is specified to be an aggregate of more refined measures.

The output measure of deposits consists of two components — the number of cheques written by public and transacted through the banks plus the number of electronic fund transfers (EFTs) to the bank customer accounts. The two sets of numbers are added for each year, yielding the number of demand deposit transactions. Loans are measured in terms of the number of new loans processed. The loan output measure is an aggregate of four types of loans : real estate, consumer, credit card and commercial and other

loans. These loan outputs are aggregated by employment weights. The measure of the output of the trust department is the number of accounts. The total number of accounts by type is combined on the basis of net income. The indices for deposits, loans and trusts, the three major activities, are combined with fixed-year weights based on employment to obtain the output index of commercial banking.

A comparison of the BLS and BEA indicators between the years 1967–1987 was done by Dean and Kunze (1992, pp.99). The BEA estimates were believed to be underestimates by many economists. BLS estimates were considered to be somewhat more meaningful. The estimated growth of the real output of the banking sector according to the BLS method was systematically above that of the BEA estimates.

In sum, although the value-added method provides a useful measure to summarize intermediation activities of a bank, it does not yield a useful measure of the 'prices'. The use of costs as weights in Benston et al (1982) may be theoretically justified only under the assumption of 'mark up', where the banking firm sets a 'price' proportional to the cost for each instrument. These prices are implicit and are reflected in the interest rates. This assumption holds good only when the interest rates are allowed to freely adjust to the changing scenario. So far as the choice of weight is concerned, the BLS method is also not without snags. The use of weights based on employment in BLS may be appropriate when the emphasis is on measuring labor productivity. Once the focus is on efficiency, as with multifactor productivity measures, weighting no longer appears to be an obvious choice. It gives very little weight to highly computer-intensive operations that may be the major growth areas in the banking industry.

Critics also contend that the cost criterion followed in the value added approach does not adequately distinguish financial inputs from financial outputs. Any financial input implies some labor and capital costs. Bank deposits that are usually identified as outputs under the value added approach contains large elements of bartered

services. Those bartered services are clearly produced by the bank and should be included in any comprehensive measure of bank output.

The User Cost of Financial Products

To measure the prices and output of banks, user cost approach has been suggested and applied by many researchers (Hancock, 1985; Fixler and Zieschang, 1992; Fixler, 1993). The user cost approach has several advantages, the main one being that it permits a valuation of the uncharged for financial services. In the traditional user cost approach, financial services are assumed to be attached to each dollar in the financial products. Therefore, financial services are measured in monetary units. All financial products are viewed as providing monetary services. However, not all products are considered as outputs. In this approach, each financial product is assigned a status of financial input or output. This status only reflects the role of the product in the financial operations of the bank. A product is considered as a financial output when its economic return is positive and as a financial input when its economic return is negative. The status of a product may change with the changes in its economic return.

To understand how it operates, consider the simple case of two products offered by a bank, a demand deposit liability and an asset, say a loan. Suppose that payment and receipt of interest take place at the end of the period and that the discount rate for the bank is ρ, meaning that ρ represents the bank's opportunity cost of money. Let k denote the reserve requirement per dollar of deposit, s the service fee charged per dollar of deposit, r the interest rate paid per dollar of deposit and x_t the quantity of demand deposit liability between periods t and $t+1$. Given that $(1-k)$ represents the quantity of deposits the bank can invest, the discounted net cost (negative variable profit) arising from the deposit product can be written as

$$\frac{rx_t - [\rho\ (1-k) + s]x_t}{1 + \rho} = \left(\frac{hc - \rho}{1 + \rho}\right) x_t \qquad (3.4)$$

where *hc* denotes the holding cost and is given by $r + \rho k - s$.

The user cost of an asset can be derived in a similar way. Let x_t be the dollar quantity of an asset Then, in simplified form, which is defined in more detail below.

$$\frac{\rho x_t - (r+s)x_t}{1 + \rho} = \left(\frac{\rho - hr}{1 + \rho}\right) x_t \qquad (3.5)$$

where *hr* is the holding revenue and is given by (r+s) and the parenthetical term on the right hand side of the equality is the user cost of financial asset. The opportunity cost of money, ρ, represents the highest alternative rate of return earned on some benchmark asset. For banks, there are several sensible candidates for ρ. For the US economy, Fixler (1993) has used average US T-Bill and T-Note rates as measures for ρ.[10]

The user costs may be positive or negative, the determining factor is the relationship between the holding revenue or cost and the opportunity cost of money. The sign of a product's user cost determines its financial input-output status. If the user cost is negative, then the product is a financial output because the user cost is the negative of the contribution to revenue associated with the product. If the user cost is positive, then the product is a financial input. Thus the user cost based financial input-output assignment is endogenous.[11]

However, because of the variability in sign, the financial service prices are defined as the absolute value of the product's user cost. Therefore, the price index may not capture the impact of a change in status. For example, suppose the user cost of a product in period 0 is *-u* and that in period 1 is *u*, i.e., there is only a change in the status. The corresponding price relative would equal 1, whether or not the status change took place.

As an example, consider the simple world where the bank produces one asset that earns an interest rate r_a and service fee s_a and one liability that pays interest rate r_l and charges service fee s_l. Ignor-

ing the discount factor and reserve requirements, the absolute value of the user cost of an asset may be written $|\rho - r_a - s_a|$ and the absolute value of the liability user cost may be written as $|r_l - s_l - \rho|$. The variable profit is given by

$$\Pi = |\rho - r_a - s_a|x_a + |r_l + s_l - \rho|x_l \qquad (3.6)$$

Suppose financial markets were perfect so that $\rho = r_a = r_l$. Variable profit would become $\Pi = s_a . x_a + s_l . x_l$ which is simply the service fee revenue. The complexities in bank output and price measurement arise because financial markets are imperfect and banks are intermediaries that bridge the information gap. Now suppose that $r_l < \rho < r_a$. The bracketed term in the user cost of the liability represents the net rate earned on the deposit funds relative to the overall alternative uses of money and the service fee revenue. Thus the value of the uncharged for demand deposit services is given by $\rho - r_l$. In this case the liability product is also a financial output. Suppose on the other hand that the liability product is a certificate of deposit that paid an interest rate such that $r_l > \rho$ and no service fee was charged, as is typically the case. The certificate of deposit would be a financial input but the financial service provided is counted in the output set of the bank.

The weights for different prices are constructed from the variable profit function of a bank. Among several alternatives, researchers have worked with the translog production function (Fixler, 1993). The output price index is based on a ratio of the variable profit functions. For some reference vector y, the index is given by

$$I = \frac{\pi (p^1; y)}{\pi (p^0; y)} \qquad (3.7)$$

where 0 and 1 denote base year and current year respectively.

Applying the translog method based on the quadratic identity of Diewert (1976), which allows the change in variable profit arising from a change in price, we may write

$$\pi \ (p^1) \ - \ \pi \ (p^0) \ = \ \tfrac{1}{2}[\nabla\pi \ (p^1) \ + \ \nabla\pi \ (p^0)] \ (p^1 \ - \ p^0) \quad (3.8)$$

One can apply this result to the profit function and obtain a superlative Törnqvist price index.[12] The weights in the derived index are the shares of net financial revenue,

$$I \ (p) \ = \ \prod_i \left[\frac{p_i^1}{p_i^o} \right]^{(w_i^o + w_i^1)/2} \quad (3.9)$$

where $w_i^t \ = \ \dfrac{p_i^t \ x_i^t}{\pi^t}, \ t \ = \ 0,1$

Using $I(p)$ and the factor reversibility condition,

$$I(p) \ \times \ Q(\cdot) \ = \ \frac{\pi^1(\cdot)}{\pi^0(\cdot)} \quad (3.10)$$

one obtains a quantity index $Q(\cdot)$, also in the superlative form. To apply the index to accounting data, a modification of the index is needed (Fixler, 1993). Let net accounting revenue be given by $\pi \ = \ \alpha' \ |x|$, where $\alpha_i \ = \ r_i \ + \ s_i \ - \ d_i$ when x_i is an asset and $\alpha_i \ = \ - \ r_i \ + \ s_i \ - \ d_i$ when x_i is a liability. Here, r_i is the interest rate, s_i is the service charge rate and d_i is the deposit insurance rate, if any. The difference between economic (user cost based) and accounting revenue lies in the difference between α_i and u_i and the difference in the financial input-output assignment of financial products.

In the economic revenue expression, the classification of x_i is given by the sign of u_i while in the accounting revenue expression, the classification of x_i is given by the sign of α_i, $\alpha_i \ > \ 0$ indicating a financial output and $\alpha_i \ < \ 0$ indicating a financial input. The sign of the ratio of accounting and economic prices, $\alpha_i \ / \ (-u_i)$, indicates difference between the economic and accounting financial input-output assignments. The proper index for the deflation of accounting (variable) profit is

$$
I\,(\gamma) = \frac{\gamma^1}{\gamma^0}\;\;I\,(p) = \frac{\gamma^1}{\gamma^0}\Pi_i\left[\frac{p_i^1}{p_i^o}\right]^{(w_o + w_1)/2} \tag{3.11}
$$

where $\gamma' = \Sigma\;[\alpha_{ij}^t/(-u_{ij}^t)]w_{ij}^t$ which is the ratio of accounting revenue to economic revenue at period t.

The user cost approach determines whether an asset or liability category contributes to the financial output of a bank. The operating costs involved in producing non-financial services associated with the asset or liability are not explicitly considered. However, under relatively standard assumptions, these operating costs are similar to the user cost and are included implicitly. An optimizing bank earns exactly its opportunity costs of funds (in financial revenue less operating costs) at the margin on each asset and pays exactly its operating costs (in financial costs plus operating costs) at the margin on every liability. Thus to the extent that the user cost approach accurately measures marginal financial revenues and opportunity costs, its allocation is largely based on excluded operating costs, which is almost the same as the basis of value added approach. The two methods, despite differences, yield similar type of results.[13]

There are some difficulties, however, in measuring financial revenues and marginal opportunity costs that make the user cost approach to distinguish outputs from inputs subject to measurement error. A problem with measuring the financial flows associated with balance sheet items, particularly loans and demand deposits, is that there is some comminglings of implicit revenues that cannot be easily disentangled. Borrowers are often required to hold part of their loan funds as idle demand deposit balances, which means that some of a bank's earnings on a loan are implicit. Further implicit earnings accrue to the bank on a loan when additional balances are kept with the bank for liquidity, clearing or timing purposes associated with the spending of the loan receipts. If the ratio of the compensating and conjunctive balances to loans were known, the implicit earnings could be allocated to loans in much the same way as the implicit losses on deposits from reserve requirements. How-

ever, this ratio is not generally known or estimated and the implicit revenues are instead allocated entirely to deposits. As a result, there is a bias toward treating loans as inputs or the output weight.

Another difficulty is in allocating opportunity costs allocating to the important characteristics of bank assets and liabilities, including differences in credit risk, liquidity and duration. Banks earn substantially higher rates for riskier, less liquid and longer-term assets and pay substantially higher rates for deposits and other liabilities that are uninsured, have fewer liquidity features and have longer terms to maturity. Theory requires that each dollar of bank liabilities or assets have the same marginal opportunity cost only after adjustment for those important characteristics. Therefore, financial returns or costs of each category must be adjusted before applying a common opportunity cost. Without such adjustments, the index may be biased.

Section IV
Indices of Banking Services :
A Possible Specification for   India

This section examines the possibility of constructing price and output indices of banking in India. The specification of a comprehensive index of bank services is not an easy task for India. Besides the theoretical problems described in Section II and III, the task involved certain specific empirical problems because of the peculiar nature of the banking services in India. These peculiarities have a long history and is intricately related to the economic and political philosophy underlying the development process.

Banking Sector in India underwent a transformation with the nationalization of major commercial banks in 1969. Banks were assigned a social responsibility more akin to non-profit institutions serving households. However, losses from the public sectors and chronic fiscal deficit forced the government to borrow from the banks on a large scale. The statutory liquidity ratio (SLR) was increased to a very high level for funding the increasing borrowing

requirement of the government. Thus even now, besides cash reserve ratio (CRR), a substantial part of the money of banks are tied in the form of SLR and banks are also required to lend a large part of their lendable resources to the priority sectors. As a consequence, the administered interest rates especially the lending rates varied on a wide scale over the asset groups of banks. Because of these peculiar features of banking in India, the existing approaches for measuring banking services need to be modified.

Among the three approaches discussed in Section III, asset approach will not be meaningful because it is based on the assumption of profit maximisation behaviour which is not a valid assumption to make in the present context. Keeping in mind the theoretical and empirical problems, the indices based on user cost approach or value added approach would be perhaps more relevant to the Indian case.

The user cost approach uses a reference rate of interest. In the Indian context, such a reference rate could be the implicit interest rate for the 91 day treasury bill sold in auction. The 91-day TB rate would be generally higher than the interest rate for saving deposit and smaller than that for the time deposit. Therefore, demand deposits would be financial input and time deposits would be financial output. This is consistent with the findings from other economies. However, in the Indian case subsidized lendings may cause certain problems in the estimates. In the extreme case, even an average interest rate for credit (defined as total interest received from credits divided by the total amount of credit extended) works out to be smaller than the interest rate on the 91 day TBs sold on auction. In such cases, an application of user cost to aggregate credit would show it as an 'input'. Thus, to apply the method of user cost successfully, we need to have fairly disaggregate data on deposits and credits.

Similarly, for a successful application of value added approach, we need disaggregate data of a different type. In this context, a serious problem arrises from the heterogeneity of banking technology in India. Some banks - especially the foreign ones - are concen-

trated mostly in the urban areas. These banks are highly computer-ized and their business profiles are very different from that other banks. Only a fair degree of disaggregate data can successfully tackle this problem. In this context, besides the data on aggregate activity profile, data on activities in a particular region would be of great significance.

So far as the value added approach is concerned, the indices may be constructed in several ways depending on the method to be followed for specification of a quantity index. Some of issues in this context are :

- How do we measure quantity of intermediation services of banks? The problem can be approached in two different ways. Benston *et al.* (1982) have measured it by the total number of accounts of different types. However, depending on data availability it can be measured by the total number of vouchers prepared.

- How to choose a set of weights? Benston *et al* (1982) have constructed the weights from the data on operating cost of banks. Another possible approach is to estimate the imputed total service charge of an activity using the turnover for that activity.

- What formula to use? The indices may be compiled using different formula. Besides the more obvious indices (e.g., Laspyere's index, Paasche's index), use can be made of Tornqvist index. The compilation of these indices will depend on the availability of data on the weight variable for both the 'base' year and the 'current' year.

Based on the first two questions, there can be four different strategies :

1. Derive the weights based on cost on that instrument and use number of accounts as quantities.

2. Strategy 2 is similar to Strategy 1, we may   use   the number

of vouchers produced for each account in place of number of accounts.

3. Derive the weights based on turnover and use number of accounts as quantities.

4. Same as Strategy 3, except use number of vouchers in place of number of accounts.

The quantity of service may be measured by the number of vouchers. Since an individual gets a service from a bank every time he/she operates her account to account, the second approach may yield a better estimate of bank output. Also, this would be more relevant because some of the services of a bank (e.g. demand draft etc.) are not account based and only measures based on the number of vouchers may give a true idea of the quantity of service produced.

Let I_Q be the quantity index. In our specification

$$I_Q = \sum_i \sum_j \left[\frac{q_{ij}^1}{q_{ij}^0} \right] w_{ij} \tag{4.1}$$

where q_{ij}^t is the number of vouchers prepared by bank i on the j-th instrument for the t-th period and w_{ij}'s are weights which are either based on costs or turnover or are proportional to the derived service revenue of the i-th bank from the j-th instrument. Unlike the goods sector, the weights may, however, undergo changes within a brief period. The robustness of the weights, therefore, should be examined.

For Tornqvist index, the weights should be constructed for both the base year and the current year. Let w_{ij}^p be the weight in the base year and w_{ij}^1 be the weight in the current year. Let $w_{ij} = (w_{ij}^p + w_{ij}^1)/2$ be the average weight. Then the Tornqvist index would be defined as

$$I_Q = \prod_i \prod_j \left[\frac{q_{ij}^1}{q_{ij}^0} \right]^{w_{ij}} \qquad (4.2)$$

Note that from value added approach alone, construction of price indices is difficult, as the concept of 'price' is not clear. However, with the help of some simplifying assumptions, one may calculate the individual price relatives. The assumptions are similar to the assumptions made in the NAS in India to obtain the value added of the banking sector in constant prices from current prices. Thus, the intervals within which the indices are likely to vary can be obtained from this approach.

Let us consider any deposit or credit related activity i. Let X_i^λ be the amount of money related to that activity in the base year. For deposit related activities, we may consider X_i° to be the aggregate deposit and for credit related activities, the amount of credit outstanding. Let us also assume that the implicit service charges are proportional to X_i°. An implication of the assumption is

$$S_i^\circ = p_i^\circ q_i^\circ = k_i X_i^\circ \qquad (4.3)$$

where S_i° is the implicit service charge in the base year and k_i is an unknown constant. Note that k_i's may be different from activity to activity. Thus the proportion considered as implicit service charge for time deposit may not be the same as that for savings deposit, or for any credit items. However, in the short run, we may assume that k_i does not change in the base year and the current year. Therefore,

$$\frac{S_i^1}{S_i^\circ} = \frac{p_i^1 q_i^1}{p_i^\circ q_i^\circ} = \frac{X_i^1}{X_i^\circ} \qquad (4.4)$$

Thus the ratio of deposits in the current year and base year will give the ratio of the value of the ith instrument. Dividing it by the quantity relatives, the price relatives may be obtained. Thus the price relatives will be proportional to the ratios of deposit (credit

outstanding) per account or deposit (credit outstanding) per voucher in the current year and the base year. Note that although we obtain the price relatives, we cannot obtain the individual prices in the base year and the current year from this method, as k_i's cannot be estimated.

Section V
Indices of Banking Services : A Numerical Illustration

This section provides a small numerical example of calculating price and quantity indices for the financial services sector based on the methods proposed in Sections III and IV. Even if there is agreement on the appropriate measures of gross output of the banking sector, it is necessary to have a more detailed classification of output to identify homogeneous product groups that are suitable for decomposition into prices and quantities. It has been a practice in many studies to evaluate whether bank output activity is best specified by the number of loan accounts (or, deposits) of different types, or by their respective monetary volumes. The issue arises because loans are not a homogeneous commodity. They differ in size and also in other characteristics like riskiness, compensating balance requirements etc.

Heterogeneity of inputs or outputs is addressed in the economic measurement as the 'quality problem', but the empirical methods followed in the literature have so far not been applied to banking. A part of this section examines the problem. However, due to data limitations at the present stage, we do not expect the estimates to be close to the true values.

To simplify the exercise, we have used aggregate cost data of banks based on a survey for the years 1992-93 (April to March) for the years 1992-93 and 1993-94 (April to March). The data consist of total number of vouchers and other related measures for each activity for the years 1992-93 and 1993-94. The activities of the banks available in the survey can be divided into three broad classes :

- Deposit Items : Separate information on activities related to current, savings and term deposits is available.

- Credit Items : Credit related activities can be divided into two broad groups, viz., priority sector credit and non-priority sector credit. For the priority sector, separate information on agriculture, small scale industries and other priority sectors is available. The non-priority sector is also divided into two groups, viz., industry & trade and others. For easy comparison with data from other sources, we have considered four types of credit accounts, viz., (i) agriculture, (ii) small-scale industries, (iii) other industries & trade and (iv) miscellaneous.

- Other Services : These group of activities consist of a host of remittances services like demand draft (DD), mail transfer (MT), telegraphic transfer (TT) and resident traveler's cheque (RTC) services (issued and paid), TT purchased and recorded, bills and cheques discounted, currency chest services etc.

The prices charged by the banks for the activities belonging to Other Services are currently not available in this data. However, the data include the estimates of turnover from these activities. Although the list of items in the data on costing is nearly exhaustive, some items are either still missing or are overlapped with other items. The list does not include separate estimates for certificate of deposit (CD) and information on transactions in credit card. It also provides no information on electronic funds transfer and other services like acceptance fees, guarantees and letter of credit fees, brokerage fees etc. Currently some of these may not play an important role in the banking sector in India. However, with the sweeping changes in the financial sector, their contributions are likely to increase in near future. Determination of the prices and the quantities of some of these items involves same type of problems as in intermediation services. In the example outlined below these items of services have been ignored.

For each activity, the number of vouchers prepared during the reference period is available. The term 'voucher' is used to represent

an entry of receipt or payment in the register or ledger of a bank.
While 'cash' transactions give rise to one voucher per transaction,
transfer or clearing activities give rise to a minimum of two vouch-
ers per transaction. The vouchers are in the form of challans, slips,
advices, demand drafts, cheques, pay orders, deposit receipts etc.
Whenever more than one transaction are represented by a single in-
strument or a slip, the number of such entries are reckoned as the
number of vouchers although a single voucher would have been
used for that purpose.[14]

From the data on costing, we first examine the robustness of the
voucher-account ratio. Calculation of this ratio is necessary for two
reasons. First, the ratio measures the number of transactions per
account. Estimation of this ratio is important because if the ratio is
found to be stable over time then the estimates of quantity rela-
tives of financial intermediation from both the ratio of accounts and
the ratio of vouchers would be close and the debate on appropri-
ateness of any one of them would lose empirical relevance. Sec-
ond, aggregation over banks causes some problem because of un-
equal number of banks in the two years.[15] In 1992-93, eight banks
participated in the survey, while in 1992-93 the participant banks
were nine. A simple ratio of the vouchers for the two years will
not yield a correct measure of the quantity relative because of un-
equal number of banks in the two years. Even a ratio of average
number of vouchers may not be the right quantity relative because
of the unequal size of the sample. We, have therefore, adjusted the
data in the following manner. To estimate the total number of
vouchers for the two years, we have collected the total number of
accounts of all banks in 1992-93 and 1993-94 from BSR data and
multiplied them by the voucher-account ratio estimated from the
survey data. The voucher-account ratios and the aggregates have
been presented in Table 5.1.

Table 5.1 : Number of Accounts and Vouchers for the Years 1992-93 and 1993-94

	1993, March			1994, March		
	No. of Accounts ('000)	V/Ac Ratio	No. of Vouchers ('000)	No. of Accounts ('000)	V/Ac Ratio	No. of Vouchers ('000)
DEPOSITS						
Current	15401.0	70.6	1087310.6	16826.0	64.8	1090324.8
Savings	269345.0	6.4	1723808.0	276497.0	7.3	2018428.1
Term	94965.0	3.5	332377.5	103556.0	4.2	434935.2
TOTAL	**379711.0**		**3143496.1**	**396879.0**		**3543688.1**
CREDIT						
Agriculture	26216.7	4.1	107488.5	25535.1	4.1	104693.9
SSI	4666.2	12.5	58327.5	4634.2	12.2	56537.2
Other Industries						
and Trade	11572.4	173.7	2010125.9	10832.9	134.1	1452691.9
Miscellaneous	19660.9	10.1	198575.1	18648.6	9.4	175296.8
TOTAL	**62116.2**		**2374517.0**	**59650.8**		**1789219.8**

@ V/Ac ratio is the voucher per account ratio. SSI stands for small scale industries.

Table 5.1 shows that the voucher-account ratio is stable for most of the items. However, for some items like deposits in current accounts it displays slight variation. The variation is especially large for the activities related to credit to industry and trade sector. It would be interesting to study the extent of similarity of the voucher-account ratio for a particular activity across banks. Such a study would be based on disaggregate data and would reveal valuable insights. Using Table 5.1, we have estimated the ratio of vouchers for 1992-93 and 1993-94 for each of the above activities and used them as quantity relatives for the corresponding activities in Table 5.2.

Table 5.2 reveals that there is substantial variation in the quantity relatives. In terms of the 'quantity' of banking services, the deposit items have registered an increase and the credit items have registered a decrease in the two years for both account and voucher based measures. However, in voucher based measures the changes are more prominent, especially in term deposits among deposit re-

lated activities and industry and trade among credit related activities. While the former has registered an increase of 30.9%, the second one has fallen by 27.7%. The quantity index would vary within this range. However, because the individual quantity relatives vary over a wide range, the quantity index will be sensitive to choice of weights.

For this exercise, we have considered two sets of weights. Both these sets have been constructed from the survey data on costing of banks. For the first set, the weight of an activity in the index has been specified to be proportional to the total costs incurred by the banks for that activity. For the second set, the weight of an activity has been taken to be proportional to its turnover.[16] Both sets of weights have been calculated for the years 1992-93 and 1993-94.

Table 5.2 : Quantity Relatives from Number of Accounts and Number of Vouchers for the Year 1993-94 with respect to the Year 1992-93 and Weights Corresponding to 1992-93 and 1993-94

	Quantity Relatives		Cost Weights		Turnover Weights	
	Accounts	Vouchers	1992-93	1993-94	1992-93	1993-94
DEPOSITS						
Current	1.093	1.003	0.16	0.16	0.14	0.13
Savings	1.026	1.171	0.31	0.31	0.14	0.14
Term	1.090	1.309	0.15	0.15	0.36	0.38
TOTAL	1.045	1.127	0.62	0.62	0.64	0.65
CREDIT						
Agriculture	0.974	0.974	0.09	0.09	0.05	0.05
SSI	0.993	0.969	0.15	0.15	0.09	0.08
Other Ind. & Trd.	0.936	0.723	0.07	0.07	0.19	0.18
Miscellaneous	0.948	0.883	0.07	0.07	0.03	0.04
TOTAL	0.960	0.754	0.38	0.38	0.36	0.35

The weights based on costs have been found to be stable over time. For the two years under consideration, they do not display any change. This is not surprising because within a short span, abrupt changes in the banking technology are unlikely. Even the weights based on turnover register little changes. This could be an important empirical finding but for two weaknesses :

1. We have examined data for two years only. Before drawing any firm conclusion, data for several years need to be examined.

2. The activities considered are only a small subset of all activities of a bank. A full examination of the relative costs and turn-overs of all activities of banks is needed.

Although the weights have been found to be stable over time, they display differences across activities. In the deposit side, the differences are more prominent for saving and term deposits. The weights for these two activities based on costs and turnover have almost been reversed. This is because, the cost of maintaining term deposit is low compared to other activities, but its turnover is comparitively high. The opposite holds for savings deposits. On the credit side, relative cost for priority sector lending is high, as reflected in the weights for Agriculture and Small Scale Industries (SSI), but its relative turnover is low. On the other hand, the bulk of turnover on the credit side comes from credit to other industries and trade at a lower relative cost. Thus the indices based on these two sets would be somewhat different.

However, a surprising feature of the weights is the closeness of the aggregate measures. For both sets as well as both years, the weights for aggregate deposit vary within a very narrow range, indicating that any index based on these aggregate measures will not be very different. However, since the quantity relatives vary widely, the exercise reveals the importance of disaggregation of activities of a bank.

Table 5.3 : Different Types of Quantity Indicators of Financial Intermediation Services for the Year 1993-94 with respect to the Year 1992-93

	Weights Based on			
	Cost		Turnover	
	1992-93	1993-94	1992-93	1993-94
Disaggregate				
Arithmetic Average				
Accounts	1.0249	1.0249	1.0334	1.0345
Vouchers	1.0652	1.0652	1.0754	1.0845
Tornqvist@				
Accounts	1.0229		1.0319	
Vouchers	1.0496		1.0553	
Aggregate				
Arithmetic Average				
Accounts	1.0127	1.0127	1.0144	1.0153
Vouchers	0.9853	0.9853	0.9927	0.9964
Tornqvist				
Accounts	1.0118		1.0140	
Vouchers	0.9674		0.9771	

Other Measures : (a) Ratio of Cheque Clearance = 0.9689, (b) Implicit NAS Index = 1.0460.

@   For Tornqvist indices, weights are arithmetic averages for the base year and the current year. However, the results are presented in the column for 1992-93.

Using both sets of weights, we have calculated the quantity indices for the year 1993-94 using 1992-93 as base year and presented the results in Table 5.3. The indices based on relative costs (i.e., for Strategy 1 and Strategy 2) reveal that between 1992-93 and 1993-94, quantity of banking services in India has increased, the estimated increase is 2.5 per cent based on number of accounts and 6.5 per cent based on number of vouchers. The estimates based on turnover are close, although for the years under consideration they yield slightly higher estimates. Note that between the same years, the implicit quantity indicator in the NAS for banking and insurance was 104.6, i.e., it registered a growth of 4.6 per cent. Thus,

the index based on vouchers gives slightly higher estimates than that based on the number of accounts and the estimate obtained from NAS lies between them. Whether this is a general trend or is specific to only the years under study needs to be examined.

Table 5.4 : Price Relatives Based on Number of Accounts and Number of Vouchers for the Year 1993-94 with respect to the Year 1992-93 and Weights Corresponding to 1992-93 and 1993-94

| | Ratio of Value | Price Relatives | | Weights Based on | | | |
| | | | | Cost | | Turnover | |
		Acco-unts	Vou-chers	1992-93	1993-94	1992-93	1993-94
DEPOSIT							
Current	1.175	1.075	1.171	0.16	0.16	0.14	0.13
Savings	1.172	1.142	1.001	0.31	0.31	0.14	0.14
Term	1.175	1.078	0.898	0.15	0.15	0.36	0.38
TOTAL	**1.177**	**1.126**	**1.044**	**0.62**	**0.62**	**0.64**	**0.65**
CREDIT							
Agriculture	1.037	1.065	1.065	0.09	0.09	0.05	0.05
SSI	1.091	1.099	1.126	0.15	0.15	0.09	0.08
Other Ind. & Trd.	1.081	1.155	1.495	0.07	0.07	0.19	0.18
Miscellaneous	1.109	1.170	1.256	0.07	0.07	0.03	0.04
TOTAL	**1.078**	**1.123**	**1.430**	**0.38**	**0.38**	**0.36**	**0.35**

The above example also illustrates the effect of aggregation. If we do not differentiate between different types of deposit and credit accounts (vouchers) and consider only the aggregates, we obtain results which are somewhat different. The indices based on accounts vary within the range of 101.3 and 101.5 and that based on vouchers vary between 98.5 and 99.6 only. Similarly, the ratio of cheque clearances for the two years is 0.9689, indicating a de-

crease in the number of inter-bank transactions in cheques. This is because in the deposit side, the number of savings accounts is large compared to other accounts. Similarly, in the credit side the number of vouchers from other industry and trade is large. Thus the movement of these accounts (vouchers) are the main determinants of the index.

Table 5.5 : Different Types of Price Indicators of Financial Intermediation Services for the Year 1993-94 with respect to the Year 1992-93

	Weights Based on			
	Cost		Turnover	
	1992-93	1993-94	1992-93	1993-94
Disaggregate				
Arithmetic Average				
Accounts	1.111	1.111	1.105	1.105
Vouchers	1.090	1.090	1.104	1.096
Tornqvist @				
Accounts	1.111		1.105	
Vouchers	1.080		1.080	
Aggregate				
Arithmetic Average				
Accounts	1.125	1.125	1.125	1.125
Vouchers	1.191	1.191	1.183	1.179
Tornqvist				
Accounts	1.125		1.125	
Vouchers	1.177		1.167	

@ For Tornqvist indices, weights are arithmetic averages for the base year and the current year. However, the results are presented in the column for 1992-93.

We have also calculated the price relatives based on the methods in Section IV. The results have been presented in Table 5.4. The price relatives using vouchers as quantities show considerable variation. They very within a range of 0.898 for time deposits to 1.495 for credits to industry and trade, indicating that any price index based on vouchers would be sensitive to the choice of weights. As for the quantity indices, we have used the set of weights based on costs and turnover and have shown the results separately for aggregate and disaggregate measures. The results have been presented in Table 5.5. The indices based on cost weights of the banks, however, are close. While price index based on accounts is 111.0, the same from vouchers is 109.0 for both the years. The indices based on weights from turnover are also very close to those based on costs.

The price indices based on aggregate deposit and credit are, however, higher than the disaggregate figures. This is not surprising because the quantity indices based on the aggregates have been found to be relatively stable during the years under consideration.

Section VI
Indices of Banking Services : Possible Data Requirement

The numerical estimates of price and quantity indices in this study were obtained for simple cases with some simplifying assumptions. However, for a more complete and comprehensive estimates, we need to have a disaggregateed data base on different types of banking services. Some of the important issues which need to be addressed in this context are: the frequency of the index, the range of financial activities to be included and the formula to be used.

The amount of data to be collected crucially depends on the index to be used. If the Laspeyere's index is used and weights of price and quantity relatives are determined for a benchmark year, information on many items will not be necessary in subsequent years.

However, if Paasche's or Tornqvist indices are used, data on all the major items should not only be collected for the benchmark year, but for all subsequent years too.

In order to prepare output and price indices of the banking sector, bank-wise information on the following items will be necessary:

- Number of accounts and/or number of vouchers prepared for each financial activity for the base year and the current year. This will give the ratio for a particular activity.

- Data on different types of interest rate for different types of deposits and credits (along with the deposit/loan balance and interest payment/receipt on each such instrument) charged by the bank. This data will be helpful for calculation of a 'reference' rate of interest as well as income from each such instrument. If the interest rates include service charge or deposit insurance payments, that should be separately mentioned.

- For analogous problems faced by OECD countries, Collins (1993) has proposed a model design. The design also includes a column for interest allocation. Separate information on deposits of the household sector and the corporate sector would be extremely helpful. Detailed data on corporate deposits and also on priority sectors and other subsidized lending would help to determine the exact amount of transfer created by the banking sector.

- Data on the service price charged by banks for each financial instrument. In particular, data on the service prices of the auxiliary activities of a bank would be necessary for calculating the weight of the activity of the bank in the indices. Besides the prices, the estimated revenue of the bank from that activity would also be necessary.

Even with respect to prices, it is difficult to ascertain their 'true' levels because many of the services provided by banks are jointly produced and included in the form of non-monetary transaction. So

far, all approaches relating to measurement of banking services have suffered from the absence of data on barter transaction. Ideally, one must conceptually separate such services from their monetary counterparts. However, such a task will be extremely difficult. Although the 'true' value of the services for free cheques, automatic teller machine and credit card usage etc. would be difficult to determine, data on transaction on these items over time may still provide valuable insights on the qualitative changes in the banking services.

Section VII
Conclusion

The paper provided a critical survey of the method of estimation of nominal and real output of the financial sector, with special reference to banking in India. The paper discussed some common approaches of measurement of real output of the banking sector. It was shown that direct application of these approaches would not lead to a meaningful solution because of the peculiarities of the banking sector in India. The paper suggested certain modifications of the existing techniques. Under a simplified set up, it compared the empirical performance of the proposed indicators vis-à-vis that of the traditional ones used in the national accounts statistics. The possibility of constructing such indices for banking services with the existing databases was also discussed.

The present database is not adequate for a meaningful construction of price and output indices for the banking sector when the periodicity of the index is less than one year. Currently most of the banks do not disseminate data on costs on a regular basis. Hence, the number of banks common in the base year and current year may turn out to be even smaller. To arrive at a meaningful estimate, the coverage of the data on costing needs to be improved. This is particularly important for India because of heterogeneity of bank-operations across regions and across bank-groups.

At present, the classification of the data on interest rates and interest payments (receipts) is not adequate for the calculation of opportunity costs of various types of financial products. Auxiliary information on the service charges of most of the financial activities are currently not available. An index without such activities may turn out to be incomplete.

Ideally, the indices should be complemented with some additional indicators showing the volume of non-monetary transactions mostly associated with demand deposit related services. The valuation of these transactions is extremely difficult and combining them into one single indicator involves many theoretical and practical problems. However, a large quantitative change in any of these transactions would imply a change in the quality of banking services. Usually information on these services are not available in the databases of most of the countries and the literature on measurement of bank output has by and large ignored these transactions. Collection of data on these items would thus prove very useful.

The OECD and the other developed countries are now attempting to estimate indicators of the services sector on a monthly basis. In most cases the recommended indicator is the turnover of the different sub-sectors within the services sector. The indices discussed in this paper are more complex. Any reduction of periodicity of these indices would be of great help to the policymakers. However, in India most of the information necessary for compiling such indices are collected on annual basis. Reducing the periodicity of these indices would, therefore, necessitate bringing about certain significant changes in the process of data collection.

Notes

1. The problem was discussed in a meeting of Service Statistics Experts at the Organisation for Economic Co-operation and Development (OECD) in 1991. The experts agreed that the issue of short time statistics on service sector deserves immediate attention. Accordingly, the item was included in the work programme of the ad hoc group formed to address the problem.

2. The paucity of appropriate service sector statistics can perhaps explain why such indices are so few in number. Corporate Service Price Index (CSPI) developed

and issued by the Bank of Japan is one of them. Similar type of measures are also available for Canada.

3. Short term production and price indices generally exclude the services sector. Complementing these indices by service production and price indices would increase its relevance. Ideally, the assessment of overall economic trends and cyclical fluctuations should be done using indices which include both the goods and the services sector.

4. In fact, between the years 1980-81 to 1994-95, the contribution of the tertiary sector (including electricity etc. and construction) to Gross Domestic Product (GDP) has increased from 42.7% to 49.3%.

5. Since the indices on services sector should ideally complement the production and price indices of the goods sector, many official statistical agencies recommend that the indicators of service production should be compiled on a monthly basis. Estimation of some other common measures (e.g., value added of a sector) encounters great difficulties for such a brief period. Therefore, some agencies feel that a more appropriate measure for short term service production indices would be turnover, as it is directly observable.

6. Benston et al. (1982) remark "Output should be measured in terms of what banks do that cause operating expenses to be incurred".

7. For example, Fixler (1993) argues that "...if safekeeping is the only financial service attached to deposits, then the measure of safekeeping provided by a bank is the volume of deposit balances because each unit of the deposit money is kept safe"

8. US measures of banking labour productivity also use an output concept that is essentially the activity approach, including in their measure of bank output counts of loan and deposit activities (such as loan applications processed and cheques cleared).

9. The data used in this study were collected by the Department of Statistical Analysis and Computer Services of Reserve Bank of India.

10. For India, one may use treasury bill rates or bank rates.

11. Nearly half of the financial categories in Fixler and Zieschang (1990) switch between inputs and outputs over a five-year period, even without changing the method of computing opportunity cost. Some economists feel that if banking technology remains sufficiently stable, the status of inputs and outputs should not change so often (Berger and Humphrey, 1992), and even consider it as "nonsensical" (Wykoff, 1992, pp. 28).

12. A superlative index is one whose underlying aggregator function is a second-order approximation to an arbitrary twice continuously differentiable linearly homogeneous function and one for which the ratio of values measured by the index directly relates to the underlying optimization problem of the economic agents.

13. For the US economy during 1984-88, the growth rate of output was 7.6% by value added method and 8.8% by user cost method (Berger and Humphrey, 1992).

14. For instance, if in respect of applying interest on a half-yearly basis on the savings accounts of customers, only one debit entry is made by debiting the interest paid on account in a particular savings ledger. However, credit entries are given to the respective individual accounts. Here, the number of credit vouchers on account of this transaction would be the number of accounts to which interest credits are made in ledger, whereas the number of debit vouchers would be only one.

15. The problem due to aggregation is specific to this exercise only. It will not occur if disaggregated data are available for all banks.

16. Here, turnover refers to the amount of deposit or credit outstanding in each instrument.

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Ricardian Equivalence and Consumption in India

Charan Singh*

Public debt has been an important source of mobilising financial resources for economic development in India. The implications of the rising domestic debt are varied on the macro economic aggregates. The rising domestic debt can affect the consumption pattern, interest rates, price level and growth in the economy. In India, these issues have assumed paramount importance in the recent years. In this article, the implications of domestic debt for consumption are analysed. The concept of Ricardian Equivalence is theoretically discussed followed by a discussion on the consumption functions. The model developed in the paper decomposes domestic debt into anticipated and unanticipated components and uses the Permanent Income – Life Cycle hypothesis to test the impact of domestic debt on consumption. On the basis of empirical results for the period 1971-95 it is concluded that given the appropriate specification of the consumption function the consumers do not exhibit Ricardian Equivalence behaviour.

Introduction

Public debt has been an important source of mobilising financial resources for economic development in India. The increasing need of financial resources for development purposes could not be met through other fiscal instruments like tax revenues due to the weak income base of the country and inadequate surpluses generated from the public sector enterprises. Therefore, increasing reliance was placed on domestic debt.

In India, there has recently been a debate on the implications of rising domestic debt for the aggregate economic activities. The debate pertains to Ricardian Equivalence Hypothesis (REH) which asserts that consumers respond in exactly the same way to a change in taxes as to a change in the government deficit. Therefore, a tax cut deficit would have no effect on consumption. In this article, the Ricardian Equivalence is empirically examined. The discussion is

presented in five sections. The theoretical discussion of the model is presented in Section I. A few empirical studies on domestic debt and consumption in India are briefly discussed in Section II. This is followed by a discussion in section III on data specifications and definitions used in the estimation. The empirical results are presented in Section IV. The conclusions are set out in Section V.

Section I

Ricardian Equivalence Hypothesis and Consumption

Ricardian Equivalence – The Theoretical Concept

The Ricardian Equivalence Hypothesis states that a public loan and a lump-sum tax exert equivalent effects upon the economy.[1] More precisely, the choice between levying lump-sum taxes and issuing government bonds to finance government spending does not effect the consumption pattern of any household nor does it effect capital formation. The fundamental logic underlying this argument was presented by Ricardo (1951). Ricardo assumes that the creation of public debt implies a stream of future interest payments and possible repayments of principal. These future payments have to be financed by future taxes. It is argued, that a rational individual living during the time when the expenditure decision is made will fully capitalise all future tax payments arising due to debt and will consequently write down the value of the income-earning assets which he owns by the amount of the present value of these future payments. The present values of assets will be reduced by the present value of the tax obligations created by the future service charges. The present values will be identical in the two cases. The argument of the Ricardian Equivalence is simple. If government expenditure is not financed by current taxes then it can be financed by incurring debt. In the case of debt, rational individuals must know that taxes will be levied in future to pay the interest as well as the principal. To provide for future taxes, the households will save more, precisely enough to purchase new government bonds. As a result, aggregate wealth and consumption remain unaltered.

The increase in private saving offsets the decrease in public saving and the national saving remains the same. Thus, given the present value of taxes, the timing of the tax makes no difference.

The Ricardian Equivalence Hypothesis equating tax finance and bond finance would hold under the following assumptions:

(a) No possibility of escaping part of the perpetual tax liability either by dying or by leaving the jurisdiction of the government;

(b) Everyone can borrow and lend funds at the same interest rate as the government;

(c) There is uncertainty about future tax shares, which might be due to uncertainty about individual income or other characteristics that determine tax shares;

(d) Future tax liabilities implied by public debt are accurately perceived;

(e) The volume of government expenditure is independent of the method of finance; and

(f) No other channels exist for effects of the choice of financing method on the prices, rates of return, etc. faced by individuals.

Ricardian Equivalence and Consumption Function

Empirical works on the Ricardian Equivalence has been generally based on *ad hoc* specification of the consumption function. It is not usually established whether the underlying consumption function itself is supported by the data. It is crucial for tests of Ricardian Equivalence to ensure that the consumption function is robust and has an appropriate theoretical basis. Otherwise, the results with respect to Ricardian Equivalence may be caused by misspecification of the consumption function itself. One of the important assumptions of the Ricardian Equivalence is that people can rationally forecast the future implications of the decisions taken today and ac-

cordingly adjust their consumption. Therefore, the consumption function used for testing the Ricardian Equivalence Hypothesis should be consistent with the rational expectation hypothesis.

In the literature, private consumption expenditure is generally modelled on the basis of Keynesian consumption function or the permanent income – life cycle hypothesis. In more recent times, consumption functions have been formulated on the basis of permanent income hypothesis. Permanent income is defined as the steady rate of consumption that a person could maintain during his life time, given the present and future level of income and wealth. The permanent income hypothesis considers consumption to be an intertemporal decision and that the effect of a change in current income on consumption depends on whether the change is viewed by an economic agent as being permanent or temporary. If the increase is seen as permanent (i.e., occurring in every future period), only then there is an impact on the individual's lifetime budget constraint, leading to a change in current and future consumption.

The consumption function under the permanent income hypothesis can be specified as follows

$$C_t = \beta\left[\left(\frac{r}{(1+r)}\right)\left\{A_t + YD_t + \sum_{i=1}^{\infty} \frac{{}_tYD_{t+i}}{(1+r)^i}\right\}\right]$$ (1.1)

Where, A_t is current assets (or wealth), YD_t is current labour income (disposable income), ${}_tYD_{t+i}$ is the forecast of future labour income (disposable income) based on information at time 't', r is the real interest rate (assumed to be constant), and $\beta(r/1+r)$ is the marginal propensity to consume out of current income.

The similarity of the permanent income hypothesis with the REH can now be emphasised. The basic emphasis of the REH is on the household's long term budget equation or more specifically the permanent income. The important issue in the REH concerns the household's response to a tax cut, given no change in government spending, thereby implying a rise in deficit. It is argued that a tax cut deficit would not affect the household's ability to spend in the

long run - lower taxes now implies an equal increase in future taxes (on a present value basis). Accordingly, the household's consumption would not change if the expectation of their permanent income does not change.

The consumption function under the permanent income hypothesis can be extended to incorporate the implications of rational expectations.[2] Thus, the change in consumption between '$t - 1$' and 't' is a function of the unanticipated changes in assets and current and future disposable income.[3] In case there are no unanticipated changes in permanent income, then consumption follows a random walk:

$$C_t = C_{t-1} + v_t \qquad\qquad (1.2)$$
Where, $_{t-1}v_t = 0$.

Hall (1978) observed that rational consumption behaviour at time 't' would be based on expectations about future income that already takes into account all the available relevant economic information at that point of time. Therefore, consumption in the next period would differ from that in the current period only by a random component which would be serially uncorrelated. Hence, consumption variables that are lagged more than one period should not add to the predictive power of the current period consumption equation. Hall focused on US quarterly data for the period 1947-77 and found support for the above implications of the permanent income hypothesis under rational expectations.[4]

In the consumption function, net assets or wealth of the private sector, A_t can be defined as

$$A_t = K_t + R_t + GB_t \qquad\qquad (1.3)$$

Where, K_t is the value of capital stock measured by the total value of stockholder's equity plus the value of the housing stock, land, and consumer durables; R_t is the value of reserves held at the central bank which are private sector claims on the government; and GB_t is the value of government bonds which are held by the pub-

lic. Considering that the private sector wealth or assets can be divided into government bonds (GB_t) and others W_t, (where $W_t = K_t + R_t$), we have

$$A_t = W_t + GB_t \qquad (1.4)$$

Total assets can be divided into the anticipated (superscript a) and unanticipated (superscript u) components. The unanticipated component of assets can be shown as follows:

$$A_t^u = W_t^u + GB_t^u \qquad (1.5)$$

The anticipated component of wealth (W^a) has implications for the permanent income while the unanticipated component (W^u) affects consumption in the current period. On the other hand, REH suggests that government debt, anticipated as well as unanticipated, would be neutral to consumption. Therefore, in a consumption regression, under the rational expectations and permanent income hypotheses, neither anticipated nor unanticipated government bonds should have a significant coefficient. Consequently, in the following regression,

$$C_t = \alpha_1 C_{t-1} + \alpha_2 W_t^u + \alpha_3 GB_t^u + \alpha_4 GB_t^a + \mu_t \qquad (1.6)$$

the coefficients of both unanticipated and anticipated government bonds are expected to be insignificant ($\alpha_3 = \alpha_4 = 0$). Therefore, this equation can be used for empirical verification of the REH.

Testing for Ricardian Equivalence and Consumption in India

The permanent income hypothesis under rational expectations yields a consumption function that follows a random walk. Therefore, in such a consumption function the coefficient of the government debt variable should be insignificant. The consumption equation is thus specified as

$$\Delta C_t = \alpha_0 + \alpha_1 GB_t^a + \alpha_2 GB_t^u + \alpha_3 W_t^u + \mu_t \qquad (1.7)$$

Where, C is consumption expenditure, GB is government debt held by the public at the beginning of the period, and W is private sector wealth at the beginning of the period. Both GB and W are specified in their first difference forms.

The derivation of the unanticipated change in private wealth can be explained as follows. It is assumed that the rational consumer at any time 't' has a complete set of information and therefore the private holding of wealth may be influenced by income, interest rates and any other relevant information. The unanticipated change in wealth is the difference between the actual wealth and what was anticipated, given the information set. The anticipated change in wealth is given by

$$\Delta W_t = \beta_0 + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta i_{t-1} + \beta_3 \Delta V_{t-1} + \varepsilon_t \qquad (1.8)$$

Where, W_t is real per capita private wealth in the beginning of the period, i is the interest rate, Y is the income and V is a vector of any other information that may be available to the consumer. The error term (ε_t) represents the unanticipated change in wealth (W^u_t).

The income variable is expected to be significant in the wealth equation. In India, as the interest rates were administered and regulated for a long time, these may not be of much importance from the viewpoint of expectations.[5] The level of government expenditure may have a particular significance for the expectation formation since it influences the future course of national income and the tax liability of the private sector.

The anticipated and the unanticipated change in government debt held by the public are estimated on the basis of the following equation,

$$\Delta GB_t = \lambda_0 + \lambda_1 \Delta Y_{t-1} + \lambda_2 \Delta i_{t-1} + \lambda_3 \Delta V_{t-1} + \lambda_4 \Delta GB_{t-1} + v_t \qquad (1.9)$$

Where GB_t is domestic debt held by the public in the beginning of the period. The error term accounts for the unanticipated change in government debt held by the public (GB^u_t) while the anticipated change in government debt (GB^a_t) is derived as $GB^a_t = GB_t - GB^u_t$

It is assumed that given the permanent income hypothesis under rational expectations, consumption follows a random walk and the effect of surprises are felt on the current consumption.[6] In the above consumption function, the coefficients of government debt, both anticipated and unanticipated, should be insignificant ($\alpha_1 = \alpha_2 = 0$ in Equation 1.7) if the Ricardian Equivalence Hypothesis has to be validated in the Indian context.

Section II

Review of Empirical Literature

Initially, the empirical work on the Ricardian Equivalence Hypothesis was scanty but since Barro's seminal paper in 1974, a large number of empirical studies have been conducted to test the hypothesis. The growth in the empirical literature has gone along with the increasing sophistication of the techniques employed to test the REH. The vast empirical literature on consumption and Ricardian equivalence, mainly for the United States, has been critically surveyed in Leiderman and Blejer (1988), and Seater (1993).

In India, the interest in REH is relatively of recent origin. Of the five studies which specifically addressed the issue, three have rejected Ricardian Equivalence, while one yields mixed results. Ricardian Equivalence is supported by only one study (Table 1). Most of these studies face problems of data availability, specification and estimation such as the use of data in levels, and a proper definition of the income and consumption variables. The data series on macro aggregates are generally non-stationary at levels. Hence the use of data in levels could yield spurious results. In case of the income variable, as discussed by Kormendi (1983), the appropriate definition should be the national income, and not private income or disposable income. In case of the consumption variable, appropriate definition should include some component of the final consumption expenditure on durable goods.

Table 1: Empirical Studies on Ricardian Equivalence Hypothesis and Consumption in India

Study and Year	Data Specifications	Model Followed	Dependent Variable	Independent Variables	Technique Employed	Conclusion
1	2	3	4	5	6	7
1. Gopalakrishnan (1989)	1961-81, Annual	None.	C.	$PY, PYT, G, PD.$	OLS, Levels.	Supports Ricardian Equivalence.
2. Gopalakrishnan (1991)	1961-87, Annual	None.	C.	$Y, G, T^*, D.$	OLS, Differences.	Mixed.
3. Gupta (1992)	1960-1985, Annual	Buiter and Tobin (1980) Aschaer (1985).	C.	$YP, YT, GP, GT.$ $T, G, DF.$	OLS, Levels.	Rejects Ricardian Equivalence.
4. Mohanty (1995)	1961-90 (C) and 1968-90 (CND) Annual.	Modigliani and Sterling (1986); Modigliani and Jappelli (1987).	C, CND.	$Y, PD, W, DF, i, YR.$	2SLS, Levels.	Rejects Ricardian Equivalence.
5. Ghatak and Ghatak (1996)	1950-1986, Annual	Buiter and Tobin (1980); Kormendi (1983); Boskinn (1985).	C.	$Y, G, T.$	Cointegration, Differences.	Rejects Ricardian Equivalence.

Key :

Dependent Variables - C : Total Private Consumption; CND : Private Consumption of Non-durable Goods.

Independent Variables

D	: Domestic Debt	PD	: Public Debt	W	: Wealth
DF	: Budget Deficit	PY	: Private Income	Y	: Income
G	: Government Expenditure	PYT	: Private Transitory Income	YP	: Permanent Income
GP	: Permanent Government Expenditure	T	: Taxes	YR	: Ratio of Non-agricultural Income to Agricultural Income
GT	: Transitory Government Expenditure	T^*	: Taxes Net of Transfers	YT	: Transitory Income
i	: Interest Payments to Domestic Residents				

Section III

Issues pertaining to Data Specification and the Period of Estimation

The data used in the study have have been collected from the *National Accounts Statistics, Central Statistical Organisation* (CSO), and various publications of the Reserve Bank of India. The dependent variable is the real per capita private final consumption expenditure. Total private final consumption expenditure *(CT)* is decomposed into durable goods *(CD)*, semi-durable goods *(CSD)*, non-durable goods *(CND)* and services *(CS)*.[7] In the estimation, apart from using *CT* and *CND*, three more consumption measures are computed and used.[8] These are (a) consumption expenditure on non-durables and services, *CNDS* *(=CND+CS)*; (b) consumption expenditure on semi-durables, non-durables and services, *CNDT* *(=CSD+CND+CS)*; and (c) consumption expenditure incorporating some component of current purchases of durable goods, *CDT* *(=0.3*CD+CSD+CND+CS)*. The proportion of current purchases of durable goods in *CDT* is assumed at thirty per cent based on the following consideration. In the United States (US), Bureau of Economic Analysis uses ten per cent of current expenditure on durable goods and thirty per cent of total net stock of durable goods owned by consumers to compute the annual consumption flow measure.[9] In the absence of a series on net stock of durable goods owned by consumers for India we have adopted the US. norm to reclassify the durable consumption.

In the empirical estimation, total private final consumption expenditure *(CT)* was tested separately, considering that consumption expenditure on durable goods also follow a random walk (Mankiw, 1982).[10] The other aspect pertains to the definition of durable goods. In the US, durable goods refer to those commodities that have an average life of at least three years.[11] On the other hand, in India, consumer durables refer to those goods which have an expected lifetime of considerably more than one year (CSO, 1989).[12] There has been a revision in the estimation of the series on consumption expenditure on consumer durables since 1980-81

(CSO, 1989).[13] Therefore, a dummy has been used in the regressions which use total consumption expenditure (CT) or some component of consumption expenditure on durable goods (CDT) as a dependent variable. The other issue pertains to the debt variable. The data on domestic debt in India is available only on par value basis and not on the market value basis. This should not cause any ambiguity in the results, given a robust underlying consumption model. In addition, since interest rates were highly regulated until recently, the divergence between the two may not be very significant. The interest rate series, used in the estimation of the wealth and debt functions, is the minimum redemption yield on the short term (one to five years) Central Government securities (YD_{st}). This is considered to be an appropriate proxy for the yield pattern on government securities in the absence of any data on yield pattern of total government securities, inclusive of the State Governments. However, the yield pattern on Central and State Government securities are closely related. Moreover, the turnover of Central Government securities have been fairly high, hence, the yield pattern of these securities is more representative of the returns on the other government securities.

The official data series on wealth is available in the form of net stock of capital goods held in the private sector (private corporate and household) from 1981 onwards. In the absence of any other comprehensive series, a wealth series has been constructed for the earlier years using the annual data on net capital formation in the private sector (Appendix 1). In the case of the government expenditure on goods and services, data on total government purchases is not available for India. The available data series pertains to government final consumption expenditure on goods and services consisting of purchases of non-durable goods and services by the government and expenditure incurred on durable goods for defence purposes (CSO, 1989).[14] The NNP deflator is used to compute the series at constant prices in cases where they are available only at current prices. All the relevant variables used in the estimation of the equations are in real per capita terms. The detail computation of data series used in the analysis is presented in the Appendix 1. The revised data series on components of consumption expenditure

are available for the period 1970-71 to 1994-95 on an annual basis. In view of the above limitations of the data availability on consumption expenditure, the estimation is restricted to the annual series for the period 1971-95.

Section IV

Empirical Results

Estimating the Anticipated and the Unanticipated Components of Domestic Debt and Wealth

The empirical estimates of the Equations 1.8 and 1.9, are presented in Table 2. In the case of the private sector wealth (Column 2)

Table 2 : Estimation of the Wealth and the Domestic Debt Functions - 1971-95

	Wealth Function		Domestic Debt Function		
1	2	3	4	5	6
Constant	84.33	86.22	12.21	9.87	12.88
	(10.6)	(11.6)	(1.3)	(1.1)	(1.5)
ΔY_{t-1}	0.19	0.15	0.01	0.13	0.13
	(1.8)	(1.8)	(0.0)	(1.2)	(1.3)
ΔGS_{t-1}	-1.65	-1.67	0.77	1.1	
	(2.3)	(2.4)	(0.7)	(1.1)	
Δi_{t-1}	-0.87		1.81		
	(0.7)		(1.2)		
ΔGB_{t-1}			0.57	0.42	0.57
			(2.0)	(1.6)	(2.7)
R^2-Adj	0.15	0.17	0.36	0.35	0.34
SEE	26.54	26.25	30.33	30.66	30.90
DW	1.81	1.83	2.08	1.77	1.71
h-stat	—	—	—	—	—
CHI-SQ	5.05	5.17	—	—	—
LM	0.59	0.29	0.11	1.22	0.72

The dependent variable, in first differences, is wealth, W_t, in Columns 2 and 3, and domestic debt, GB_t, in Columns 4, 5 and 6. Y is net national product, i is interest rate, GS is government expenditure. The variables are specified in first differences. Figures in parenthesis are the t-values.' Indicates that the h - statistics cannot be computed because it would be necessary to compute the square-root of a negative number. (Davidson and Mackinnon, 1993). CHI-SQ statistic is the Box-Pierce statistic for the test that the residual autocorrelations are jointly zero when there are no lagged dependent variables. The LM is the Jarque-Bera Asymptotic LM Normality test to test for the normality of the residuals.

the empirical results substantiate the theoretical arguments. The interest rate is insignificant in the regression, while income and government expenditure are significant. An attempt to estimate the equation with other interest rates or with a series on gold prices, as personal holdings of gold are psychologically important for the Indian households, did not lead to any qualitative difference in the equation. Therefore, the interest rate variable is dropped from the equation and the equation with income and government expenditure is retained for the estimation of the unanticipated component of private sector wealth (Column 3).

Similarly, privately held domestic debt is explained by the changes in the levels of income, government expenditure, interest rate and lagged domestic debt held by the public. In the estimation, only the lagged dependent variable is significant (Column 4). Given the theoretical basis, the insignificance of the interest rate is expected.[15] In the next regression, the interest rate is omitted and no variable is significant (Column 5). The estimation of the regression without the income variable, but including the interest rate yields a high h-statistics suggesting the presence of mis-specification error.[15] Finally, the equation is re-estimated without the government expenditure and the lagged dependent variable is significant again (Column 6). The *t-ratio* of the income variable also improves, though marginally. This equation for different time period specification yields consistent results. In view of the economic situation in India, and the nature of the ownership pattern of domestic debt, this estimation is considered appropriate theoretically. Therefore, it is used in the computation of the anticipated and the unanticipated components of domestic debt.

Estimating the Consumption Function for the Ricardian Equivalence Hypothesis

The empirical results of Equation 1.7, specified in first differences, are presented in Table 3. In the case of the total final private consumption expenditure (Column 3) and its components (Columns 4 - 7), the results are consistently similar. The coefficient of the anticipated domestic debt is insignificant but that of the unanticipated

component is significant. The joint hypothesis that the coefficients of the two components are insignificant $(\alpha_1 = \alpha_2 = 0)$ is rejected in all the cases at the 5 per cent level of significance. Thus, the results do not support the Ricardian Equivalence Hypothesis.

Table 3: Empirical Results of the Ricardian Equivalence and Consumption

| | H_o:R.E. Expected *Sign.* | Consumption Expenditure | | | | |
		ΔCT	ΔCDT	$\Delta CNDT$	$\Delta CNDS$	ΔCND
1	2	3	4	5	6	7
Constant		23.17	22.62	31.83	22.58	21.49
		(2.0)	(2.0)	(2.8)	(2.1)	(2.0)
ΔGB^a_t	=0	-0.43	-0.44	-0.21	-0.11	-0.26
		(1.6)	(1.6)	(0.8)	(0.4)	(1.1)
ΔGB^u_t	=0	0.56	0.54	0.68	0.58	0.52
		(2.6)	(2.5)	(3.1)	(2.8)	(2.5)
ΔW^u_t		-0.18	-0.15	-0.15	-0.02	-0.02
		(0.7)	(0.6)	(0.6)	(0.1)	(0.1)
DUMMY		29.72	28.77			
		(2.1)	(2.1)			
R^2-*Adj*		0.40	0.38	0.27	0.19	0.17
SEE		28.22	28.40	30.64	29.27	28.74
DW		1.83	1.86	1.92	1.95	1.99
CHI-SQ.		3.90	4.04	3.99	5.42	5.77
LM		0.76	0.79	0.09	0.56	0.83
F-stat		5.35**	5.14**	5.14**	3.89**	3.71**

The dependent variable, in first differences, is consumption expenditure - CT is total consumption, CDT is consumption with some component of durable goods, $CNDT$ is consumption of semi durables, non-durables and services, $CNDS$ is consumption of non-durables and services, and CND is consumption of non-durables. GB is government debt and W is wealth. The superscripts 'a' and 'u' refer to the anticipated and unanticipated values, computed on the basis of the estimations, in first differences, presented in Table-2. Ho: R.E. represents expected sign under the Null Hypothesis of Ricardian Equivalence. The t-statistics are shown in parentheses. $CHI-SQ$ statistic is the Box-Pierce statistic for a test that the residuals autocorrelations are jointly zero when there are no lagged dependent variables. The LM is the Jarque-Bera Asymptotic LM Normality test to test for the normality of the residuals. F-statistics tests for $GB^a_t = GB^u_t = 0$.
** Significant at the level of 5 per cent.

The rejection of the Ricardian Equivalence result in India can be due to many reasons, the important ones being (a) existence of imperfect capital market, and (b) prevalence of regulated interest rates.

Table 4: Testing the Robustness of Results of Ricardian Equivalence in India - 1971-95

	H_o:R.E. Expected Sign	Consumption Expenditure				
		ΔCT	ΔCDT	$\Delta CNDT$	$\Delta CNDS$	ΔCND
1	2	3	4	5	6	7
Constant		21.85	21.26	29.89	20.57	19.34
		(1.8)	(1.7)	(2.5)	(1.8)	(1.7)
ΔC_{t}@		-0.22	-0.23	-0.29	-0.31	-0.30
		(0.9)	(1.0)	(1.1)	(1.2)	(1.3)
ΔGB^a_t	=0	-0.19	0.19	0.07	0.14	-0.07
		(0.5)	(0.5)	(0.2)	(0.4)	(0.2)
ΔGB^u_t	=0	0.56	0.55	0.66	0.55	0.48
		(2.5)	(2.5)	(3.0)	(2.6)	(2.4)
ΔW^u_t		-0.22	-0.20	-0.20	-0.08	-0.07
		(0.9)	(0.8)	(0.8)	(0.3)	(0.3)
DUMMY		27.44	26.23			
		(1.9)	(1.8)			
R^2-*Adj*		0.38	0.36	0.28	0.20	0.19
SEE		29.11	29.196	30.83	28.99	28.38
h-stat		!	!	!	!	!
LM		0.19	0.23	0.76	1.32	1.38
F-stat		3.54***	3.30***	4.54**	3.61**	2.76***

The dependent variable, in first differences, is consumption expenditure - CT is total consumption, CDT is consumption with some component of durable goods, $CNDT$ is consumption of semi durables, non-durables and services, $CNDS$ is consumption of non-durables and services, and CND is consumption of non-durables. GB is government debt and W is wealth. The superscripts 'a' and 'u' refer to the anticipated and unanticipated values, computed on the basis of the estimations, in first differences, presented in Table-2. @ Lag value of the respective measure of consumption in first differences. Ho: R.E. represents expected sign under the Null Hypothesis of Ricardian Equivalence. The t-statistics are shown in parentheses.! Indicates that the *h-statistics* cannot be computed because it would be necessary to compute the square root of a negative number. (Davidson and Machinnon, 1993). The LM is the Jarque-Bera Asymptotic LM Normality test to test for the normality of the residuals. F-statistics tests for $GB^a_t = GB^u_t = 0$. ** Significant at the level of 5 per cent. *** Significant at the level of 10 per cent.

In an attempt to test for the robustness of the results, this study has experimented with Equation 1.7, by including the lagged changes in consumption, thereby testing for the hypothesis of habit formation. It is hypothised that if the coefficient of lagged consumption is significant then the permanent income hypothesis under rational expectations is rejected. The results of our experiment are presented in Table 4. The coefficient of lagged consumption is insignificant in all the equations. Hence the hypothesis of habit formation does not find support in India.

The coefficients of the unanticipated component of domestic debt in all the regressions are similar to the results presented in Table 3. The anticipated component of domestic debt continues to be insignificant while the coefficients of the unanticipated component of domestic debt is significant. Thus, the results, once again, imply the rejection of Ricardian Equivalence in India.

Section V

Conclusions

It can be concluded on the basis of the empirical results that given the appropriate specification of the consumption function, the consumers in India do not exhibit Ricardian behaviour. This result is robust for different components of the private final consumption expenditure. Thus, given the permanent income specification under rational expectations, the private sector consumption pattern in India does not exhibit Ricardian behaviour. Total consumption expenditure, including expenditure on durable goods, yields similar results as that of consumption expenditure on non-durables and services. In the Indian context, permanent income hypothesis under rational expectations seems to hold good. The data rejects the alternative hypothesis of habit formation.

End-Notes

1. The term Ricardian Equivalence Theorem was introduced by Buchanan (1976). However, O'Driscoll (1977) has documented Ricardo's reservations about this result.

2. Modern research in this area originated with the work of Hall (1978), wherein, the combined implications of rational expectations and permanent income theory of consumption were derived.

3. Lucas (1976) pointed out that under rational expectations, the permanent income hypothesis does not lead to a structural relationship between consumption and income but to a statistical relationship that could change. The Lucas critique, thus, called for estimation methods that treat consumption and income jointly. Hall (1978) sharpened the implications of the permanent income hypothesis by showing that under rational expectations. only surprises in permanent income 'should affect current consumption, once lagged consumption is accounted for. Thus, a new dichotomy was added in the consumption literature - that of anticipated and unanticipated changes in income.

4. However, other studies attempting to test Hall's hypothesis, yield mixed results (Bilson, 1980; Flavin, 1981; Cuddington, 1982; Muellbauer, 1983; Wilcox, 1989; Zeldes, 1989).

5. The insignificance of the interest rates in the money demand function has been emphasised in many studies in India.

6. Permanent Income Hypothesis in India is empirically supported by Gopalakrishnan (1989) for the period 1960-61 to 1980-81. Laumas and Laumas (1976) find no support for a loose variant of the permanent income hypothesis during the period 1929-1960 while Bhalla (1980) finds mixed support on the basis of the household panel data for rural India, 1968-69 to 1970-71.

7. The share of *CD, CSD, CND* and *CS* in the total consumption expenditure changed from 1.3 per cent, 10.2 per cent, 70.4 per cent and 18.1 per cent in 1970-71 to 3.2 per cent, 14.1 per cent, 62.5 per cent and 20.2 per cent, in 1994-95, respectively.

8. Theoretically, consumption expenditure would be an appropriate measure in the consumption function but it could result in a bias through subjectivity in fixation of implicit annual rental rates. Hayashi (1982) concludes that his test for permanent income hypothesis is rejected when consumer expenditure is used, but is accepted when consumption series which includes service flows from consumer durables is used. Kormendi (1983) uses the Bureau of Economic Analysis' measure of stock of consumer durables while Modigliani and Sterling (1986) use the Federal Reserve Bank series and get different results for the United States. Darby (1978) argues that the errors in classifying consumer expenditures as durables or nondurables suggest that the use of consumer expenditure is substantially less subject to specification error than the alternative approach. However, many studies consider only the consumer expenditure on nondurables and services or only consumer expenditure on nondurables in their consumption functions.

9. This practice is followed by Kormendi (1983), Kormendi and Meguire (1986, and 1990), and Barth, Iden and Russek (1986).

10. However, Hall (1978) only considers consumer expenditure on non-durables goods and services.

11. Bureau of Economic Analysis (1993), p. M-6.

12. Central Statistical Organisation (1989), p. 341.

13. Central Statistical Organistaion (1989), pp. 205.

14. Central Statistical Organistaion (1989), p. 27.

15. The short term yield rates on government securities is insignificant in the regression (Column 4). The exercise with the long term yield rate did not make any qualitative difference in the equation. The yield rates are not significant due to the existence of the captive market. In the captive market, investments in government bonds are made statutorily, and yield rates may not play an important role.

16. The regression is not reported in the Table.

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APPENDIX 1
Data Specification and Construction

The primary data series are :

NY_t	: Net National Product (market prices) at 1980-81 prices.
NGS_t	: Government final consumption expenditure on goods and services at 1980-81 prices.
NCT_t	: Total private final consumption expenditure at 1980-81 prices.
NCD_t	: Private final consumption expenditure on durable goods at 1980-81 prices.
$NCSD_t$	: Private final consumption expenditure on semi-durable goods at 1980-81 prices.
$NCND_t$	: Private final consumption expenditure on non-durable goods at 1980-81 prices.
NCS_t	: Private final consumption expenditure on services at 1980-81 prices.
NGB_t	: Domestic debt held by the public in the beginning of the period.
NSP_t	: Net capital stock in the private sector at real prices for the period 1980-81 to 1993-1994.
$NCCF_t$	: Net capital formation in the private sector at current prices for the period 1970-71 to 1979-80.
$NTCF_t$	: Net total capital formation at current prices for the period 1970-71 to 1979-80.
$NTCRF_t$	: Net total capital formation at real prices for the period 1970-71 to 1979-80.
$NYDS_t$	: Redemption yield on short term (for one to five years) central government securities (minimum of the range).
POP_t	: Population of India (mid-year).
DEFt	: Implicit price deflator for Net National Product at market prices.

The following transformations were done to generate the variables used in the empirical estimation

Y_t = NY_t/POP_t

GS_t = NGS_t/POP_t

CT_t = NCT_t/POP_t

CD_t = NCD_t/POP_t

CSD_t = $NCSD_t/POP_t$

CND_t = $NCND_t/POP_t$

CS_t = NCS_t/POP_t

CDT_t = $0.3*CD_t+CSD_t+CND_t+CS_t$

$CNDT_t$ = $CSD_t+CND_t+CS_t$

$CNDS_t$ = CND_t+CS_t

YDS_t = $NYDS_t-INF_t$

$INF_t=[(DEF_t-DEF_{t-1})/DEF_{t-1}]$

GB_t = $NGB_t/[(0.5*DEF_{t-1}*POP_{t-1})+ (0.5*DEF_t*POP_t)]$

W_t = $NW_t/[(0.5*POP_{t-1})+ (0.5*POP_t)]$

$NW_t=NSP_t (1982 - 1995)$

$NW_t=NSP_{t-1}-NCF_t (1970 - 1981)$

$NCF_t = NCCF_t*100/DCF_t$

$DCF_t = NTCF_t/NTCRF_t$

NOTE

Sustainability of Central Government Debt

J.K. Khundrakpam*

This paper attempts to evaluate the fiscal outcomes under alternative assumptions of money and output growth. The exercise indicates that if the Ninth Plan target of 7.0 per cent growth in GDP is achieved and the rate of growth of aggregate monetary resources is restricted to 16.0 per cent, the fiscal situation would improve significantly from that of the Eighth Plan. The paper notes that if either growth falters or to maintain the growth rate if the real interest rate is contained through further monetary expansion, the fiscal scenario in both events would worsen significantly.

Introduction

An issue that has received focussed attention in the recent times is : whether the Indian public debt can be considered sustainable in the medium to long-term context. This concern has been a fallout of the rapid growth in central government deficit and debt witnessed during the eighties and the perceived inadequacy of the recent fiscal reform measures to reverse this trend. The Chakravarty Committee (1985) had drawn attention to the destabilizing effects of government deficit on the economy through automatic monetization of deficit leading to high rates of inflation. Following its recommendation the concept of monetized deficit, which otherwise in the literature is known as 'seignorage', came to be recognized as an important fiscal parameter in India. Since then there has been an increasing concern about the adverse macro-economic conseuences of the fiscal deficit and public debt. In the current economic reform process, the fiscal deficit has been adopted as an important indicator of fiscal and macro-economic situation in the Indian economy.

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The central government fiscal deficit which, on an average, stood at 6.3 per cent of GDP during the period 1980-81 to 1984-85 rose to 7.9 per cent during the period 1985-86 to 1989-90 as compared to 4.5 per cent during the period 1975-76 to 1979-80. The ratio rose to 8.3 per cent in 1990-91. Despite the slippage in 1993-94, it has been brought down to about 5.0 per cent in 1996-97 (R.E.). The budget estimates for 1997-98 envisaged to bring it down further to 4.5 per cent (Table-1). Yet, as a result of the past policies, interest payment of the central government continues to grow at a fast rate. The interest component of fiscal deficit has consistently increased from 35.4 per cent during the period 1980-81 to 1984-85 to 74.2 per cent during 1991-92 to 1995-96. The budget estimates for 1997-98 show that it would be the first time in the recent history that interest payment will exceed the net borrowing. This need not however, be interpreted as a situation of debt trap. A simple budget constraint would state that whenever the primary balance is in deficit, such a situation will automatically follow. Ideally, in the inter-temporal sense, interest payments should be met from the primary surplus in the budget. In the short run, however, it is conceivable that the absolute size of interest payment may exceed the net change in the debt stock because of the different dynamic growth path of deficit, debt, and interest payment. What is significant to note is that, a falling deficit to GDP ratio, accompanied by a rising primary surplus constitutes the critical condition for achieving continuous decline in interest payment. This is more so, if the interest rate exceeds the growth rate in the economy. If interest rate is higher than the GDP growth, and the primary account is permanently in deficit, there will be a tendency for the debt-GDP ratio to grow boundless.

The inter-temporal link between deficit and debt is reflected on the interest payment component of current expenditure that depends upon the past deficits or the accumulated debt. This link between the past and the current budgetary transaction in the simplest form of budget identity can be shown as follows :

$$\delta D = rD + (G\text{-}T)$$

Where 'r' is the nominal interest rate, 'D' is the outstanding stock of debt and (G-T) is the gross primary deficit or the difference between the total non-interest government expenditure 'G' and total revenue 'T'. In the above relationship, the outstanding debt 'D' rises forever if $rD > (G-T)$. What is a matter of concern, however, is the change in the debt to GDP ratio. From the above identity, the debt dynamic condition implies $\delta d = (r-k)d + pd$, where 'k' is the nominal growth rate of GDP, 'd' is the debt to GDP ratio and 'pd' is the primary deficit to GDP ratio. The debt-GDP ratio will grow boundless if $(r-k) > 0$ for 'pd' in positive or $(r-k)d > pd$ for 'pd' in negative.

In this simple exposition of budget identity, 'G' and 'T' are assumed to be unit elastic with respect to both inflation and GDP growth. In the real situation, however, the responses of 'G' and 'T' to price and income changes are neither unity nor equal. These varied elasticities combined with an endogenously evolving interest rate characterises the dynamic behaviour of the government budget constraint. The rest of the paper is organised as follows :

Section I presents a discussion on the linkage between the deficit, money supply and inflation, followed by the presentation of a model to analyse the behaviour of fiscal, real and monetary sectors. Based on the model, Section II generates alternative fiscal scenarios with different assumptions of income growth and the rate of growth of money supply. Section III is devoted to conclusion.

Section I
Deficit, Money supply and Inflation

Based on the relevant theoretical analytics this section presents a small econometric model on the linkage between deficit, money supply and inflation. The model developed is then integrated with a public debt model to generate the forecasts of fiscal variables for the future period. Central to the domestic implications of deficit is how the government finance influences the monetary condition in the economy and hence, the inflation and the interest rate. In India, for a long period, fiscal policy was the major driving force of the

growth of reserve money and money supply. The direct impact of fiscal transactions on the base money is traced to the government's borrowing from the Reserve Bank to finance its budgetary gap. Fiscal deficit also affects the base money indirectly through the feedback from changes in the balance of payments and the net foreign assets of the Reserve Bank. Fiscal deficit worsens the current account balance and results in loss of reserves. Therefore, a one shot increase in fiscal deficit financed by money creation generates a chain of dynamic impact on money supply — first, by increasing its level by expanding the domestic credit component and by widening the fiscal deficit in the subsequent period, thus raising the need for further monetary expansion and second, by causing a loss of reserve in the balance of payments and thus, dampening the net foreign asset component. In this context, the recent policy changes relating to the elimination of the practice of automatic monetisation of fiscal deficit opens up certain new vistas for the interaction between fiscal and monetary policies in India. According to the recent monetary policy reform, financing of the central government fiscal deficit has been delinked from the money creation through the automatic monetisation route. Central government, instead, will have an access to the ways and means advances from the Reserve Bank for financing its temporary cash deficits, thus, limiting the direct monetary impact of fiscal deficit to within the year variation of monetary base. What implication does this have for deficit, money supply, inflation and interest rate in India? An important condition for maintaining internal and external stability in the emerging condition is ensuring the sustainability of the fiscal policy for creating an environment in which monetary and exchange rate policies will take on their respective roles of stabilisation. Fiscal deficit, its extent of monetisation and its interest rate implications need a closer look in this context. In what follows a small model is presented to study the macro-economic interactions between deficit, money supply, inflation and interest rate in India.

Price level in the economy is determined by the demand for and supply of the real money balances

$$\ln (Md/P) = \ln a + b \ln Y + u \qquad \ldots\ldots (1)$$

Where 'Md' is the demand nominal money balance, 'P' is price level (represented by GDP deflator at market prices), 'Y' is the real income (represented by GDP at constant market prices) and 'u' is an error term. Inverting the above equation we get an expression for price level, which in a partial adjustment framework, provides the following empirical estimates of the impact of real income and money supply on the price level for the period 1974-75 to 1996-97.

$$\ln P_t = 1.88 + 0.283\ln M3 - 0.415\ln Y + 0.72\ln P_{t-1} \qquad ...(2)$$
$$\quad (1.24) \quad (6.16) \qquad (-3.03) \qquad (7.45)$$

$$\bar{R}^2 = 0.999 \qquad \text{Durbin's } h = 0.78$$

Interaction between money supply and fiscal deficit takes place through the changes in the base money brought (RM) about by the variation in the net RBI credit to the central government and the state of the money multiplier. These two relations are shown in equation (3) and (4), respectively.

$$RM = MD + NFA + RRM \qquad\qquad ..... (3)$$

$$M3 = - 6660.0 + 3.27\ RM. \qquad\qquad ......(4)$$
$$\quad (-1.87) \quad (74.1)$$

$$\bar{R}^2 = 0.995,\ DW = 1.61$$

Where 'MD' is stock of monetised debt, or net RBI credit to government, NFA is net foreign asset and RRM is residual reserve money.

Equations (2) to (4) can be used to analyse two different types of hypotheses. Under one hypothesis, fiscal deficit and a component financed by net RBI credit to government can be assumed to be exogenous. This implies, *ceteris paribus*, reserve money growth will follow the path chosen for the fiscal deficit. Under the second hypothesis, equation (2) can be used as the monetary sector constraint, treating money supply growth as an exogenous target which

is set by the monetary authority. The reserve money changes subsume this target. Here the burden of adjustment would be entirely on fiscal deficit. Under the emerging fiscal and monetary policy setting, this study treats the second hypothesis as a more realistic assumption in the Indian context.

In India, a number of studies have analysed the behaviour of Indian public debt. [See Seshan (1987), Bhattacharya (1992), Bhattacharya and Guha (1990), Rangarajan *et al* (1989), Buiter and Patel (1992), Bhattacharya and Guha (1992), Chelliah (1991 and 1996), Joshi and Little (1996), Mohanty and Khundrakpam (1994) and Mohanty (1997)]. Barring Rangarajan et al (1989), in most of these studies primary deficit (net or gross) has been assumed as an exogenous policy variable. This homogeneity in the assumption is not accidental. Primary balance is defined as the excess of discretionary expenditure over receipts. Therefore, theoretically it is possible to target it at a specific level by adjusting the expenditure to the corresponding receipts. On the other hand, if a long-term or structural relationship exists between receipts and expenditure on the one hand, and prices and income on the other, the primary balance should not be treated as a discretionary policy variable.

In order to generate the net primary deficit ratio under different price and income growth scenarios, it is necessary to estimate the income and price elasticities of non-interest expenditure and receipts over a significantly longer period of time. The estimate for non-interest expenditure (G) excluding net lending during 1970-71 to 1996-97 (R.E.) is obtained as,

$$\ln G = -3.59 + 1.115\ln Y + 1.19\ln P - 0.397DG \qquad .....(5)$$
$$(-0.91) \quad (3.35) \quad (6.53) \quad (-6.41)$$

$$\bar{R}^2 = 0.993 \qquad DW = 1.24$$

Where 'DG' is a shift dummy representing the expenditure reduction measures undertaken during the post-reform period of 1991-92 to 1996-97. With regard to the non-interest receipts, the relationship during 1974-75 to 1996-97 (R.E.), adjusted for tax

reform measures by a dummy 'DR' for the period 1993-94 to 1996-97, is as follows :

$$\ln R = -13.5 + 1.93\ln Y + 0.508\ln P - 0.134DR \qquad .....(6)$$
$$\quad\;\; (-5.21) \quad (8.83) \qquad (3.88) \qquad (-4.24)$$

$$\bar{R}^2 = 0.998 \qquad DW = 1.56$$

In India net lending (NL) is an important component of central government expenditure. This component of expenditure has followed a more or less similar trend as 'G'. The estimated association during 1970-71 to 1996-97 (R.E.) is given by the following regression.

$$NL = 825.9 + 0.174G \qquad\qquad\qquad .....(7)$$
$$\quad\;\; (2.53) \quad\;\; (26.2)$$

$$\bar{R}^2 = 0.96 \quad DW = 1.30$$

It is therefore, assumed that the net lending of central government would remain at about the historical ratio of 17.0 per cent of non-interest expenditure.

The stock of outstanding advance is given by the incremental net lending, plus the beginning of the period outstanding loans and advances. Interest receipts in the current year depends on the outstanding stock of claims and the average interest rate (e). An estimate of average interest rate on central government outstanding stock of advances to other sectors is given by the following equation.

$$e = 1.07 + 0.995r - 1.11DE \qquad\qquad .....(8)$$
$$\quad\; (2.05) \quad (15.46) \quad (-3.85)$$

$$\bar{R}^2 = 0.92 \quad DW = 1.49$$

'DE' represents dummy for the large fall in the average lending rate in the years 1978-79, 1982-83, 1986-87 and 1989-90.

· With regard to the interest rate, Mohanty (1997) provides a framework for endogenously determined rate. Rangarajan *et al* (1989) also had some endogenous element by relating the nominal interest rate as a constant mark up, representing real interest rate, over the price increase. An estimate of the nominal average interest rate 'r' can be derived from the money demand function, assuming that interest rate exerts a negative influence on the demand for real cash balances (Dornbusch and Fischer, 1994). The opportunity cost of holding real cash balances to financial assets is proxied by the average interest rate on government domestic debt. Assuming that the fiscal deficit exerts pressure on the demand for real cash balances, a relationship of the following type is considered :

$$\ln M_3/P = -5.49 + 0.807\ln Y - 0.0625Y$$
$$(-3.79)\quad (4.64)\qquad (-2.33)$$

$$+ 0.599 \text{ In } M_{3(-1)}/P_{(-1)} + 0.084 \text{ In RGFD} \qquad ..... (9)$$
$$(5.75)$$

$$\bar{R}^2 = 0.996, \text{ Durbin's } h = 1.37$$

This is a slightly modified version of the equation commonly used to estimate the money demand function in India (Jadhav, 1994). Inverting the estimated money demand function during 1973-74 to 1996-97, we get the following equation for the average interest rate as,

$$r = -87.79 - 15.99\ln M_3/P + 12.91\ln Y$$
$$+ 9.58\ln (M_3/P)-1 + 1.35 \text{ In RGFD} \qquad ..... (10)$$

Fiscal deficit has a positive effect on interest rate, which, if not counteracted by expansion in money supply will harden the nominal interest rate. Under a fixed monetary growth rule, interest rate is linked to the size of the fiscal deficit in the current period.

Projection of Public Debt

The framework developed above can be completed if we have an analytical framework to project the path of public debt. This is derived from the following budget constraint of the central government.

$$[G_t - T_t] + [iNDD_{t-1} + i^*CDD_{t-1} + wFD_{t-1}] +$$
$$[DL_t - DL_{t-1} - eDL_{t-1}] = [NDD_t - NDD_{t-1}] +$$
$$[CDD_t - CDD_{t-1}] + [FD_t - FD_{t-1}] \qquad \dots\dots (11)$$

G   = Government non-interest expenditure excluding net lending.
T   = Government non-interest receipts.
NDD = Outstanding stock of non-concessional domestic debt.
CDD = Outstanding stock of concessional domestic debt.
FD   = Outstanding stock of foreign debt.
DL   = Outstanding stock of loans and advances.
i   = average interest rate on non-concessional domestic debt.
i*   = interest rate on concessional domestic debt.
w   = average interest rate on foreign debt.
e   = average interest rate on domestic lending.
t   = represents time.

The above budget constraint states that gross fiscal deficit (comprising net primary deficit, gross interest payment and net lending adjusted for interest receipts) is financed by domestic borrowing *viz.*, concessional and non-concessional loans and foreign borrowing. The empirical estimate of net lending $(DL_t - DL_{t-1})$ is given by equation (7).

The foreign borrowing (FB) is assumed to be maintained at a constant proportion (X) of GDP i.e.,

$$FB_t = (FD_t - FD_{t-1}) = X*PY \qquad \dots\dots (12)$$

The average cost of this debt is also assumed to remain constant. Concessional domestic debt which is the debt owed by the central government to Reserve Bank in the form of special securi-

ties issued in conversion of ad hoc treasury bills is serviced at 4.6 per cent per annum. With regard to the nominal interest rate on non-concessional domestic debt 'i', it is derived from the average nominal interest rate on total domestic debt 'r' as estimated in equation (10), and adjusting it to the concessional component.

$$r = \frac{[i\,NDD(t\text{-}1) + 4.6CDD(t\text{-}1)]}{[NDD(t\text{-}1) + CDD(t\text{-}1)]}$$

$$\text{or, } i = + \frac{CDD(t\text{-}1)}{NDD(t\text{-}1)}\,[r\text{-}4.6] \qquad \qquad \ldots\ldots(13)$$

Targeting a real GDP growth of 'g' per cent yields a nominal income growth of k = g + p, where 'p' is the rate of increase in GDP deflator. Thus,

$$Y_t = (1+k)Y_{t\text{-}1} \qquad \qquad \ldots\ldots (14)$$

Outstanding total debt (TD) is defined as the outstanding at the beginning of the year plus the fiscal deficit;

$$TD(t) = TD(t\text{-}1) + FD \qquad \qquad \ldots\ldots (15)$$

In equation (11), the left hand side (LHS) equals the right hand side (RHS) which equals the fiscal deficit FD. 'G' and 'T' on the LHS is determined from equations (5) and (6), respectively. 'i*' is given as 4.6 per cent and 'i' is determined from equations (10), which estimates 'r', and equation (13). 'w' is assumed as given and 'FD' is automatically derived from (12) once the growth of 'Y' is assumed and 'P' is estimated from the structural relationship given at (2). Similarly, 'NL' is derived from (7) and 'e' is obtained from (8) by employing the value of 'r' arrived from (10). These sets of equations, the assumed value of parameters and the outstanding stock of each component of debt at the beginning of the year determine the FD in the LHS of (11).

In order to generate a dynamic process, the three components of financing the GFD, *viz;* domestic non-concessional, domestic concessional and foreign borrowing and their outstanding at the beginning of the current fiscal year need to be derived. Following policy changes, the outstanding stock of concessional debt has been fixed at the 1996-97 level i.e., henceforth, fiscal deficit would not be financed through this form of borrowing. This assumption holds good with the abolition of the system of financing a part of deficit through ad hoc treasury bills. Foreign borrowing which has been assumed at 0.4 per cent of GDP at market prices is automatically derived from the assumed rate of growth of real GDP and the estimated GDP deflator. The domestic non-concessional debt, therefore, forms the residual component of financing the fiscal gap. Once the level of each component of debt is determined, the gross interest payment is obtained as,

$$\text{GIP}(t) = i\,\text{NDD}(t-1) + i^*\text{CDD}(t-1) + w\,\text{FD}(t-1) \qquad ..... \ (16)$$

The overall debt-GDP ratio is obtained as ratio of TD in (15) and GDP at market prices 'Y' in (14).

In the analytical framework that follows debt projection with exogenously given value of parameters, the primary deficit and interest rate are assumed to be invariant to the rate of inflation and income growth. The debt stability condition and the terminal value of debt remains the same. Therefore, the effect of inflationary pressure on the evolution of debt is not properly captured in these projections. Resorting to monetary expansion by suppressing the level of interest rate can lower the volume of interest payment, deficit and debt. On the other hand, the feedback of inflation to primary budget balance is expected to be adverse which will increase the primary deficit and worsen the fiscal indicators. The net effect, however, would depend upon the values of the parameters. Similarly, restricting the expansion of monetary growth when the income growth improves would have the effect of raising the rate of interest. The primary balance, however, will improve at the same time counteracting the increase in the volume of interest payment, deficit and debt that would follow from the rising interest rate.

As shown in the Appendix, the ratio of net primary balance to GDP would improve when the following condition is satisfied.

$$\frac{p}{g} < \frac{m-c}{a-l} \qquad\qquad ..... (17)$$

Where, 'm' and 'c' are income elasticities of receipts and expenditure and 'a' and 'l' are price elasticities of expenditure and receipts, respectively. Given the estimated values of parameter in (5) and (6) and the assumed rate of income growth of 7.0 per cent, the maximum rate of inflation from the condition at (17) works out to P < 8.4 per cent. In other words, assuming the projected real income growth of 7.0 per cent during the Ninth Plan, the inflation rate must be limited to below 8.4 per cent in order to improve the ratio of primary balance further from the more or less balanced position in 1997-98 (Budget Estimates). The lower is the rate of inflation from this level the greater would be the improvement in primary balance. As would be evident from the exercise later, this is achieved by restricting the money supply growth at 16.0 per cent. The condition is more restrictive for lower targeted income growth.

In the Indian context most studies on public debt have assumed an inflation rate of 7.0 per cent, an income growth of 6.0 per cent and a fixed primary deficit ratio. As demonstrated by the condition at (17) an income growth of 6.0 per cent would necessitate limiting the inflation rate to less than 7.1 per cent if the fiscal situation is not allowed to deteriorate further. This would require restricting the monetary growth to a lower rate than what would be consistent with a real income growth rate of 7 per cent. A further effect would stem from the interest rate which is linked to real, monetary and fiscal condition. In what follows the model presented in this section is iterated for different assumptions of real growth rate and money supply targets in order to evaluate the alternative paths of deficit and debt.

Section II
Alternative Debt Scenarios and Implications

The base run is attempted with an assumed growth rate of 16.0 per cent in M_3 and the real growth rate of 7.0 per cent starting from *1998-99*. *What happens if the monetary expansion is* limited to a lower rate or if the GDP growth target falters? It is also interesting to evaluate the fiscal outcomes when money supply is increased at a higher rate than the base run.

All the relevant parameters in the model have been estimated with the exception of 'w' i.e., the average interest rate on external debt and 'EB', the ratio of external borrowing to GDP. For the sake of simplicity and want of better alternatives, the values of 'w' and 'EB' are assumed at their 1996-97 (revised estimates) levels of 3.098 per cent and 0.4 per cent, respectively.

Projections

Under a combination of 16.0 per cent growth in M_3 and 7.0 per cent real income growth, the net primary account would turn from a deficit to surplus during the Ninth Plan (*1998-99* to 2001-02) and show further improvement thereafter. With these real and monetary conditions in place, the observed average NPD of 1.47 per cent to GDP during the Eighth Plan would turn to a surplus of 0.18 per cent during the Ninth Plan and 1.12 per cent during 2002-03 to 2009-10 (Table 2). This is achieved through a steady fall in the inflation rate during this period, although the real interest rate would come under some pressure. While the average nominal interest rate shows a moderate rise from 10.29 per cent during the Eighth Plan to 11.59 per cent during the Ninth Plan and further to an average of 13.56 per cent during 2002-03 to 2009-10 due to the falling inflation rate, real interest rate strengthens from 1.54 per cent to 4.88 per cent and 7.62 per cent, respectively. The increase in average real interest rate does not, however, pose adverse consequences for the fiscal sector due to the strengthening of the net primary account in the wake of a high rate of growth in income, which initially exceeds the real interest

rate. Even though the real interest rate would exceed the income growth at some later stage, the strengthening of primary surplus would prevent the growth of debt/GDP ratio. The interest burden on both GDP and the total revenue receipts shows a progressive reduction and the fiscal deficit ratio declines to below 4.0 per cent by the year 2002-03. The consequence of a continuously falling fiscal deficit ratio is the decline in the debt ratio to below 40.0 per cent during 2002-03 to 2009-10 as against the Eighth Plan average of 62 per cent (Table-2).

Alternative Money Supply Growth

If the targeted level of monetary expansion is kept at, say 14.5 per cent, the inflation rate falls even more rapidly and approaches 4.0 per cent towards the end of the projection period (Table 3). In this case, the improvement in the primary balance and fiscal deficit is even larger. The real interest rate, however, rises to above 8.0 per cent during the intervening period. As a result, the burden of interest payment to GDP ratio shows an initial increase from the base values but turns around by the end of the forecast period. Restricting the rate of monetary expansion has the potential effect of improving the fiscal scenario significantly, provided the income growth is sustained. The limitation of this policy, however, is that the high real interest rate on government borrowing in the medium-run by acting as a reference rate for the rest of the economy can adversely affect the investment decisions and the growth of the economy.

Consider a less optimistic scenario, with a money supply growth of 14.5 per cent and real GDP growth of 5.5 per cent. In such an event there would be a different set of fiscal outcomes. The net primary balance rather than being in surplus would turn into a deficit while inflation rate still stays at a moderate value of about 6.5 per cent. Though the average real interest rate in the medium-run would be contained at a moderate level, the fiscal deficit ratio rises in the medium to long-run. The rise in the fiscal deficit exerts a strong upward pressure on the average nominal interest rate. As a result, a self perpetuating process of rising interest burden, fiscal

deficit and interest rate is set in motion. (Table 4). Relaxing the monetary expansion to 20.0 per cent and keeping the growth rate at 7.0 per cent increases the average inflation rate to 9.5 per cent during the projection period. While real interest rate would decline appreciably during the Ninth Plan, a self defeating process soon sets in due to the increase in the fiscal deficit ratio. Since the net primary deficit would show a steady rise, the consequent growth in the fiscal deficit would put pressure on the nominal interest rate. As a result, a rising net primary deficit would be reinforced by a growing interest payment to GDP ratio, thus resulting in the deterioration in the fiscal situation (Table 5).

A comparison of few crucial fiscal ratios under the four alternative scenarios are given in graph A to F. The net primary deficit ratio would grow if either M_3 growth is high (20.0 per cent) or when the GDP growth declines (5.5 per cent) (Graph A). A high rate of monetary expansion or lower GDP growth raises the nominal interest rate in the long run (Graph B). In other words, provided the income growth is not adversely affected, the lower the M_3 growth the more concave downward is the interest rate curve. Otherwise, the curve is convex downward. Similarly, the interest to GDP ratio, if income growth is sustained, initially stays higher and follows the concave path when M_3 growth is restricted. A high rate of monetary growth can at the most have an initial advantage after which the burden rises at a rapid rate. Worse still is when the GDP growth slows down (Graph C). The temporal behaviour of fiscal deficit ratio to GDP shows that a high M_3 growth (20 per cent) even when the income growth is 7.0 per cent, produces an accelerating rate of increase in the ratio (Graph D). The containment of debt ratio at a lower level through higher monetary expansion can be effective for a limited period. In the long-run monetary restriction would make debt burden lighter (Graph E). With regard to the pre-emption of revenue receipts by interest payments, lower rate of increase in money supply proves superior to other alternatives (Graph F).

Section III
Concluding Observation

The objective of this paper has been to evaluate the alternative fiscal outcomes under different real and monetary conditions and the extent of adjustment necessary to ensure sustainability of fiscal situation. The analysis presented in the study demonstrated the likely effects of a fixed monetary and growth target on the primary budget balance and the debt burden of the central government. A common practice followed in most studies is to treat the primary deficit as a policy variable, which can be adjusted to ensure sustainability of public debt, given the interest rate and growth rate in the economy. In this framework, primary budget balance is assumed to be flexible. Budget balance, however, is influenced by both cyclical factors and discretionary fiscal policy changes by the government. The approach adopted in this study has been to evaluate the primary budget balance and the debt and interest burdens of the central government under the alternative conditions of real growth rate and inflation. If the growth is high, given the built-in-elasticity of the fiscal system, the primary budget balance will see an improvement. On the other hand, a high inflation rate, given the relatively higher price elasticity of expenditure than revenue, would tend to deteriorate the primary budget balance and hence the sustainability of future fiscal condition.

The empirical results presented in the paper reveal that if the real growth rate is sustained at 7 per cent and money supply growth is restricted to 16 per cent, all fiscal indicators would see appreciable improvement in medium to long run. Under these conditions it would be possible to restrict the fiscal deficit ratio to GDP of the central government to around 4 per cent during the Ninth Plan. Both debt to GDP ratio and the interest burden would be relieved significantly. If the growth rate fails to keep up its desired momentum due to factors such as high interest rate or any other exogenous factor, the budget balance of the government would deteriorate in the medium to long-run. Responding to this situation by increasing monetary growth is likely to further worsen the primary budget balance because of feedback effect of inflation

on the revenue and expenditure of the government. Therefore, increasing the money supply growth to address the problems of high fiscal deficit is found to be unsuccessful as this results in deterioration of long-term fiscal situation in the economy. A policy implication of this finding is that if money supply growth is increased at a faster rate than desired and/or the growth rate suffers for whatever reasons, the discretionary fiscal policy must be activated to prevent the unsustainable build-up of public debt. In other words, both a low inflation rate and a faster rate of growth of GDP constitute the two most critical conditions for ensuring the stability of the fiscal system.

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Appendix

We write,

$$G(t) = (1 + a_*p + c_*g)_*G(t-1)$$

$$T(t) = (1 + l_*p + m_*g)_*T(t-1)$$

NPD(t) is defined as G(t) - T(t)

Employing the above identities and dividing by Y(t) we get,

$$\frac{NPD(t)}{Y(t)} = \frac{(1 + a_*p + c_*g)_*G(t-1) - (1 + l_*p + m_*g)_*T(t-1)}{Y(t)}$$

Deducting $\dfrac{NPD(t-1)}{Y(t-1)}$ from both sides and using $Y_t = (1+g+p)_*Y_{t-1}$

$$\frac{NPD(t)}{Y(t)} - \frac{NPD(t-1)}{Y(t-1)} = pd = \frac{(- p - g + a_*p + c_*g)_*G(t-1)}{(1 + g + p)_*Y(t-1)}$$

$$+ \frac{(p + g - l_*p - m_*g)_*T(t-1)}{(1 + g + p)_*Y(t-1)}$$

If NPD is to improve, pd should be less than 0.

i.e., $(- p - g + a_*p + c_*g)_*G(t-1) < (- p - g + l_*p + m_*g)_*T(t-1)$

If NPD is already in balance or surplus,

T(t-1) > or = G(t-1), therefore,

$(- p - g + a_*p + c_*g)_*T(t-1) > (- p - g + a_*p + c_*g)_*G(t-1)$

It then follows that, the condition

$(- p - g + a_*p + c_*g)_*G(t-1) < (- p - g + l_*p + m_*g)_*T(t-1)$

is always satisfied if and only if,

$(- p - g + l_*p + m_*g)_*T(t-1) > (- p - g + a_*p + c_*g)_*T(t-1)$

or, $l_*p + m_*g > a_*p + c_*g$

or, $\dfrac{p}{g} < \dfrac{(m - c)}{(a - l)}$

which is the condition given at (17) in the text.

Graph A : Primary Deficit to GDP Ratio

—■— M3 20% & GDP 7%   —◆— M3 16% & GDP 7%
—▲— M3 14.5% & GDP 7%   —□— M3 14.5% & GDP 5.5%
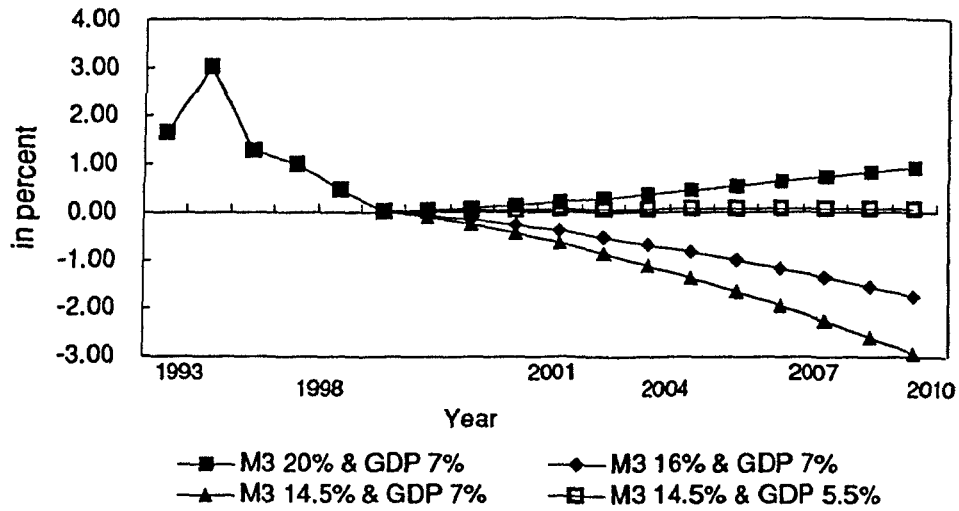
Graph B : Interest Rate on Domestic Debt

—■— M3 20% & GDP 7%   —◆— M3 16% & GDP 7%
—▲— M3 14.5% & GDP 7%   —□— M3 14.5% & GDP 5.5%
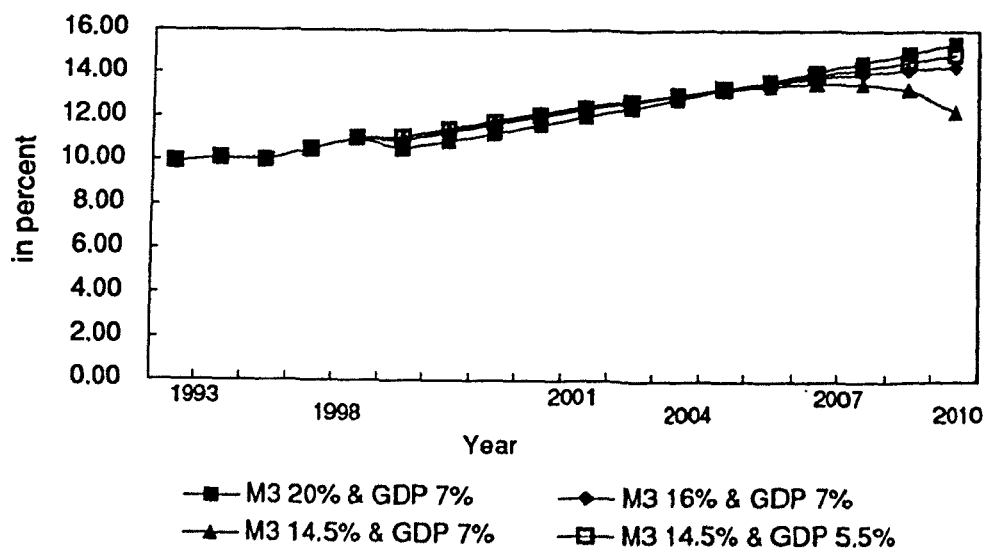
Graph C : Interest Payment to GDP Ratio

— ■— M3 20% & GDP 7%   — ◆— M3 16% & GDP 7%

— ▲— M3 14.5% & GDP 7%   — ☐— M3 14.5% & GDP 5.5%
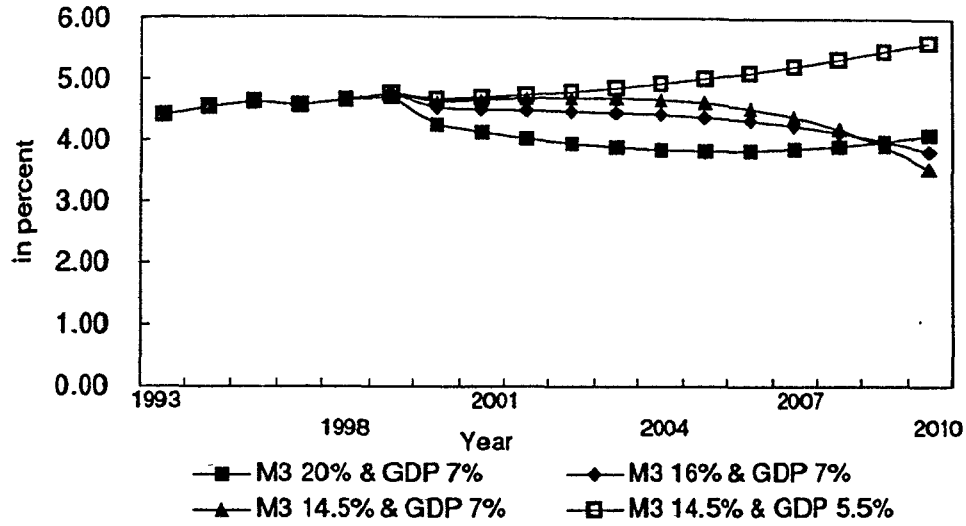
Graph D : Fiscal Deficit to GDP Ratio

— ■— M3 20% & GDP 7%   — ◆— M3 16% & GDP 7%

— ▲— M3 14.5% & GDP 7%   — ☐— M3 14.5% & GDP 5.5%
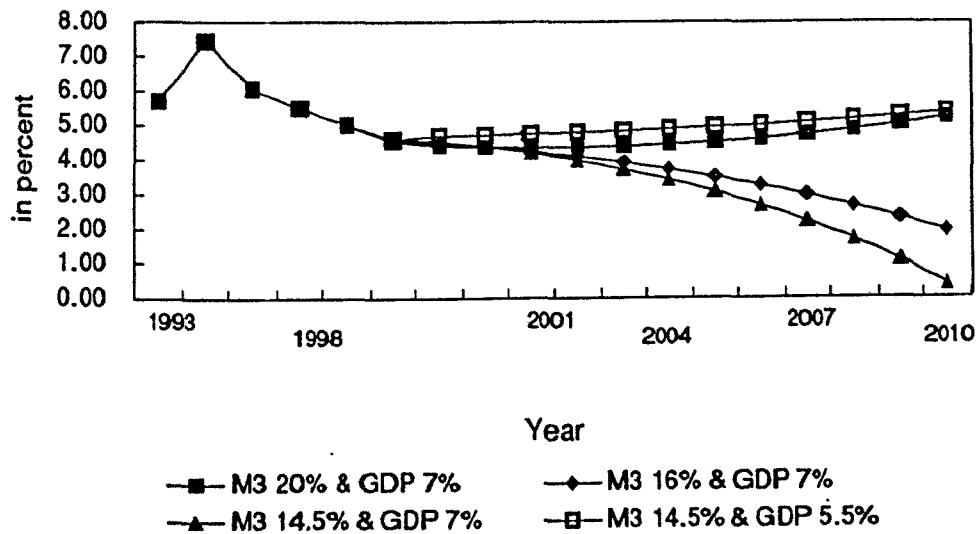
Graph E : Total Debt to GDP Ratio

—■— M3 20% & GDP 7%   —♦— M3 16% & GDP 7%
—▲— M3 14.5% & GDP 7%   —□— M3 14.5% & GDP 5.5%
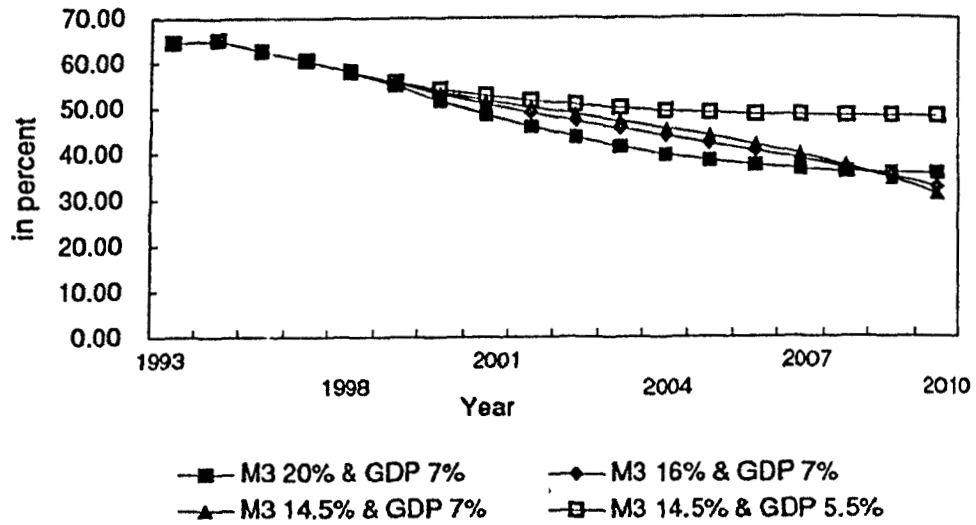
Graph F : Interest to Revenue Ratio

—■— M3 20% & GDP 7%   —♦— M3 16% & GDP 7%
—▲— M3 14.5% & GDP 7%   —□— M3 14.5% & GDP 5.5%
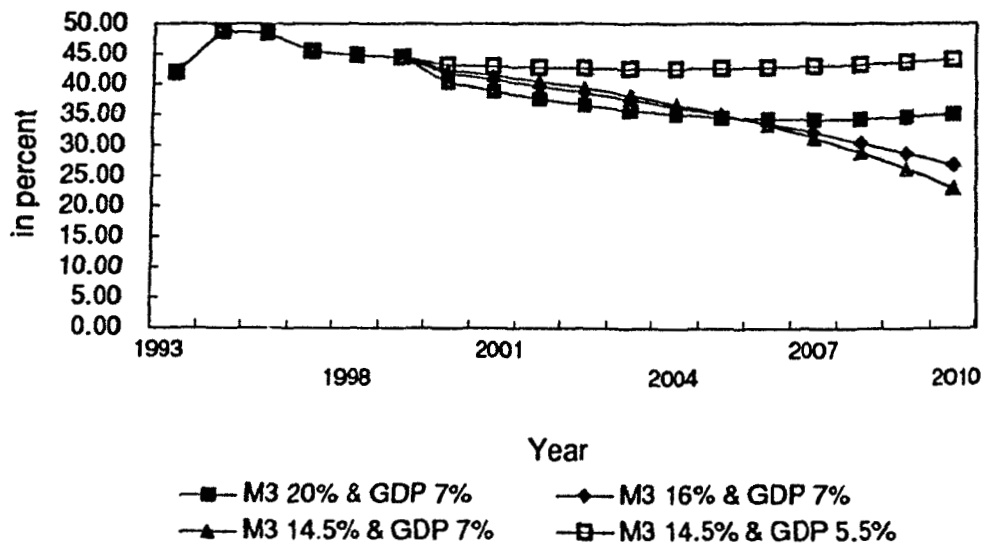
Table-1: Various Fiscal Indicators During 1975-76 to 1996-97
(in percent)

Indicators	1975-76 to 1978-80	1980-81 to 1984-85	1985-86 to 1989-90	1990-91	1991-92 to 1995-96	1996-97 (R.E.)	1997-98 (B.E.)
Fiscal Deficit to GDP Ratio	4.53	6.26	7.93	8.33	6.11	5.00	4.50
Interest to Fiscal Deficit Ratio	37.04	35.40	42.35	48.16	74.19	92.66	104.00
Revenue Deficit to GDP Ratio	-0.31	1.10	2.58	3.46	3.05	2.23	2.08
Capital Expenditure to GDP Ratio	4.84	5.16	5.35	4.87	3.06	2.77	2.42

Minus indicates a surplus

Table-2: M3 Growth of 16.0 percent with GDP growth of 7.0 percent

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
1993	1.65	8.60	64.29	5.69	4.40	41.92	9.92	1.77
1994	3.00	9.32	64.87	7.44	4.54	48.69	10.07	1.86
1995	1.26	11.01	62.42	6.05	4.62	48.37	9.97	1.66
1996	0.98	7.42	60.38	5.48	4.55	45.43	10.48	1.68
1997	0.46	7.39	57.85	5.01	4.64	44.73	10.99	1.74
1998	0.01	7.36	55.40	4.56	4.74	44.40	10.87	1.68
1999	-0.07	6.93	52.91	4.49	4.51	41.75	11.25	1.59
2000	-0.16	6.62	50.75	4.37	4.50	40.68	11.61	1.62
2001	-0.27	6.39	48.82 ·	4.24	4.48	39.61	11.96	1.65
2002	-0.40	6.23	47.03	4.08	4.47	38.51	12.29	1.68
2003	-0.53	6.11	45.33	3.91	4.45	37.37	12.62	1.72
2004	-0.68	6.03	43.67	3.72	4.42	36.17	12.93	1.75
2005	-0.84	5.97	42.01	3.50	4.38	34.88	13.22	1.79
2006	-1.01	5.93	40.32	3.25	4.32	33.50	13.50	1.84
2007	-1.18	5.89	38.55	2.97	4.24	32.00	13.76	1.88
2008	-1.37	5.87	36.69	2.66	4.14	30.37	13.99	1.92
2009	-1.56	5.86	34.71	2.31	4.00	28.58	14.17	1.96
2010	-1.76	5.84	32.57	1.92	3.83	26.63	14.30	2.00

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
Average during 8th Plan	1.47	8.75	61.96	5.94	4.55	45.83	10.29	1.74
1997-98	0.01	7.36	55.40	4.56	4.74	44.40	10.87	1.68
Average during 9th Plan	-0.18	6.71	50.98	4.35	4.54	40.99	11.59	1.64
Average during 2002-03 to 2009-10	-1.12	5.94	39.23	3.03	4.22	32.44	13.56	1.86

For 1996-97 and 1997-98 data relate to revised and budget estimates, respectively.

Table-3: M3 Growth of 14.5 percent with GDP growth of 7.0 percent

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
1993	1.65	8.60	64.29	5.69	4.40	41.92	9.92	1.77
1994	3.00	9.32	64.87	7.44	4.54	48.69	10.07	1.86
1995	1.26	11.01	62.42	6.05	4.62	48.37	9.97	1.66
1996	0.98	7.42	60.38	5.48	4.55	45.43	10.48	1.68
1997	0.46	7.39	57.85	5.01	4.64	44.73	10.99	1.74
1998	0.01	6.94	55.62	4.58	4.76	44.40	11.02	1.69
1999	-0.11	6.20	53.47	4.52	4.62	42.32	11.42	1.63
2000	-0.26	5.67	51.67	4.38	4.65	41.42	11.77	1.67
2001	-0.44	5.28	50.07	4.20	4.67	40.42	12.11	1.72
2002	-0.64	5.01	48.54	3.98	4.69	39.32	12.42	1.76
2003	-0.87	4.81	47.01	3.73	4.69	38.08	12.71	1.81
2004	-1.11	4.66	45.40	3.43	4.67	36.67	12.97	1.86
2005	-1.38	4.56	43.66	3.08	4.62	35.07	13.20	1.91
2006	-1.66	4.49	41.73	2.68	4.53	33.24	13.38	1.96
2007	-1.96	4.43	39.56	2.21	4.39	31.17	13.50	2.00
2008	-2.27	4.39	37.10	1.68	4.19	28.80	13.50	2.04
2009	-2.60	4.37	34.30	1.08	3.92	26.08	13.27	2.06
2010	-2.95	4.35	31.11	0.39	3.55	22.88	12.26	2.05

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
Average during 8th Plan	1.47	8.75	61.96	5.94	4.55	45.83	10.29	1.74
1997-98	0.01	6.94	55.62	4.58	4.76	44.40	11.02	1.69
Average during 9th Plan	-0.29	5.82	51.87	4.33	4.68	41.58	11.75	1.69
Average during 2002-03 to 2009-10	-1.85	4.51	39.98	2.28	4.32	31.50	13.10	1.96

For 1996-97 and 1997-98, data relate to revised estimates and budget estimates, respectively.

Table-4: M3 Growth of 14.5 percent with GDP growth of 5.5 percent

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
1993	1.65	8.60	64.29	5.69	4.40	41.92	9.92	1.77
1994	3.00	9.32	64.87	7.44	4.54	48.69	10.07	1.86
1995	1.26	11.01	62.42	6.05	4.62	48.37	9.97	1.66
1996	0.98	7.42	60.38	5.48	4.55	45.43	10.48	1.68
1997	0.46	7.39	57.85	5.01	4.64	44.73	10.99	1.74
1998	0.01	6.94	55.62	4.58	4.76	44.40	11.02	1.69
1999	0.03	6.82	54.03	4.68	4.65	43.13	11.35	1.65
2000	0.04	6.74	52.69	4.71	4.69	42.89	11.67	1.68
2001	0.05	6.68	51.56	4.74	4.74	42.66	11.98	1.72
2002	0.05	6.63	50.61	4.78	4.79	42.52	12.29	1.76
2003	0.06	6.60	49.83	4.82	4.86	42.45	12.61	1.80
2004	0.06	6.58	49.19	4.88	4.93	42.46	12.92	1.85
2005	0.06	6.56	48.69	4.94	5.02	42.53	13.24	1.90
2006	0.06	6.55	48.32	5.00	5.11	42.68	13.56	1.95
2007	0.07	6.54	48.07	5.08	5.22	42.90	13.88	2.00
2008	0.07	6.53	47.94	5.17	5.34	43.19	14.20	2.06
2009	0.07	6.53	47.92	5.26	5.47	43.55	14.53	2.12
2010	0.07	6.53	48.01	5.37	5.62	43.98	14.86	2.18

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
Average during 8th Plan	1.47	8.75	61.96	5.94	4.55	45.83	10.29	1.74
1997-98	0.01	6.94	55.62	4.58	4.76	44.40	11.02	1.69
Average during 9th Plan	0.03	6.76	52.90	4.70	4.73	43.12	11.66	1.70
Average during 2002-03 to 2009-10	0.06	6.55	48.50	5.07	5.20	42.97	13.73	1.98

For 1996-97 and 1997-98, data relate to revised estimates and budget estimates, respectively.

Table-5: M3 Growth of 20.0 percent with GDP growth of 7.0 percent

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
1993	1.65	8.60	64.29	5.69	4.40	41.92	9.92	1.77
1994	3.00	9.32	64.87	7.44	4.54	48.69	10.07	1.86
1995	1.26	11.01	62.42	6.05	4.62	48.37	9.97	1.66
1996	0.98	7.42	60.38	5.48	4.55	45.43	10.48	1.68
1997	0.46	7.39	57.85	5.01	4.64	44.73	10.99	1.74
1998	0.01	8.50	54.82	4.52	4.69	44.40	10.48	1.66
1999	0.04	8.88	51.46	4.40	4.24	40.25	10.82	1.50
2000	0.08	9.15	48.41	4.36	4.12	38.78	11.19	1.49
2001	0.14	9.35	45.72	4.34	4.02	37.54	11.57	1.48
2002	0.21	9.49	43.38	4.35	3.94	36.49	11.96	1.48
2003	0.28	9.60	41.37	4.38	3.88	35.63	12.36	1.49
2004	0.36	9.67	39.69	4.44	3.84	34.96	12.77	1.50
2005	0.44	9.72	38.31	4.51	3.83	34.48	13.19	1.52
2006	0.53	9.76	37.23	4.60	3.83	34.19	13.61	1.55
2007	0.63	9.79	36.41	4.72	3.86	34.10	14.04	1.58
2008	0.72	9.81	35.85	4.86	3.91	34.21	14.48	1.62
2009	0.82	9.82	35.54	5.03	3.99	34.51	14.92	1.66
2010	0.92	9.83	35.46	5.22	4.09	35.01	15.37	1.70

Year	Primary Deficit Ratio	Inflation Rate	Debt Ratio	FD Ratio	Interest to GDP Ratio	Interest to Revenue Receipts Ratio	Interest Rate	interest receipt to GDP Ratio
Average during 8th Plan	1.47	8.75	61.96	5.94	4.55	45.83	10.29	1.74
1997-98	0.01	8.50	54.82	4.52	4.69	44.40	10.48	1.66
Average during 9th Plan	0.10	9.08	48.76	4.39	4.20	39.49	11.20	1.52
Average during 2002-03 to 2009-10	0.59	9.75	37.48	4.72	3.91	34.64	13.84	1.58

For 1996-97 and 1997-98, data relate to revised estimates and budget estimates, respectively.

BOOK REVIEWS

Isher Judge Ahluwalia and I.M.D. Little (eds) : *India's Economic Reforms and Development : Essays for Manmohan Singh*, Oxford University Press, 1998, Pages 404, Rs. 575.

The Indian economy presently stands at a crucial juncture seeking to benefit from the process of integration with the global economy. Such an interface requires extensive reforms in the domestic economy, part of which has been attempted over the course of the last six years of economic reforms. While some significant steps have been taken since 1991, the next few years will be critical to the future growth of the Indian economy. Learning from past experiences and chalking out the future course of action are the needs of the hour. Thus, when a set of distinguished economists embark upon the task of evaluating the past policies and framing an agenda for the future on the occasion to honour Dr. Manmohan Singh, the moving spirit behind this economic voyage, one cannot but expect a rich fare. The book under review, a Fetschrift for the chief architect of the reform process, fulfils such expectations.

The introduction provides a brief resume on the various roles played by Dr. Manmohan Singh in Government - as Secretary of Economic Affairs, Ministry of Finance; Governor, Reserve Bank of India; Deputy Chairman, Planning Commission and the Finance Minister. Bereft of ideological predilections, with absolute commitment to the growth of the economy and possessing the rare combination of the intellectual brilliance of an academician and the pragmatic expertise of a practitioner, Dr. Singh faced numerous challenges during his long stint in the Government to chart a new course of the Indian economic history. The editorial note by Isher Judge Ahluwalia and I.M.D. Little, single out three durable achievements of the regime when Dr. Manmohan Singh was at the helm-first; the infusion of some degree of competitiveness in India's high-

cost and low quality industries, secondly; the emphasis on export promotion as a way of attaining self reliance and thirdly, and most crucially; changing the political mindset of the nation with all political parties converging on a consensus on economic reforms. Apart from the introduction, this volume contains fifteen papers by economists of repute who were close to Dr. Singh during various stages of his career. The contributions have been classified into four sections depending upon the broad thematic focus.

The first section on 'Development Strategy' contains four essays from Jagdish Bhagwati, Meghnad Desai, C. Rangarajan and Amartya Sen, focussing on Dr. Singh's achievements against the backdrop of India's development experience. This section places the reform process in a proper perspective and provides an evaluation of the underlying economic philosophy behind the reform. In his paper, Jagdish Bhagwati points out that the process of planning started with the right emphasis on promoting growth and devising a suitable framework which would be instrumental in mobilising savings to meet the enhanced investment needs, and triggering the self fulfilling private sector investment response. The trouble started in the late 50s and early 60s, when in response to a foreign exchange crisis, India progressively moved towards an inward looking development strategy. Bhagwati argues that the failure to put in place a viable export promotion policy in 1960s constrained the domestic investment rate. This turned out to be a crucial point of departure of Indian development strategy from that of Korea, which benefited enormously from an outward oriented economic strategy. The inward-looking economic regime in India discouraged foreign investment in the presence of significant trade distortions, which coupled with a strict regime of industrial licensing led to the growth of an inefficient production system. In the words of Bhagwati "We had clearly reproduced beautifully the disadvantages of communism, without any of its benefits".

Bhagwati asserts that the process of economic reform initiated in India since 1991 is a move in the right direction. Dismantling of the licensing system, introduction of current account convertibility and the liberal attitude to foreign investment have gone a long way

in correcting the earlier imbalance. Bhagwati sets out a reform agenda, which will produce growth rates of 9 to 10 per cent. Topping this agenda are two- conditions – privatisation of public enterprises and enhancement of efficiency of labour force. Bhagwati points out that the central focus of social engineering should be the provision of gainful employment and active involvement of NGOs possessing micro-knowledge in the developmental process.

A contrasting view point of development strategy is presented by Meghnad Desai in his essay "Development Perspectives : Was There an Alternative to Mahalanobis?". Desai presents a comparative analysis of the Mahalanobis Model, which decisively influenced the planning strategy in India and the Vakil-Brahmanand model, which did not receive the emphasis it needed in the planning framework. The Mahalanobis model assigned top priority to the production of capital goods which will ultimately result in growth of consumer goods output at a later stage. In contrast, the Vakil-Brahmanand model stressed that unemployment in India is not due to shortage of capital goods but due to wage goods scarcity. It suggested an investment strategy involving low capital-intensive high-yielding projects to produce sustained growth in output and employment. Desai suggests that India should have adopted the Vakil-Brahmanand model, which meant opting for employment and output growth. The cost of such a strategy could have been continued reliance on import of capital goods and possible shortage of foreign exchange. He, however, argues that the foreign exchange constrain would not have posed a difficult problem if the capital goods imported for promotion of consumer goods industries had smaller gestation lags and contributed to export growth. Desai contends that the price of self-sufficiency was paid for in terms of low income growth and unemployment.

The volume includes a contribution by C. Rangarajan which raises certain interesting issues on development perspective relating to the inflation control in a developing economy. Rangarajan notes that in the recent years, there has been a turnaround in the basic thinking on the management of the macro-economic policies and in this context the objectives of monetary policy. The prolonged expe-

rience of stagflation in several countries in the 1970s has high-
lighted the role that monetary policy can play in promoting eco-
nomic growth. Many countries pursuing economic reforms have
focussed their attention on maintenance of price stability which is
an essential requirement for improving productivity and competitive-
ness in the economy. The affirmation on controlling inflation by use
of monetary policy stems from the empirical finding that there is
no long-run trade-off between the objectives of price stability and
growth in the Indian economy. The costs of inflation on the other
hand, are substantial.

A high rate of inflation creates uncertainty about the future in-
flation and adversely affects production decisions, it reduces the
information content of price signals and distorts the allocation of
resources among different industries. Inflation-induced distortions
have wider social implications for developing economies on account
of its adverse impact on the real incomes of the poor who have
no hedge against the price rise. Rangarajan provides empirical evi-
dence on the cross-country experience to drive home the point that
high and volatile inflation-environment adversely affects capital accu-
mulation and growth. Examining the relationship between money,
output and prices in India, the author cautions against high and
disproportionate growth in money supply which in the long run
could affect both internal and external balance of the economy. In
contrast to other papers, this paper discusses in considerable depth
some of the empirical issues relevant to the subject. It achieves a
fine blend of theory, empiricism and practice of monetary policy in
India. While recognising the importance of money for promoting
growth, Rangarajan argues that money supply must be controlled in
a manner that it does not lead to sacrifice of macro-economic sta-
bility in the economy. Rangarajan does not, however, favour an
extremely low or zero inflation as this involves significant output
costs for the Indian economy. There is, therefore, a need to fix an
acceptable level of inflation in the Indian context which the author
argues should not exceed 6 per cent. Notwithstanding this, the re-
cent literature have argued that central banks should target a zero
inflation rate since the long-term benefits of zero inflation are far
higher than the short run costs. The empirical findings in this

study, however, demonstrates that inflation is not such a bad thing as to be avoided completely, but to be chosen with the emphasis on maintaining a balance between the objectives of growth and inflation control.

Amartya Sen's contribution to the volume brings some fresh perspectives on development strategy. Sen has expressed certain concerns regarding the success of the outward-oriented growth strategy without the required pre-conditions in place. Sen's criticism stems not from "the correction of governmental over-activity in some fields" but from "the need to correct government under-activity in other areas" which has not been given due emphasis. Sen contends that growth strategy must be favourable to widespread participation of population in economic change. The experience of countries in export led growth strategy shows that high literacy rate, reasonable degree of female empowerment, radical land reform measures aimed at human development and improvement in quality of life are some of the critical preconditions necessary for the success of the reform process. Improvements in social infrastructure, therefore, must be a critical component of the economic reform process in India.

The second part of the book deals with the issues relating to transition to an open economy. The contributors to this part include Montek Singh Ahluwalia, Ashok Gulati, Vijay Joshi, Ajit Singh and T.N. Srinivasan, and cover critical issues like infrastuctural bottlenecks, agricultural liberalisation, capital market reforms, export prospects and issues relating to fiscal stabilisation. This section presents an assessment of economic reform programmes in various sectors and also draws the agenda for future reform.

Ahluwalia examines India's experience with infrastructure development. He sets off with the question : Is India's reform programme accompanied by a cohesive strategy of infrastructural development? The Eighth Plan for the first time provided an articulation of the strategy for infrastructure development in India. It envisaged the continuance of public sector dominance in infrastruc-

ture with the private sector joining in a supplemental role. Ahluwalia draws upon extensive empirical evidence on the performance of major segments of infrastructural sector viz, power generation, telecommunication, road development, and ports to conclude that excessive reliance on public sector resulted in shortfalls in outlay and capacity expansion with very little attention on private effort to promote this critical sector. In this context, Ahluwalia analyses the possibility of 'unbundling' of infrastructural sector, with a view to introducing competition in some of the segments through private sector participation. The future strategy should focus on a much larger order of public investment in the Ninth Plan along with active involvement of private sector investment in infrastructure. Ahluwalia argues that public sector performance will crucially depend on the institution of a viable tariff structure (as the experience of telecommunications industries shows) and the ability to address the organisational weaknesses of government agencies. A possible approach to institutional reform may be to recognise these agencies wherever possible on the lines of corporations rather than government departments. The preconditions for private participation in infrastructural projects include public acceptance of the need of private sector, institution of remunerative tariff structure, transparency of procedures governing the interface between private investor and public authorities to reduce uncertainty, and putting in place independent regulatory agencies with a view to ensuring fair treatment to private investors. Ahluwalia also draws attention to the financing problems in the infrastructure sector. The financing constraint is closely related to resolution of problems such as risk mitigation and creating an appropriate condition for the infrastructure projects to access the capital market in a big way. Here, Ahluwalia alludes to the need for a clear and credible government policy which can help reduce risk perceptions in this sector.

Ashok Gulati's paper deals with issues relating to Indian agriculture in an open economy. Gulati argues that trade in agriculture is still taking place at a residual level rather than being driven by the global trade situation. Indian agriculture has failed to respond to the opportunities created by the liberal global agricultural trade

environment due to several structural bottlenecks including the unfavourable pattern of landholding, inefficient water management and the insufficiency of institutional credit to the rural sector. Some of these supply side issues need to be addressed seriously if Indian agriculture has to carve a niche in the world market. On the demand side, a major aspect of policy debate is how liberalisation of agricultural trade would affect domestic food security and whether it would increase the domestic price of food. While Gulati allays fears concerning food security, he is of the view that at the policy level emphasis should be placed on greater amount of resource allocation to agriculture and promotion of irrigation. Demand side management strategies should include, among others, decanalisation of import of coarse cereals or coarse varieties of superior cereals, restricting the PDS and 'targeting' it to the poor with panchayats taking control over the fair price shops and improving the social infrastructure in the countryside designed to improve the quality of life of the people. These are some of the suggested policy course by the author which need to be acted upon to achieve a greater degree of integration of Indian agriculture with the global market.

The issue of fiscal prudence in economic reforms is discussed by Vijay Joshi in his essay on "Fiscal Stabilization and Economic Reforms in India". Joshi draws attention to the issues surrounding unsustainable fiscal deficit of the non-financial public sector in India. He points out that high fiscal deficits crowd-out economic growth and result in loss of effectiveness of policy instruments in the hands of the government. According to the author, the magnitude and quality of fiscal adjustment should be carefully decided to ensure sustainability of the fiscal system, avoid significant crowding out of private investment and protect public investment in certain essential areas. He has suggested that the primary deficit of the non-financial public sector should be brought down by 3 percentage point through reduction in government consumption expenditure, and additional resource mobilisation through privatisation. He argues that pursuing the above policy prescription may reduce the fiscal deficit to 4.5 per cent of GDP which will be consistent with a low rate of inflation and a sustainable current account. What are

the options for achieving such a fiscal target? There is widespread pessimism on the modalities of containing government expenditure as much of the fiscal deficit stems from committed expenditures such as interest payments, subsidies and defense expenditures. Joshi argues that while taxation cannot be the centerpiece of fiscal stabilisation, the movement away from a high tax regime does not eliminate the scope for widening the tax base. Restructuring of subsidies is a crucial component of fiscal reform programme, and this cannot be attained without proper targeting of food subsidies and drastic reduction of fertiliser subsidies. There has to be also a clear cut policy regarding hidden subsidies to irrigation, power and other economic services which cast a heavy burden on the fisc. The wages and salaries of government servants should be restricted while a freeze in employment will help reduce the massive surplus staff of government departments.

The suggested course of fiscal stabilisation by Joshi though not novel, reinforces the critical importance of the micro-reform measures in the government finances. The hard reality is that many of these reforms would need a broad based social consensus on the size of the government and its role in various spheres. Joshi provides ample justification of this point. He suggests that the fiscal agenda should be broader than mere attainment of sustainability. It should be driven by the goal of stimulating economic growth and supporting structural changes.

Ajit Singh discusses two broad issues concerning the liberalisation of the capital market in India : first; growth impact of stock market reforms and second; the efficacy of takeover reforms and emergence of a corporate control market in India. The question of growth impact of stock market reforms is explored by subjecting available theoretical conjectures to empirical analysis. Imperfections in stock markets in emerging economies with poor information collection and dissemination network, arbitrary pricing of shares and inadequate legal protection for investors often lead to 'pecking orders' where firms try to generate internal resources before taking recourse to debt financing. The stock market then assumes a residual character in generation of resources. Empirical

results presented by Singh shows that poor internal resource generation forces Indian firms to deviate from an optimal pecking order and place excessive reliance on debt financing. Singh argues that the decline in corporate profitability has been due to an increase in the cost of funds owing to excessive reliance on external finance and growing product market competition as a result of liberalisation. The stock market reforms have generated significant non-debt creating portfolio capital inflows which have positive growth implications although a sudden reversal may produce a negative shock to the real economy. While available empirical evidence fail to find positive growth impact of capital flows, it needs to be noted that much of the analyses in this area still rely on information and data pertaining to pre-reform period. Singh's view on takeover issue is quite interesting. He argues that the absence of takeover threats have promoted domestic long term investments in the Indian economy which is an essential prerequisite to sustain growth and provide incentives to firms for undertaking expensive investment in human capital. Singh seems to stress that takeovers are not the only conceivable solution to the problem of corporate governance. In the Indian scenario the problems of corporate governance include lack of cohesion among controlling families, adverse effects of large interlocking and total exclusion of small shareholders from decision making. Given the current stage of reform in the capital market and corporate structure, India stands at a crucial juncture and Singh's analysis of the issues in this volume provides a clear perspective of the future course of policy reform in this sector.

The last article of the section by T.N. Srinivasan places India's recent export performance in a comparative perspective. Recounting the theoretical and empirical literature on the influence of foreign trade on economic growth, the author provides empirical evidence to show that average growth of real GDP has been much higher in open economies than in closed ones, economic liberalisation has led to convergence of low income economies with high income ones and an open economy is less susceptible to serious macroeconomic crisis. Commenting on the steady growth of Indian exports since the mid-80s, the author points out that the lack of

competitiveness in a number of commodities has adversely affected India's market share in the international trade. From the policy point of view, the author suggests that addressing infrastructural bottlenecks can go a long way in improving the competitiveness of exports. Apart from the direct positive effect of an efficient infrastructure system on export growth, a favourable infrastructural scenario helps attracting the flow of FDI with significant impact on export competitiveness. Srinivasan argues that appreciation in the real effective exchange rates should be avoided to reduce the disincentive effects on exports. His recommendations on ensuring a competitive exchange rate include maintaining the fiscal sustainability and avoiding of inflationary financing of fiscal deficit.

Part III of the volume comprises of three contributions on issues relating to poverty and social justice by Deepak Lal, Kirit S. Parikh and Suresh D. Tendulkar. Some of the concerns raised in this section are extremely relevant from the view point of enhancing social opportunity. However, with surprise one notes the absence of any suggestion on education and literacy enhancements, which has strong theoretical underpinnings in the new view of economic growth and which enjoys a great deal of support in empirical studies on cross-country experiences.

The contribution by Deepak Lal examines the association of economic reform and poverty alleviation. His paper is based on a crucial question : is the establishment of fully-fledged western-style welfare states essential to alleviate poverty in the developing countries? The author distinguishes between three types of poverty – mass structural poverty, destitution and conjectural poverty. Mass structural poverty was widely prevalent in the 'organic' or 'agricultural' economies, but have gradually declined with growth. In India, it is possible to eliminate mass structural poverty through economic growth. The destitutes on the other hand, lack labour power due to some physical disability or do not possess the necessary wherewithal to eke out a living. Conjectural poverty originates from temporal loss of income generating employment, or what Sen calls "entitlement failures". Such conjectural poverty, seasonal in agriculture and cyclical in industries, needs to be tackled through income

transfers. Examining the 'tough' approach of distributivist egalitarianism and the 'soft' approach of classical liberalism, the author seems to prefer the latter with its emphasis on basic needs and targeting of resources for welfare. The author is particularly critical about the universal welfare schemes due to their dynamic costs and political entitlements and feels that growth is the main policy instrument to tackle poverty in the long run. He argues that the case for public financing does not imply a case for public production and feels that the implementation problems may be tackled with decentralisation or involvement of private agencies like NGOs. The priorities of reform should include achieving a steady rate of growth, putting in place labour market reforms and instituting an efficient system of targeted social safety net to eliminate the problems of mass structural poverty of the subcontinent.

Kirit Parikh in his essay discusses the problems of food security and the policy option available for India in this regard. Dwelling on the reasons behind food insecurity in India, the author discusses two major alternative approaches to food insecurity — institution of public distribution system and attaining food security through employment programmes. The author argues that the employment generation route is cost efficient and ensures self-targeting. In stark contrast, our PDS experience has been beset with poor targeting and has proved to be a substantial burden on the public exchequer. In Parikh's view buffer stocking of food acts as a strong disincentive to the speculators and this should be vigorously pursued as a price stabilisation instrument. In this context, the author points out that a nationwide employment guarantee scheme, a properly targeted PDS and ensuring price stabilisation with adequate buffer stock ranging between 5 to 10 million tones combined with a liberal trade policy can provide national level food security in India. Suresh D. Tendulkar explores the relationship between Indian economic reforms and poverty on the basis of empirical evidence during 1991-94. He finds that rural poverty situation is closely related to weather conditions while urban poverty has not increased (even with fiscal contraction and structural adjustment) due to institutional rigidities in the organised labour market, indexation of urban organised sector incomes, avoiding closer of inefficient private sec-

tor units and the slow pace of public sector restructuring. This, to the author, reflects the interplay of interest group pressures in a pluralistic democratic society which tends to reduce the pains of transition on the weaker sections.

Given the emerging centrifugal nature of the developments in the centre-state financial relation, inclusion of a special section on this subject in the book provides it with a special touch particularly for the cognisant readers. This section contains three essays by Amaresh Bagchi, Raja J. Chelliah and V.A. Pai Panandikar. There is remarkable similarity in the approaches and coverage of the contributions of Amaresh Bagchi and Raja J. Chelliah, both seeming to oscillate around what may be termed as the NIPFP consensus. Bagchi's essay "Tax Assignment in the Indian Federation : A Critique" and Raja J. Chelliah's piece on "Liberalisation, Economic Reforms and Centre-State Relations" address broadly the same set of issues relating to the tax assignment strategy in the Indian federation and its relationship with the process of economic reforms. Bagchi discusses the problems emanating from sharp imbalance between the taxing power and spending responsibilities of different levels of governments, complex allocation of tax bases, inadequate safeguards against tax exporting and tax competitions and the broad limitations of major taxes in India. Bagchi argues that excessive importance placed on central transfers has undermined fiscal discipline at the state-level. It is necessary, therefore, to restructure the tax assignment system with a view to improving the efficiency of the tax system. Bagchi raises his concern about the 'tax competition' and 'tax wars' among states to attract investment thereby distorting the location of industries, upsetting equity and altering the revenue potentials of some states. As a solution, Bagchi suggests introduction of a destination-type Value Added Tax (VAT) in replacement of all taxes on domestic production and trade. While addressing a similar set of issues, Chelliah stresses the need to move towards a system of cooperative federalism between the centre and the states. This will require, inter alia, amending the constitution to grant more powers to states not only in taxation but also in policy decisions, leaving some concurrent fields of taxation to states, doing away with the arbitrary distinction between plan and

non-plan funds to ensure that a large part of grants from the central government to the states flow through the Finance Commission. He also suggests that grants given by the Finance Commission should not be aimed at gap filling (as is currently done through the adoption of modified gap-filling approach) but achieving equalisation of fiscal capacity, where the equalisation grant is the difference between average fiscal capacity and the fiscal capacity of a given state. Chelliah also suggests that long term investment in the states may be financed through a more active market borrowing programme. A proper blend of autonomy, fiscal discipline and inter-state equity should constitute the basic features of cooperative federalism. In the last contribution in this section, V.A. Pai Panandikar makes some observations on the political economy of centre-state relations which constitutes the backbone of Indian democracy. India has a deep rooted democracy, in contrast to many of her neighbours. The author highlights the emergence of a growing middle class in the urban areas and its growing importance of centre-state relations in India. Although the author discusses a wide variety of issues related to the political economy of centre-state relations in India, their interrelation with the reform process have been ignored in the analysis.

It is always difficult to ensure that a book of this kind is complete in terms of coverage of all issues. It has left out, for instance, some of the crucial issues such as the problems of the open economy, issues relating to human development, and industrial growth, but this is more than balanced by the incisive analysis of the essays included in the book. This makes the volume an invaluable addition to the literature on Indian economy and perhaps the first major contribution on the evolution of the Indian economic reform process. While the full impact of the reform process is yet to unfold, the essays in this Festchrift is a clear reflection of the emerging consensus on the necessity of economic reforms in the Indian context.

<div align="right">**Sunando Roy***</div>

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Apostolas-Paul Refenes (eds) : *Neural Networks in the Capital Markets,* A Wiley Finance Edition, John Wiley & Sons, 1995, Pages 379, $90.75

Neural Networks are a field of research that is fast expanding and gaining popularity in both academic and industrial research communities. Neural networks are statistical devices that help in performing inductive inference. The novelty of neural networks lies in their ability to model non-linear processes with few a priori assumptions about the nature of the generating process. Therefore, they are particularly useful in study of financial markets, where much is assumed and little is known about the nature of the processes determining asset prices. It is in this context that the book under review, which is a collection of articles on various topics in the field, assumes great importance.

The book is organised into five parts. Part I gives a general introduction to neural networks while the remaining four parts deal with application of neural networks in studies relating to equity, foreign exchange, bonds and corporate performance. There are six articles in part I of the book, five of which are contributed by the editor Apostolas-Paul Refenes himself. Apostolas is a senior research fellow at the London Business School and pioneered much of the work in this field as Director of the Neur-forecasting unit. In the five articles contributed by him, Apostolas has briefly but lucidly described neural networks, their design considerations, methods of optimal designs, data modeling considerations and testing strategies. The sixth article contributed by Anthony and Biggs deals with computational learning theory view of economic forecasting with neural networks.

Neural networks attempt to mimic the way in which the human brain processes information. The principal goal of neural learning is to form associations among observed patterns. There are two variants of the associations paradigm : auto-association and hetero-asso-

ciation. An auto-associative paradigm is one in which a pattern is associated with itself (clustering) and a hetero-associative paradigm is one in which two different patterns have to be associated with each other (regression). Depending on whether a learning procedure uses external signals (environmental feedback) to help form the association, one can divide the learning procedures into three classes: procedures implementing supervised learning, associative reinforcement learning and unsupervised learning. In supervised learning (learning with a teacher), the environmental feedback specifies the desired output pattern. The learning feedback is provided for each input-output association to be learnt by the network. Supervised learning is instruction-oriented. In associative reinforcement learning (learning with a critic), the learning feedback is a scalar signal called a reinforcement signal which indicates whether or not the desired and actual output patterns coincide. Associative reinforcement learning is evaluation-oriented. In unsupervised learning (learning by oneself) the network does not receive any environmental feedback. Unsupervised learning is self-organisation learning. Supervised learning procedures use some function of the difference between the target outputs and the desired output as a measure of how well they are doing during learning. Associative reinforcement procedures use a scalar value as a reinforcement signal with suitable weight adaptation. Unsupervised learning has no environmental feedback.

The two most commonly used procedures in financial data analysis viz., error back-propagation algorithm for supervised learning and self-organising feature maps for unsupervised learning are discussed in detail in the first article of part I. In the second article on design considerations, features and choice criteria of activation function, cost function, network architecture, control times and learning times are dealt with. Identifying the optimal network parameters for a particular data set is not a trivial task. Trying many different combinations of these parameters can be extremely time-consuming. There are sophisticated methods for deriving the otpimal network architecture. These methods, classified into three broad categories — analytic estimation, constructive techniques and pruning techniques — are discussed in the third article. Analytic estima-

tion methods are those in which algebraic or statistical analysis is used to determine hidden unit size a priori. By analysing the size and dimensionality of the input vector space, analytic techniques are able to give an a priori estimate of the number of hidden units. Algebraic estimation and heuristic estimation come under these methods. Constructive techniques are those where the hidden units are constructed in layers one by one as they are needed. Cascade correlation, tiling algorithm, and constructive learning by specification (CLS) are some of the constructive techniques. Pruning techniques are those which remove redundant or least sensitive connections in the network. Network pruning and artificial selection are some of the pruning techniques. Although the core component on any successful neural application is the efficiency of the learning procedure, the statistical methodology for preprocessing the input data and output data should always be given serious consideration prior to training neural networks. In the fourth article on data modeling considerations, statistical techniques like detrending, normalisation, outliers, correlation analysis, multi-collinearities and catastrophic noise are explained. The design and execution of a comprehensive testing strategy is an integral part of application development. Its ultimate goal is to reassure the modeler that the results are robust. The fifth article deals with testing strategies. In the sixth article titled "computation learning theory view of economic forecasting with neural nets", Anthony and Biggs discuss about learning in the probably approximately correct (PAC) sense. Theorems, along with proofs, dealing with PAC expressive power of a hypothesis space and efficient computation are given in this paper.

Part II of the book is a devoted to application of neural networks to stock markets. There are five articles in this chapter. In the first article, Apostolos, Zapranis and Francis investigate the performance of models that can be built using neural networks to study changes in structural relationship between a stock's return and its determinants so that the models can be used to

— predict the relative outperformance of each stock, six months in advance, given the current values of its determinant factors;

— test the hypothesis that excess returns required by investors for factor exposures, change slowly over time as the economic environment evolves and that a period of six months is a reasonable time frame for dynamic remodeling;

— analyse the factors which determine stock performance and to identify how the relative significance of these factors change over time.

A dynamic version of the arbitrage pricing theory (APT) called DynIM Hypothesis is stated as "the excess returns required by investors for factor exposures tend to change slowly over time as the economic environment evolves". To illustrate, small companies tend to be hit hard during a recession, but they do very well in a buoyant economy. A neural network model based on this hypothesis has been built and results have been compared with those obtained from linear regression based on three performance metrics, goodness of fit in-sample (convergence), goodness of fit out-of-sample (generalisation), stability of results with varying network parameters and different data sets.

It has been shown that neural networks give better model fitness in-sample by an order of magnitude and outperform linear regression in out-of-sample forecasting. Intervals of values for the parameters that influence network performance over which the results are stable have been identified and the persistence of performance across different training/test sets has been shown. It has been shown that by using sensitivity analysis, neural networks can model the environment more convincingly than regression models. Pointing out that even simple neural learning procedures such as the back propogation algorithm far outperform the current statistical techniques, the authors mention that the performance measures can be improved further with careful network design and preprocessing of data. This becomes an area for further research. Some of the other contributions in this part deal with issues such as tests of Efficient Market Hypothesis with gradient descent algorithms, the usefulness of neural network as an alternative stock market model, empirical tracking of Amsterdam Stock Index using neural net-

works, and forecasts of gold futures prices applying neural networks.

Part III of the book discusses the use of neural networks for foreign exchange applications. There are in all six contributions in this part. Mahendra Mehta deals with application of neural network learning methods in the foreign exchange markets. Describing the principal characteristics of the foreign exchange market in detail, the author systematically goes through various stages in neural network learning design like network configuration design, learning vector selection, learning parameter selection, learning and testing data selection and update strategy and problems. After training the network on either long-term or short-term market movements, the network can be used to trade in the market place. Although learning to trade in forex markets is a complex procedure, a robust strategy can be evolved. But it is difficult to judge its stability. The author concludes the article by mentioning that the problem-solving abilities of neural networks have a lot to offer for modeling and forecasting the short and long-term behaviour of forex time series. There is considerable scope for further research in areas like hedging, risk management, arbitrage, mispricing and estimation of volatility.

The next four articles deal with non-linear modeling of the DEM/USD exchange rate, managing exchange-rate prediction strategies with neural networks, financial market applications of learning from hints and machine learning for foreign exchange trading. Hsu, Hsu and Tenorio discuss the issues relating to selecting predictive indicators in currency trading by using neural network procedure. By a process of selecting and eliminating factors that affect USD/DEM rate using neural networks, the authors identify seven important indicators viz., two-and five-point tangent slopes, past one-week returns on DEM, trends for 5, 10 and 65 days DEM rates, 65-day trend on the Swiss franc, 20 and 40-day volatility, Monday returns on sterling and Monday returns on the Japanese yen.

Part IV of the book deals with bond applications of neural

networks. The three articles in this part are on criteria for performance in gilt futures pricing, architecture selection strategies for neural networks (as applicable to corporate bond rating prediction) and bond rating with neural networks. In the second article on architecture selection strategies for neural networks, the authors, Moody and Utans present a methodology for developing neural network bond rating predictor using architecture selection methods. Results obtained from a linear bond rating predictor and predictions from a model with two-layer perceptions are compared to observe that non-linear networks outperform linear regression models. The authors have demonstrated that architecture selection via heuristic search is effective.

Part V focuses on Macroeconomic and corporate performance. Poddig contributed the first article on bankruptcy prediction. The author studies the results of bankruptcy prediction using discriminant analysis and neural networks. Two types of neural networks are used for the study viz. Multi-layer perception (MLP) and learning vector quantiser (LVQ) to show that neural networks are suitable to be used for bankruptcy prediction and that they outperform discriminant analysis. Between the two, MLP provides better performance in the study conducted by the author in Germany. But the results may vary from country to country due to differing accounting conventions. It may be interesting to study which neural networks perform better and the reasons for the same. The other two articles in this part are on predicting corporate mergers and self-organising neural networks.

The book is a primer on neural networks aimed at financial modeling. Articles on application of neural networks in the areas of stock markets, forex markets, bonds and corporate performance provide useful material for further research in these areas. Given its wide coverage, from theory to comparative analysis and application, the book is fairly balanced in terms of content and issues for those who are interested in financial sector modeling.

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