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Central Bank Independence and Effectiveness of Monetary Policy: A Survey

Partha Ray*

This paper offers a survey on the theoretical justification for and empirical evidence on the relationship between central bank independence and effectiveness of monetary policy. The theoretical justification for central bank autonomy has come from three distinct paradigms, viz., the rational expectationists (in the context of dynamic inconsistency problem of optimal plans), the rational political business cycle literature, and the public choice school. The multi-country evidence in this regard has associated central bank autonomy with more effective inflation control without any deleterious effect on the real sector of the economy. Despite the claims regarding the positive aspects of central bank independence, most of the studies in general favour a co-ordination between monetary and fiscal policies. Thus, the real issue remains in the field of providing functional autonomy to the central bank in general, and putting some curb on the automatic monetization of deficit in particular.

Introduction

The issue of central bank independence has attained immense importance over the eighties. A number of countries have in fact adopted legislative changes of far reaching implications for central bank independence. Against this backdrop, this paper seeks to answer mainly two questions. *First*, what is the theoretical justification for putting forward the case for an independent central bank? *Secondly*, what does the evidence say in this regard? The present survey does not therefore discuss the country-specific experience, nor does it take up the various practical issues concerning the establishment of an independent central bank.

The theoretical rationale for an independent central bank comes from three distinct, but not necessarily mutually incompatible, paradigms. The bulk of the mainstream theoretical literature views central bank independence as a solution

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to the dynamic inconsistency problem of optimal plans, formalized by Kydland and Prescott (1977). Consequently it borrows considerably from the 'rules versus discretion' or 'credibility and reputation' literature on monetary policy. The other school advocating central bank independence is the present day reincarnation of the 'political business cycle' (*a la* Nordhaus, 1975) in a rational expectations garb. Finally, there have been attempts to put forward the case for an independent central bank as a solution to the inherent bias towards deficits in modern democracies in the 'public choice' literature.

However, the moment one justifies the case for an independent central bank, the issue of policy coordination comes in. Over the eighties there have been theoretical developments to study the issue of conflict and cooperation between monetary and fiscal policies. These developments have important ramifications on the issues relating to policy implementation and political economy.

In the present survey an attempt is made to look into the answers that are given to some such questions against the backdrop of the international evidence on this count.

The paper is organized as follows : Section I, which is in the nature of a digression, discusses the dynamic inconsistency problem. The theoretical justification for an independent central bank that comes as a solution to the dynamic inconsistency problem is taken up in Section II. The problem of cooperation and coordination between the monetary and the fiscal authority that may arise out of an independent central bank is taken up in Section III. Section IV discusses the theoretical rationale for an independent central bank from what is called the 'rational political business cycle' theories. The case for an independent central bank from a 'public choice' viewpoint is taken up in Section V. Section VI makes an attempt to survey the international evidence on the relationship between the independence of central banks and macroeconomic performance. Section VII provides conclusions of the study.

SECTION I

Dynamic Inconsistency Problem of Monetary Policy

The point can most easily be explained using Kydland and Prescott's own oft-referred non-economic example. Suppose the government believes that it is undesirable to build houses in the flood plain of a river. In order to discourage such houses, it is optimal for the government to announce that no relief will be available to those who build their houses on the river plain. Once the flood actually occurs, however, most government will send relief to the affected persons (no matter what

the earlier announcement was). People who expect government to behave in this way, thus, will not be discouraged to build houses close to the river irrespective of government's declared policy objective. This is really the crux of the dynamic inconsistency problem. The problem will occur, as Fischer puts it,

“... when a future policy decision that forms part of an optimal plan formulated at an initial date is no longer optimal from the standpoint of a future date, even though no new information has appeared in the meantime” (Fischer-1990, pp.1169-70).

The above noneconomic example can be translated in the context of central bank behaviour to inflation control, where the public do not believe the monetary authority's pledge to control money supply for price control. In this sense, a monetary policy aimed constantly at zero inflation can be said to be 'time inconsistent' because if the public does believe that prices will remain stable, policy makers have an incentive to allow a temporary increase in monetary expansion so as to increase the level of employment.

There have been a number of attempts to model and extend this time-inconsistency problem of monetary control and related rules versus discretion debate. Notable among them are Barro and Gordon (1983a and 1983b), Backus and Driffill(1985), and Barro(1986b). Cukierman(1986), Barro(1986a), Persson(1988), Driffill(1988), Blackburn and Christensen(1989) and Fisher(1990) all provide interesting surveys. But how to model interaction between two economic agents? Most of these models adopt a game-theoretic framework with the monetary authority and the public as the two players of a non-cooperative game. While a detailed account of this literature is clearly beyond the scope of the present paper, what follows below is an illustration of the basic point following Cukierman(1986).

The basic model can be conceived of the following equations:

Lucas Supply Function:

$$y = y_n + (m - m^e)$$

Central Bank's Social Welfare Function (W):

$$W = -m^2 + 2(y - Y_n)$$

or $W = -m^2 + 2(m - m^e)$

Utility Function of the Public (U):

$$U = -(m - m^e)^2$$

where, y and y_n are actual and natural rates of output respectively; m and m^e are actual and expected rates of monetary growth.

Given the above functional forms of the model one can derive⁽¹⁾ the following pay-off (or utility) matrix where the first term within the bracket represents the pay-off of the central bank and the second term indicates that of the public :

Table 1 : Pay-off Matrix of the Central Bank and The Public

Central Bank Chooses(m)	Public Expects(m^e)	
	0 (Low)	1 (High)
0 (Low)	(0,0)	(-2,-1)
1 (High)	(1,-1)	(-1,0)

Source : Cukierman (1986),p.7.

Interestingly for the central bank $m=1$ (i.e., a high monetary growth) is the dominant⁽²⁾ strategy. On the other hand, given rational expectations, since the public knows the central bank's incentive structure, it expects the central bank to choose $m=1$, and consequently it chooses $m^e=1$ ⁽³⁾. The resultant outcome is an inferior solution with payoffs -1 to the central bank and 0 to the public. Hence there seems to be an inflationary bias in the economy. Therefore, the dilemma may be summarized as, "...the optimal policy is in general time-inconsistent, whereas the time-consistent policy is in general sub-optimal" (Carraro-1987, p.173). Before we proceed further let us note that the literature on the dynamic inconsistency problem relies heavily on the issue of strategic monetary policy. Consequently the technicalities of this literature are often couched in terms of tools of game theory. For a ready understanding of the sections to come what follows below is a non-technical quick run-down of some of the relevant concepts of game theory.

The way we have presented the payoffs or utilities in Table 1, it is apparent that the concept of equilibrium in this context (i.e., $m=1$ and $m^e=1$) is quite different from the sense in which we understand the term in usual economic parlance. In this case the strategy $m=1$ (or $m^e=1$) is the best response from the central bank (or the public) given that the public (or the central bank) has already chosen $m^e=1$ (or $m=1$). In game theoretic term this is referred to as Nash equilibrium, named after the mathematician J.F.Nash. That is to say, "a Nash equilibrium is an array of strategies, one for each player, such that no player has an incentive (in terms of improving his payoff) to deviate from his part of strategy

array" (Kreps-1990, p.28). Therefore, unlike the usual concept of equilibrium in Economics, Nash equilibrium is not an absolute concept. It is in this sense that in general an equilibrium in a game is not Pareto optimal⁽⁴⁾. As for the example in Table 1, a combination of low monetary growth both on the part of the public and the central bank (i.e., $m=m^c=0$) is optimal to the attained Nash equilibrium of high monetary growth. The obvious question is what debar the economy to arrive at this superior solution? In intuitive terms it is the lack of belief or the incentive to break promises on the part of either of the parties which is the chief responsible factor. Thus, one of the ways to solve the problem is to build up a reputation of the central bank so that the public believes that it is not going to break its promises. An independent central bank is expected to serve precisely this function.

The way we have presented the monetary policy game between the central bank and the public, it may appear that such games are essentially a one-shot affair. The recent literature in this field extends this one-shot game and probes the role of asymmetric information in this context. In particular it has been shown that the models proposed by Barro and Gordon (1983a) is a variant of infinite-horizon trigger-strategy equilibrium, first proposed by James Friedman (1971). This has been extended by Rogoff (1989)⁽⁵⁾ to allow for equilibria analogous to severe-punishment equilibria of Abreu (1988). Based on the model of Green and Porter (1984), Canzoneri (1985) incorporates the role of private information in these monetary games. However, there is a riddle of finitely repeated games as the outcomes of the one-shot game merely gets repeated in finite repetition with perfect information. Using the solution concept of this 'chain-store paradox', proposed by Kreps and Wilson (1982b), models of monetary games have been developed by Backus and Driffill (1985), and Barro (1986b). A related development has been the model of Vickers (1986), which is based on the limit pricing model of Milgrom and Roberts (1982). Finally, a number of papers use the concept of 'sequential equilibrium' of Kreps and Wilson (1982b), e.g., Cukierman and Meltzer (1986). A discussion of these models and tracing their origin is beyond the scope of the present paper. The above list merely exemplifies the extent to which these models of monetary games borrow from 'industrial organization' literature.

SECTION II

Central Bank Independence as a solution to Dynamic Inconsistency Problem

But how does an independent central bank solve the dynamic inconsistency problem? We can do no better but to quote at length from a recent survey on this question,

“If the source of a credibility problem lies in the natural propensity of democratically elected governments to resort to inflation, then private sector skeptical about an alleged commitment to an anti-inflationary monetary policy could be quelled by charging the responsibility of monetary policy to an independent political authority. Many of the arguments for central bank independence appeal to this line of reasoning... What it does, of course, is to alter the parameters of the utility function... [of the policy maker] such that greater weight is attached to inflation prevention and less weight is attached to economic stimulation” (Blackburn and Christensen - 1989, pp.15-16).

With this backdrop in mind let us have a review of the recent rules-versus-discretion literature insofar as they relate to central bank independence.

The pioneering work of relating the time-inconsistency problem to central bank independence is due to Rogoff (1985). Rogoff develops a stochastic rational expectations IS-LM model, where monetary policy can have short-term real effects due to existence of not-fully-indexed wage contracts, set up a period in advance. Rogoff's model clearly shows the time-inconsistency problem, yielding a stagflationary situation. The first best solution in such a situation is to remove labour market distortion. A second best solution would be to design, “a permanent constitutional reform that absolutely ruled out systematic inflation, and yet left the central bank free to respond to disturbances” (Rogoff-1985, p.1177). However, Rogoff notes that such constitutional money supply rules are often difficult to administer, and as a solution, instead considers an independent central bank attaching more weight to inflation (relative to stabilization). He clearly demonstrates that social welfare under a conservative and independent central bank is greater. Following Persson(1988) it may be noted that if the central bank is independent enough to allow the performance of the central banker to play a dominant role, the appointment of the central banker is like a principal-agent problem. In essence, central bank independence through the appointment of an inflation-averse central banker can reduce inflationary bias and consequently improves social welfare.

However, the case for an independent central bank on the ground of superiority of rules over discretion creates a practical problem. In reality often the functioning of central bank is shrouded in secrecy [for a documentation of the U.S case of central banking and secrecy, see Goodfriend (1986)]. In that case, does not the establishment of an independent central bank really enhance more discretionary policies? Cukierman and Meltzer(1986) extend the inflation game so as to combine the existence of private information held by the policy maker [as in

Canzoneri(1985)] with incomplete information on the part of the private sector concerning the policy maker's utility [(as in Backus and Driffill(1985) or Barro(1986b)], and find a justification for central bank's inclination for secrecy. One of their main results suggests that the central bank does not necessarily choose the most efficient control procedure available. Instead it may choose to increase ambiguity. The intuitive reasoning is that a certain degree of ambiguity provides the policymaker with greater control of the timing of monetary surprises, and consequently enables it to enhance employment without engendering inflation⁽⁶⁾. However, as Sheffrin(1989) has pointed out, it is hard to believe that the minute details of actual operating procedure of the central bank are taken into account for expectation formation by the wage setters in the economy. Hence, their model, "is best taken to be a parable and an interesting contribution to the logic and grammar of policy making" [Sheffrin(1989), p.157].

There have been a number of extensions of the Cukierman and Meltzer(1986). Notable among them are Basar and Salmon(1990), Lewis(1991) and Balke and Haslag(1992). Balke and Haslag(1992) introduce the concept of '*Fed Watching*' in this context. Basically they extend the notion of a predetermined information set on the part of the people. They consider a model where agents can acquire, "at a price an independent source of information about the monetary authority's preference" [Balke and Haslag(1992), p.620]. It is this acquisition of additional information that they term as '*Fed Watching*'. Their result show that with the existence of Fed-Watching the central bank has an incentive to use a less noisy money control mechanism. This result, though weakening Cukierman-Meltzer's justification of central bank's inclination towards secrecy, strengthens the case for an independent central bank on the usual ground of avoidance of dynamic inconsistency problem.

In another extension of Cukierman and Meltzer(1986), Lewis(1991) probes into the question as to why the society allows the central bank to remain secretive. His formal model indicates two reasons. First, when a social planner prefers stable policy but the central bank responds to the changing influence of interest groups, the planner can induce the monetary authority to ensure policy persistence. Secondly, even if social planner's own relative tradeoffs change over time, society may prefer central banks to be more secretive so as to reap the full benefit of monetary surprises.

SECTION III

Dichotomy between Monetary and Fiscal Authority

So far we have spoken in favour of an independent central bank from the standpoint of credibility and reputation of monetary policy. An obvious question

in this context is that how does an independent central bank solve the dynamic inconsistency problem whereas a democratically elected government can not? That is to say, does there exist any intrinsic difference between the nature and arguments of the objective function pursued by the government and the central bank? If that is so, then in the case of an independent monetary authority, there exists a possibility of a conflict between the monetary and the fiscal authority. It is to this case to which we now turn.

What are the reasons for lack of co-ordination between the two authorities? Blinder (1982) cites three reasons for such an outcome, *viz.*, (i) adoption of different objectives, (ii) differing opinion about the likely effects of fiscal/monetary policy action, and (iii) differing forecasts of the likely state of the economy in the absence of policy intervention.

In case of such a lack of coordination what are the possible modes of interactions between these two authorities? Blinder (1982) enumerates a four-way classification. First is clearly the notion of a single, unified policy maker and can be traced to Friedman's (1982) suggestion of subordinating the central bank to administration. However, where the presence of such a single unified policymaker is ruled out, a number of complicated outcomes follow. Three such outcomes are possible, *viz.*, (i) two uncoordinated policy makers, (ii) leader-follower arrangement, (iii) one party follows a nonreactive rule. We discuss the second case which is more relevant for the present purpose.

We consider Blinder's simplistic⁽⁷⁾ example of two way policy options for both monetary and fiscal policy, *viz.*, expansion and contraction. The following pay-off matrix (Table 2) describes choice-mix of the monetary and fiscal authority with the first number indicating the monetary authority's ranking of policy, and the second number indicating the fiscal authority's preference ranking of policies⁽⁸⁾.

Note that for an independent central bank playing with the government the only Nash equilibrium possible is the lower left corner of the pay-off matrix where the central bank contracts money supply and the fiscal authority expands government expenditure (shown with the rectangle). However, the upper right corner of the pay-off matrix with tight fiscal and easy monetary policy is clearly Pareto-superior to this Nash equilibrium, which the economy can attain only with fiscal-monetary coordination. In terms of game theory, this prisoners' dilemma solution can be avoided only through a pre-play communication, or coordination in this case⁽⁹⁾. Nevertheless, the essential dichotomy between the central bank and the fiscal authority in Blinder's example can be traced in terms of a Friedmanian central bank and a Keynesian fiscal authority.

Table 2 : Pay-off Matrix of the Policy Ranking between The Central Bank and the Fiscal Authority

Fiscal Policy	Monetary Policy	
	Contraction	Expansion
Contraction	(1,4)	(2, 2)
Expansion	(3, 3)	(4,1)

Source : Blinder (1982) , p.23.

Buckle and Stamp(1991) consider the issue of central bank autonomy and credibility of monetary policy in the context of the Reserve Bank of New Zealand Act 1989, introducing a number of important changes ensuring a greater degree of autonomy. They consider a Poole(1970)-type framework with standard open-economy stochastic IS-LM functions. Expectations are, however, static in their model. The objectives of the policy makers are in the form of loss functions. While the central bank's loss function is specified in terms of squared deviation of price level, the same for fiscal authority runs in terms of squared deviation of output. The policy outcomes are analyzed in case of three different shocks, viz., real demand shock, financial shock, and supply side shock. The general solution of their model discusses an interactive game with the possibility of a conflict. A better outcome is achieved through cooperation in their model. Thus they conclude,

“...universal acceptance of a single monetary policy objective such as price stability is the best way to ensure that monetary policy is able to consistently pursue the single objective. Should this condition exist it is not at all clear what is to be gained by central bank autonomy. If this political situation does not exist, central bank autonomy alone will generally not be able to ensure the credibility of monetary policy. Credibility of monetary policy will not depend on monetary policy alone but upon the entire macroeconomic programme”(p.75; emphasis added).

Blake and Westaway(1993) consider a Barro-Gorden(1983a)-type monetary policy game, with output being determined by a Lucas supply function. The objective of the monetary authority is to minimize a cost function of the form:

$$C = k (y_t - y_t^*)^2 + (1 - k)^2 P_t^2$$

where, P_t is the rate of inflation, and y_t and y_t^* are actual and targeted rate of growth of output. The parameter k represents the relative priority attached to

inflation and output. The moment fiscal authority is brought into the picture, a number of complications arise. Apart from the objective function and the degree of cooperation, two other considerations are important. The first is the length of the period over which commitments can be made by both of the policy makers. The second is the extent of leadership that the two policy makers have over each other and over the public. They have investigated the implications of these effects using a linearized version of the National Institute Macroeconomic Model of the UK. Three major conclusions emerge from their model. First, due to lack of time inconsistency problem in their model, the establishment of an independent Bank of England is expected to yield very little outcome. Secondly, cooperation among the policy makers distinctly ensures a superior outcome. Thirdly, even if the authorities cooperate they must take proper account of the costs of other's policy instruments.

Jensen's (1992) paper, in a sense, is a marked departure from the standard monetary game. He points out to two kinds of inefficiencies arising out of dynamic inconsistency problems of optimal plans. The first is clearly the Kydland-Prescott (1977)-type problem of inflation bias due to discretionary monetary policy so as to increase employment above its natural rate. The second type of dynamic inconsistency problem leads to the possibility of aggravated unemployment resulting from fiscal accommodation in economies with unionized wage setting [Driffill (1985)]. Based on a model developed by Alesina and Tabellini (1987) he makes an attempt to bridge the gap between these two types of problems. In his model monetary and fiscal authorities are independent of each other. While the monopoly labour union aims at increasing real wage even at the cost of unemployment, the central bank makes an attempt to increase employment through monetary expansion. The fiscal authority tries to stimulate the economy through a distortionary tax cut. One of his results deserves special attention. If, instead of independent policy authorities, a joint maximization of the objective functions of the monetary and fiscal authorities is considered, then under reasonably realistic assumptions⁽¹⁰⁾, inflation will be higher and employment will be lower. In other words, both policy makers are unambiguously worse-off from conducting policies cooperatively. The basic reason behind such a counter-intuitive outcome in Jansen's model is his consideration of trade union⁽¹¹⁾ as another player in the policy game, making it a 3-party game between the central bank, the government and the labour union. In fact, this is in line with the well-established result that cooperation by a subset of players in a game may alter the behaviour of players outside the coalition in a manner which could make the cooperating players worse-off. From this standpoint cooperation may be counter-productive and independent policy authorities may be preferable.

Thus the literature in general calls for more cooperation between the monetary

and fiscal authority. Nevertheless this apparent virtue of cooperation need not be put forward as a case against central bank independence. As Alesina (1992) has pointed out, any refusal to monetize the budget deficit on the part of an independent central bank keeps two options open to the fiscal authority, *viz.*, increase debt burden, and reduce expenditure and increase taxes. Since the adoption of the first option can be inflationary [see Sargent and Wallace (1981)], ultimately the second option will be chosen in the presence of an independent central bank.

SECTION IV

Political Business Cycles, Monetary Policy and Central Bank Independence

The discussion so far leads us to two important questions. First, why in reality should there be a conflict between the objectives of fiscal and monetary authorities? Secondly, in the presence of such a conflict, does not an independent central bank amount to transgressing the democratic process? While partially the first question has already been answered in terms of Blinder's (1982) model, we now turn to a separate development in economics in recent years which offers a meaningful answer to these questions, namely the political business cycle theory.

The *locus classicus* in this field is the paper by Nordhaus (1975). Nordhaus makes three crucial assumptions, *viz.*, (i) the policy makers are only motivated by the tenure of the office, (ii) there is a short-run Phillips' curve (thereby making the control of inflation and reduction in unemployment as conflicting objectives), (iii) voters are not rational in the sense that they fail to realize that they are systematically fooled by the politicians. As a result politicians overstimulate the economy immediately before the election in order to reduce unemployment so that they get elected. Once they come back to office they tend to reduce inflation through a recession (via the Phillips' curve). Thus the economy moves on to an electoral business cycle.

Nordhaus' model really fails to take off because of the influence of the rational expectations school and the resultant breakdown of the Phillips' curve. Empirically too it fails to perform well. However, in recent years there has been a revival of interest in the political business cycle literature in the context of what is known as ideological parties and rational voters. That is to say political parties depending upon their ideology put different weights to the twin objectives of inflation-control and stabilization; on the other hand, it is common knowledge that voters cannot be fooled on account of their ignorance of the economic policies pursued (or to be pursued) by the ruling (or the opposition) party. This literature

is known as '*rational political business cycle*' (RPBC). However, by 'rationality' these models do not mean that individuals are only self-motivated; in fact in all these models individuals have 'ideologies' and may care about fellow citizens. Thus according to the RPBC theoreticians the traditional PBC models take an extreme view that, "the society can be characterized by a bunch of crooks (politicians) who manipulate a bunch of 'idiots' (the citizens)" [Alesina (1992), p.3]. Basically in the RPBC literature the government is treated like any other economic agent and its behaviour is seen as an outcome of a well-defined optimization problem. As Persson and Tabellini (1990) note, solution to such a problem yields a positive theory of economic policy, which in turn leads to normative suggestions about how to modify the incentive structure of the policy problem. In this sense these RPBC models are closely related to the rational expectationist models of rules versus discretion.

We now turn to three such models which incorporate the role of an independent central bank in the framework of rational political business cycles.

Backus and Driffill (1985) operate essentially with a Barro-Gordon policy game, and demonstrate the possibility of a political business cycle without relying on voters' myopia [unlike Nordhaus (1975)]. Monetary policy is seen in their model as an outcome of a dynamic mixed-strategy Bayesian game⁽¹²⁾. Applying the notion of 'sequential equilibrium'⁽¹³⁾ [Kreps and Wilson (1982a)] they have been successful in avoiding the dynamic inconsistency problem. They have considered two versions of government behaviour, *viz.*, a government aiming at maximizing a utility function where growth and inflation both enter as arguments (called a '*wet*' government), and a government, committed to pursue a zero inflation policy (called a '*hard-nosed*' government⁽¹⁴⁾). Their analysis suggests that,

"...Government may try to appoint central bankers with reputations for fighting inflation, even if their own preferences place positive weights on employment. By doing so they minimize the costs associated with uncertainty about the policy and with the credibility problem wet government have with non-inflationary policies. *Autonomous central banks thus act as a precommitment device which may help to make non-inflationary policies more credible and less costly*" (Backus and Driffill (1985), p.537, emphasis added)⁽¹⁵⁾.

However, note that the model developed by Backus and Driffill is applicable when both the authority and the private agents act strategically, e.g., government and labour union. If the private sector is atomistic then this kind of game is inappropriate.

Alesina(1987) builds up a model characterising economic cycles connected to the political cycles. The equilibrium in his model of a two-party game has been shown to be sub-optimal⁽¹⁶⁾. Alesina(1988) extends his earlier model to take the monetary policy questions. The discretionary equilibrium in his model is sub-optimal because of two reasons. First, even with rational voters, the average inflation is indeed high because politicians belonging to either parties have an incentive to generate monetary surprises. Secondly, the partisan monetary policies generate suboptimal fluctuations in money, output and employment. In such a situation reputational forces or a rather strict contingent rule fixing the monetary growth (c.g., Friedman's(1968) x per cent rule) can be seen as a sensible solution. However, in line with Tabellini(1987), Alesina(1988) argues that, "since concerns for reputation may not be a sufficiently strong incentive to ensure cooperation, certain institutions could be designed to help achieve the optimal outcome, such as a central bank, independent from each current government" (i.e., belonging to either parties)(p.38). In essence, three goals can be achieved through an independent central bank in Alesina's model, viz., (i) reduction of inflationary bias, (ii) reduction of partisan variability in monetary policy, and (iii) reductions of pre-electoral manipulation of monetary policy. In this connection Rogoff(1990) raises an interesting point. If the electoral cycles give some kind of a signal about the competence of the government, then it may not be very beneficial for the society to block them through the establishment of an independent central bank. After all, in that case government may have to use more costly ways to signal their competence.

Waller(1989) incorporates an 'independent' central bank into a variation of Alesina's (1987) policy-game. There are two parties in his model, viz., 0 and 1, each having a distinct loss function in terms of deviations of actual inflation rate from its desired rate, and deviation of actual output from natural rate. This apart there is a long-run Lucas Supply function. Both parties are assumed to put same weight on the social loss of deviations of the inflation rate from its desired rate, which, however, differs from party to party. While Party 1 prefers output stability, Party 0 receives a benefit where there is an expansion but suffers a loss where there is a recession. The central bank is 'independent' in Waller's model because of two reasons. First, board members cannot be removed from office even if they disagree with the current administration. Secondly, as a result of the majority of the incumbents in the central bank board are from the opposition party, the chosen policy will not reflect the preference of the current administration. His results indicate that both output variability and mean inflation rate under such a central bank structure are distinctly low. This is due to the signalling of information concerning future policy from the central bank to the private sector. Furthermore, Waller demonstrates that as proposed by Rogoff(1985), society can increase its welfare by reducing inflationary bias through appointment of conservative central bankers.

However, note that the existence of a 'conservative' central banker is a more strong condition than that of an 'independent' central bank. In fact a cautious approach can be followed in this context. As Persson and Tabellini(1990) have rightly noted,

" It is not optimal to appoint an 'ultra conservative' central banker, some one who cares only about inflation. Intuitively, under discretion inflation is too high whereas employment is set optimally (given the informational constraints and the lack of other policy instruments). At the margin, it is therefore, optimal to accept some additional employment variability, in exchange for a reduction in inflation" (pp.26-27).

SECTION V

Public Choice Theory and Central Bank Independence

Public choice theory is most succinctly described as, 'an invasion by economics of political science' [Tullock(1988),p.1]. Over the last thirty years, 'public choice' has established itself as an independent discipline and progressed into various directions. However, the issue of central bank independence is not one of its main branches. In the context of reducing budget deficit the primary solution offered in the public choice literature is a constitutional amendment for a pre-specified stipulation on central bank credit to government. Nevertheless, in recent years, as a secondary solution to the deficit problem some public choice theorists put forward the case of an independent central bank.

Before we turn to the issue of central bank independence in the public choice literature let us have a synoptic view of the basic ideas of the school. The discipline of public choice, when applied to macroeconomics, emerges as an antithesis of Keynesian macropolicies. It is worth quoting Wagner(1987) in this context,

"The claims of Keynesian macroeconomic theory and policy may or may not be correct; I for one think they are quite false. But political survivability may be quite different from such matters of truth or falsity. Even if Keynesian presuppositions about economic life were true, it does not follow that those policy outcomes would dominate alternative policies within existing democratic regimes" (p.201).

The basic contention of the public choice school is this : unless there are constitutional or institutional constraints to the contrary, a democracy contains a bias towards deficit finance⁽¹⁷⁾. Thus they operate within the premise that

politicians do not necessarily pursue public interest but are more concerned with their personal political agenda⁽¹⁸⁾. Brennan and Buchanan (1981) outline the case for constitutional rules governing monetary policy. It may be noted that these constitutional rules are not advocated as the first best solution, but as the best workable solution [see Sheffrin(1989, p.9)].

But what about the development of some institutions as an alternative to these constitutional rules? In this context we now turn to a paper by Parkin(1987) which explicitly talks about central bank independence. Parkin bases his analysis in a modified Sargent and Wallace(1981) framework, where Sargent and Wallace have shown that a tight monetary policy unaccompanied by a tight debt policy is unsustainable and will lead to both current and future inflation. In other words, even if monetary authority pursues a low and fixed monetary growth, inflationary outcome may turn out to be perverse. In this set-up Parkin finds a solution in an independent central bank, which will ensure not only low inflation but act also as an effective 'institutional constraint'.

Parkin's basic construction runs as follows. First, there is a dichotomy between tax collection and government spending programme. While the former is, in most cases, in nominal terms, the latter is couched in real terms. Secondly, as a result, the deficit (defined as the difference between government spending and real taxes) will not attain a 'political equilibrium'. Parkin finds that there will be two kinds of political pressure due to an on-going inflationary process, *viz.*, with rising revenue, expenditure is likely to go up; there will be constant pressure for redefining tax brackets and transfer programmes. Finally, the deficit process is not independent of the nature of the monetary institutions. Parkin finds that an independent central bank is expected to perform analogous function of an independent judiciary. To quote,

"Presumably the separation of the powers of the legislature and executive from those of the judiciary is viewed as producing different distributions both of real resources and rights than would occur in a unified system of government. The same line of reasoning suggests that an independent central bank established under a set of incentives that insulates its policies from the desires of the government will also produce a different outcome..."(p.318).

Therefore, an independent central bank basing its decision on financial integrity and efficiency, is expected to solve the Sargent-Wallace problem.

As already noted, the role of an independent central bank performs a secondary role in the public choice literature. This apart, the related ideas are not

strictly formalized and often fails to capture the interaction between the government, the public and monetary authority⁽¹⁹⁾. Despite these lacunae, the public choice paradigm produced some of the early empirical studies on central bank independence and effectiveness of monetary policy, which will be taken up in the next section.

SECTION VI

Empirical Evidence on Central Bank Independence and Effectiveness of Monetary Policy

Since the late seventies there have been a spurt of empirical studies on the relationship between the central bank independence and the effectiveness of monetary policy. Apart from coverage and motivations derived from different paradigms already discussed, one of the reasons behind such multiplicity of studies is the inherent ambiguity of the term 'central bank independence'. Various authors have taken various relevant indicators and aggregated them through some normalization rule to arrive at a single unique number as the index for central bank independence. However, as Cukierman *et.al.* (1992) has pointed out, almost all these studies have confined themselves within what may be called the legal framework of central bank legislation. But mere provision of a legal framework may not ensure the required degree of independence; in fact much in this context depends on the conventions and norms established over the years, in the historical specificity of the country. This is a general drawback from which most of the studies, that we are going to discuss, suffer.

Purely in terms of coverage there are two kinds of studies, *viz.*, single country and multicountry. Since in the context of the present survey, we are concerned with discerning some general traits, we will only cover the multicountry studies. Thus the studies rich in documentation and discussing country specific issues are, in general, not considered.

Parkin and Bade(1978), Bade and Parkin(1985), and Parkin(1987) are some of the earlier multicountry studies on central bank independence in the broad public choice framework. Bade and Parkin(1985) take twelve industrial countries and devise a two-way classification for the respective central banks, *viz.*, financial type (based on three criteria, *viz.*, approval of central bank budget, determination of board members' salaries and allocation of profit), and policy type (on the basis of three criteria, *viz.*, who is the final policy authority, who appoints the board members, and whether government has a nominee in the central bank board). The relevant classification pattern is reported in Table 3. The important point that can be noted from Table 3 is that the direction and degree of independence need not

be uniform according to the two criteria. The empirical findings of both Parkin and Bade(1978) and Bade and Parkin(1985) indicate that the countries with an independent central bank experience significantly lower inflation rates than countries whose central banks come under direct control of the government. Based on Bade and Parkin(1985) classification Parkin(1987) extends the relationship to budget deficit and domestic debt with the theoretical justification coming from an extension of Sargent-Wallace(1981) proposition on 'unpleasant monetarist arithmetic'. Though no obvious relation emerges from the properties of money supply growth process and central bank independence, the picture is more clear in the case of deficit process in the sense that the steady state behaviour of the deficit matches closely with the central bank independence⁽²⁰⁾. The two countries with most independent central banks (*viz.*, Germany and Switzerland) have both lower rate of inflation and steady state deficit process close to zero.

Table 3 : Bade and Parkin(1985) Classification of Central Banks

Policy Types	Financial Type			
	Govt approves budget determines board members' salaries, & Profit Allocation	Bank determines Budget allocation, but Govt. determines board members' salaries, & Profit Allocation	Bank determines Budget allocation, and board members' salaries & Profit allocation is determined by the Statute	Bank determines budget determines board members' salaries & Profit Allocation
	(1)	(2)	(3)	(4)
(A) Govt is final Policy Authority, has officials in Board & appoints all its members		Australia		
(B) Like (A) but no Govt. Official in the Board		France , Sweden	Belgium , Canada, Italy, Netherlands	United Kingdom
(C) Bank is final Policy Authority but all board members are appointed by the Govt	Japan	United States		
(D) Bank is final Policy Authority and some board members are appointed by the Bank			Germany, Switzerland	

Source : Bade and Parkin (1985).

Alesina(1988) from a rational political business cycle viewpoint extends Bade and Parkin's classification of central bank independence so as to include New Zealand and Spain and arrives at an index of central bank independence. The empirical evidence shows that, broadly speaking, there is an inverse relation between the degree of independence of central banks and the average inflation rate. He, however, points out that some missing institutional variables like policies of the government in the left-wing spectrum, index of labour conflicts and the size of the public sector may have a significant contribution in explaining this correlation.

Buderkim and Wohor(1990) put forward four hypotheses for G-7 countries and Switzerland. First, is deficit accommodation more prevalent in countries with non-independent central banks? Second, could central bank refusal to monetize the deficit force the fiscal authority to cut the deficit? Third, do more independent central banks pursue price stability more vigorously? Fourth, do the effects of monetary and fiscal policies vary with different institutional arrangements? Following Ahking and Miller(1985) they test the hypothesis in terms of the following 3-equation system :

$$x = A_x + B_x(L) H + C_x(L) EF + D_x(L) P + E_x(L) GOV \\ + F_x(L) TB + G_x(L) e + F_x(L) BP \\ \text{(for } x = H, EF, \text{ and } P \text{)}$$

where, H, EF and P are high-powered money, government's budget deficit as a ratio of GNP and price level respectively; GOV, TB, e, and BP indicate ratio of government spending to GNP, treasury bill rate, exchange rate in terms of US dollars and current account deficit, respectively. The empirical evidence validate three out of the four hypotheses. Only in case of the first hypothesis, there is no clear demarcation between the deficit equations estimated for countries with and without independent central banks. Therefore, independent central banks seem to foster both lower inflation rate and lower monetary growth.

Grilli *et al*(1991) consider the issue of central bank independence in a much broader framework. They try to discern the degree of central bank independence at two levels, *viz.*, (a) political, and (b) economic. The classification is, however, closely related to the one devised by Bade and Parkin. The political aspect of central bank autonomy runs in their analysis in terms of three attributes, *viz.*, the procedure for appointing the members of central bank boards, the relationship between the board and the government, and the fiscal/constitutional responsibility of the central bank. Each head is further decomposed into a number of subheads. Similarly, the notion of economic independence is described by the influence of the government in determining the net central bank credit to government, and the

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nature of monetary instruments under the control of the central bank. Their sample consists of 18 industrial countries. The broad indices are given below in Table 4.

It is interesting to note that there is no one-to-one correspondence between the two indices. One can subdivide the countries into four groups with the mean level of independence between 3 to 4 for both the indices. The first group consists of 5 countries (Netherlands, West Germany, Switzerland, US and Canada) which

Table 4 : Grilli et. al. Index of Central Bank Independence

Countries	Index of Political Independence	Index of Economic Independence
Australia	3	6
Austria	3	6
Belgium	1	6
Canada	4	7
Denmark	3	5
France	2	5
Germany	6	7
Greece	2	2
Ireland	3	4
Italy	4	1
Japan	1	5
Netherlands	6	4
New Zealand	0	3
Portugal	1	2
Spain	2	3
Switzerland	5	7
U.S.A.	1	5
U.K.	5	7

Source : Grilli-Masciandaro-Tabellini(1991), pp.368-369.

enjoy central bank autonomy on both counts. The second group consists of 4 countries (Spain, New Zealand, Portugal, and Greece) with a dependent central bank on account of both the dimensions. All other central banks have independence on one count only. Grilli *et.al.* have noted that out of the four countries with highly dependent central bank, three *viz.*, Greece, Portugal and Spain share three common features, *viz.*, unstable political system, unsustainable debt paths and high level of seigniorage. In terms of formal testing they consider two major hypotheses. First, inflation is determined by economic and political independence

of central banks; and secondly, inflation is determined by the political stability and central bank independence. In both cases they further subdivide the entire period of 1950-89 into four decades. Their result indicate negative and significant coefficients of central bank independence on both the dimensions (both for the whole and the sub-periods). However, for the whole period central bank independence fails to have any impact on real performance. Thus they conclude, "A more independent central bank brings about low inflation but not necessarily worse macroeconomic performance" (p.375).

Almost similar conclusion has been reached by Alesina and Summers(1993). Their construction of index for central bank independence involves the following steps. First, they have taken the Bade and Parkin(1985) index as extended by Alesina(1988). Secondly, the available indices for Alesina-sample countries have also been taken from Grilli *et.al*(1991), simply by adding the two measures of independence. Thirdly, they have converted the Grilli *et.al.* (1991) index comparable to Bade and Parkin index using a (1) - (4) scale⁽²¹⁾. Finally, they have arrived at a composite index of their own by simply averaging the two indices so derived. Apart from inflation rate, they have taken the following variables to measure macroeconomic performance, *viz.*, real GNP per capita, GNP growth, unemployment and real interest rate. All the variables have been taken both in average and variance forms. Their methodology of discerning the relationship between central bank independence and macroeconomic performance is simple enough and consists of plotting the various variables with respect to central bank independence for the period 1955-87. As in Grilli *et.al.*(1991) their evidence also indicates, "monetary discipline associated with central bank independence reduces the level and variability of inflation but does not have either benefits or costs in terms of real macroeconomic performance" (p.159).

Leone(1991) views the issue in a somewhat narrow sense. His concern is to probe into the effectiveness and implication of limits on central bank credit to government. Apart from surveying the legal provisions existing during mid 1980s for a sample of over 100 countries, data from 22 industrial and 22 developing countries (including India) have been analyzed for the period 1975-87. His basic evidence indicates a close positive association between central bank lending to government and printing of base money. Furthermore, whenever the expansion of monetary base exceeds some structural constraints, it results in high inflation. Interestingly his evidence indicates anomalies in the legal concept of central bank credit to government. In a number of countries, even with a lax law, actual central bank lending has remained at a low level; on the contrary even with strict legal structure there are instances of transgression of these limits.

All the studies we have discussed so far encompass the concept of central bank independence in terms of some legal variables. However, the existence of some

laws ensuring central bank independence may turn out to be neither necessary nor sufficient for its implementation in actual practice. A partial support of this proposition can be found in Leone (1991). It is in this context that Cukierman *et al.* (1992) make the most significant contribution. In fact, of all the studies, Cukierman and others offer by far the most comprehensive, well documented research on this issue. Their study is an improvement over the previous works on three counts. First, their sample of countries is wider including up to 72 countries (21 industrial and 51 developing countries). Secondly, the time span is much broader covering 1950-89. Finally, they view the notion of central bank independence from a multidimensional angle. They have taken four different notions of central bank independence. The first notion is by the usual concept of legal independence (captured by the following four attributes⁽²²⁾, *viz.*, governor of the central bank, policy formulation, objectives of monetary policy, and limits on lending to the government). The second is based on the governor's actual turnover rate. The third utilizes the responses of some specialists to a questionnaire on central bank independence, and the fourth ranking is through a combination of the first two.

Their evidence indicate a dichotomy between the industrial and developing countries insofar as the relationship between central bank *legal* independence and the average inflation rate is concerned. For the industrial countries these two variables are related in a significant manner with the relationship for the developing countries being insignificant. On the contrary, independence, when measured by the governor's turnover emerges as a significant explanatory variable for inflation in developing countries. This apparent divergent pattern of the turnover rate results gets resolved once the turnover rate is decomposed into two ranges, high and low. They have sought the explanation in underdeveloped legal compliance in the developing countries. Replication of the exercise for smaller samples [as in Alesina (1988) or Grilli *et al.* (1991)] confirms the earlier result on an inverse relationship between central bank independence and inflation rate. Even for the whole sample an inflation-based index of central bank autonomy (combining both turnover rate and legal aspect) significantly explains the cross-country variation in the rate of inflation. However, based on simple Granger causality they have arrived at a two-way causation between inflation and central bank independence.

Though Havrilesky and Granato (1993) study the issue of central bank autonomy and inflationary performance for a smaller sample of 16 countries, based on Alesina (1988) index, it offers a different insight. In the framework of public choice the basic question that they pose is as follows : Is the degree of cooperation among the group decision makers (i.e., political parties, labour union etc.) or the central bank autonomy that affects the inflationary performance? To

start with, on the basis of inflationary performance they subdivide the whole sample of countries into two groups as high mean - high variance and low mean - low variance group (based on Chow's test). They have used a canonical discriminant procedure (based on canonical correlation, Mahalanobis distance function, and Wilks' lambda) to test which variables, if any, explain this breakdown of samples. Their discriminant analysis is based on following nine variables, viz., percentage of total labour force unionized, index of union confederation power in collective bargaining, index of organizational unity of labour unions, percentage of cabinet portfolios held by left-wing parties, percentage of votes going to left-wing parties, Alesina(1988)-index of central bank autonomy, value of imported oil as a percentage of GNP, per capita public expenditure. The political variables, though apparently unimportant, occupy significant role in the public choice paradigm. Their results are indeed striking. Among all the nine variables, only the central bank autonomy has an influence on inflation performance. The broad nature of this finding remains unaltered even with alternative indices of central bank autonomy.

SECTION VII

Concluding Remarks

The theories and evidence discussed so far put forward the case for an independent central bank. We have shown that the theoretical justification can come from three sources, and consequently central bank independence is expected to achieve the following three functions. *First*, it is expected to solve the dynamic inconsistency problem of optimal monetary policy. *Secondly*, in case of conflicting objectives of economic policy, existing in a democracy, an independent and conservative central bank has the potential to minimize the inflationary bias of the economy, and hence can increase social welfare. *Finally*, from a public choice viewpoint an independent central bank can emerge as a credible institutional alternative to a constitutionally stipulated monetary rule.

Empirically, an independent central bank in both industrial and developing countries have been associated with low inflation rates. The performance of the real sector, on this count, also does not seem, to be retrogressive. Therefore, an independent central bank is expected to reduce the inflation rate without hurting the real sector.

All the above theories and evidence need not be taken in an absolute sense, so also 'central bank independence'. After all, the literature, more or less unambiguously, establishes the cooperation between monetary and fiscal authority as a precondition of a superior policy outcome. That is to say, an independent central

bank at the cost of uncoordinated monetary and fiscal policies may turn out to be counterproductive.

Hence the real issue may be one of functional autonomy in general and limiting the automatic monetization of deficit in particular. Of course, it involves a lot of practical and implementational issues⁽²³⁾. Clearly these are beyond the scope of the present paper.

Notes

- (1) Note that pay-off of the central bank is given by, $W = -m^2 + 2(m - m^e)$. Therefore, we can find the following cases :
 $m = 0, m^e = 0$ implies $W = 0$,
 $m = 0, m^e = 1$ implies $W = -2$,
 $m = 1, m^e = 0$ implies $W = 1$,
 $m = 1, m^e = 1$ implies $W = -1$.
 Similarly from the payoff of the public i.e., $U = -(m - m^e)^2$, we get,
 $m = 0, m^e = 0$ implies $U = 0$,
 $m = 0, m^e = 1$ implies $U = -1$,
 $m = 1, m^e = 0$ implies $U = -1$,
 $m = 1, m^e = 1$ implies $U = 0$.
- (2) A strategy is said to be dominant for a player if it yields the highest pay-off to that player irrespective of the strategies chosen by the other player. In our example $m=1$ is dominant strategy as by choosing $m=1$ or high money supply, the central bank is getting 1 or -1 units of utilities, both of which are greater than the corresponding utilities, viz., 0 or -2 had it chosen a low money supply growth.
- (3) Formally this can be shown as follows : Solution to $\text{Max } U = -(m - m^e)^2$ yields, $m = m^e = 1$.
- (4) For a formal but mathematically less demanding proof of this proposition, see Binmore and Dasgupta (1986) p.25.
- (5) In fact Rogoff (1987) uses the game theoretic term 'subgame perfect' in place of the popular jargon of 'time consistent'.
- (6) However, quite opposite conclusion has been reached by Canzoneri (1985). He argues that if the central bank's forecast is public information there are no difficulties in maintaining low inflation.
- (7) We use the word simplistic in view of Poole (1982)'s critique of Blinder (1982) on the ground that any monetary policy game in the US should have three players, viz., the Fed, the administration and the congress.
- (8) Note that the rankings may be derived in the following manner. Since the central bank wants to reduce inflation, it prefers most a contractionary monetary policy with a contractionary fiscal policy. On the contrary, the fiscal authority prefers an expansionar

- policy in both the fronts in order to stimulate the economy. Similar reasoning generates other orderings.
- (9) Blinder considers a three policy variant of this game with options of 'expansion', 'contraction', and 'do nothing' policies. Here also the Nash equilibrium is Pareto dominated by a number of outcomes.
 - (10) The assumptions are as follows : (i) the implied disagreement between the monetary and fiscal authority over the importance of expenditure is greater than the disagreement over the importance of unemployment ; (ii) the monetary authority is more concerned with inflation while the fiscal authority is more concerned with output and employment.
 - (11) Note that the objective of the labour union (higher real wage even at the cost of some unemployment) is clearly antagonistic to the objective of both monetary and fiscal authority (viz., higher employment).
 - (12) Almost similar strategy has been employed by Barro(1986b). Since Barro does not explicitly discuss the implication of central bank independence we have omitted his paper from the present survey.
 - (13) Technically speaking this notion of equilibrium is a generalization of subgame perfection to a game with incomplete information . As Driffill(1988) has noted , the solution is time consistent , since, "at each stage in the game players update their beliefs using optimally the information conveyed by their observations of moves made since previous updating using Bayes' rule" (p.535).
 - (14) Note that the private sector does not know the specific type of the government, and simply attaches probabilities p and $1-p$ to the two possibilities.
 - (15) For an alternative approach see Vickers(1986). He considers two governments which differ in their inflationary tendencies, with neither committed to zero inflation. However, this relatively minor change produces quite different results (see also Driffill (1988).
 - (16) In this sense the model is complementary to Rogoff-Sibert(1985).
 - (17) It is interesting to note the dedication in Buchanan *et.al.* (1987) in this context. The book is dedicated to, "those future generations.....who may profit if the principle of budget balance is restored by democracies".
 - (18) Note that the proposition is in direct contrast to rational political business cycle theories with ideological parties.
 - (19) In crude terms, the absence of game-theoretic model is the main responsible factor behind the lack of formalization of interactions between the various institutions in the public choice literature.
 - (20) He bases his conclusion from the regressions of the following form :

$$D_t = a_0 + a_1 D_{t-1} + a_2 H_{t-1} + a_3 C_t$$
, and

$$H_t = b_0 + b_1 D_{t-1} + b_2 H_{t-1} + b_3 C_t$$
; where D_t and H_t are domestic debt and base money respectively. C is a measure of the current cyclical state of the economy and is equal to the deviation of real GNP from trend.

- (21) The conversions are as under :

<u>Grilli <i>et al.</i> index(x)</u>	<u>Conversion</u>
$x > 11$	4
$7 < x \leq 11$	3
$4 < x \leq 7$	2
$x \leq 4$	1

- (22) Each attribute has been further decomposed into a number of detailed components; see Cukierman *et al.* (1992) pp 358-359.
- (23) Leone(1991), Swinburne and Castello-Branco(1991) and Bockelmann (1991) have interesting discussion on this relevant issue.

References

1. Abreu, D (1988) : 'On the Theory of Infinitely Repeated Games with Discounting', *Econometrica*, Vol.56, pp 383-396.
2. Ahking, F.W., and S.M. Miller (1985) : 'The Relationship between Government Deficits, Money Growth and Inflation' *Journal of Macroeconomics*, Vol.7, pp 447-467.
3. Alesina, A.(1987) : 'Macroeconomic Policy in a Two-Party System as a Repeated Game' , *Quarterly Journal of Economics*, Vol.102(August), pp 651-78.
4. — (1988) : 'Macroeconomics and Politics', in *NBER Macroeconomics Annual*, Vol.3, pp 13-52.
5. — (1992) : *Political Models of Macroeconomic Policy and Fiscal Reform*, Policy Research Working Paper (# WPS 970), World Bank, Washington D.C.
6. — and G.Taellini (1987) : 'Rules and Discretion with Non-Coordinated Monetary and Fiscal Policies', *Economic Inquiry*, Vol.25, pp 619-630.
7. — and L.H. Summers (1993) : 'Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence', *Journal of Money, Credit and Banking*, Vol.25(2), pp.151-162.
8. Bade, Robin and Michael Parkin (1985) : *Central Bank Laws and Monetary Policy* , Mimeo, University of Western Ontario.
9. Backus, David and John Driffill(1985) : 'Inflation and Reputation', *American Economic Review*, Vol.17(1), pp 530-38.
10. Barro, Robert (1986a) : 'Recent Developments in the Theory of Rules Versus Discretion', *Economic Journal* (Conference Papers), Vol.96, pp 23-37.
11. — (1986b) : 'Reputation in a Model of Monetary Policy with Incomplete Information' , *Journal of Monetary Economics*, Vol.17(1), pp 530-38.
12. — and D.B. Gordon (1983a) : 'Rules, Discretion and Reputation in a Model of Monetary Policy', *Journal of Monetary Economics*, Vol.12, pp 101-121.

13. — (1983b): 'A Positive Theory of Monetary Policy in a Natural Rate Model', *Journal of Political Economy*, Vol.91, pp 589-610.
14. Balke, Nathan and Joseph H. Haslag (1992) : 'A Theory of Fed Watching in a Macroeconomic Policy Game', *International Economic Review*, Vol.33(3), pp 619-28.
15. Basar, Tamer and Mark Salmon (1990) : 'Credibility and Value of Information Transmission in a Model of Monetary Policy and Reputation', *Journal of Economic Dynamics and Control*, Vol.14, pp 97-104.
16. Binmore, Ken and Partha Dasgupta (1986) : *Economic Organizations as Games*, Basil Blackwell, Oxford.
17. Blackburn, Keith and Michael Christensen (1989) : 'Monetary Policy and Policy Credibility : Theory and Evidence', *Journal of Economic Literature*, Vol.27(March), pp 1-45.
18. Blake, Andrew P. and Peter F. Westaway (1993) : 'Should the Bank of England be Independent ? ', *National Institute Economic Review*, February, pp 72-80.
19. Blinder, Alan S (1982) : 'Issues in the Coordination of Monetary and Fiscal Policies', in *Monetary Policy Issues in the 1980s*, A Symposium Sponsored by the Federal Reserve Bank of Kansas City, pp 3-34.
20. Bockelmann, Horst (1992) : 'Credibility and Consistent Central Bank Policy : An Insider's View', in Eckstein, Zvi (ed.) *Aspects of Central Bank Policy Making*, pp 133-146, Springer-Verlag, Berlin.
21. Brennan, G.H. and J.M. Buchanan (1981) : 'Monopoly in Money and Inflation', The Institute of Economic Affairs, Sussex ; reprinted in James M. Buchanan (ed.) *Constitutional Economics*, pp 47-90, Basil Blackwell, Oxford, 1991.
22. Buchanan, J.M., C.K. Rowley, and R.D. Tollison (1987) (ed.s) *Deficits*, Basil Blackwell, Oxford.
23. Buckle, Robert and Peter J. Stamp (1991) : 'Reserve Bank Autonomy and the Credibility of Monetary Policy : A Game Theoretic Approach', *New Zealand Economic Papers*, Vol.25(1), pp 51-85.
24. Buderkin, Richard C.K. and Mark E. Wohor (1990) : 'Monetary Institutions, Budget Deficits and Inflation', *European Journal of Political Economy*, Vol.6(4), pp 531-51.
25. Canzoneri, Mathew B (1985) : 'Monetary Policy Games and the Role of Private Information', *American Economic Review*, Vol.75, pp 1056-70.
26. Carraro, Carlo (1987) : 'A Folk Theorem of Monetary Policy', in Didier Laussel, William Marois and Antoine Soubeyran (ed.s) *Monetary Theory and Policy*, pp 173-206, Springer-Verlag, Berlin.
27. Cukierman, Alex (1986) : 'Central Bank Behaviour and Credibility : Some Recent Theoretical Developments', *Federal Reserve Bank of St. Louis Review*, Vol.68(May), pp 5-17.

28. — and Alan H. Meltzer (1986): 'A Theory of Ambiguity, Credibility and Inflation under Discretion and Asymmetric Information', *Econometrica*, Vol.54(5), pp 1099-1128.
29. —, Steven B. Webb and Bilin Neyapti (1992): 'Measuring the Independence of Central Banks and its Impact on Policy Outcomes', *The World Bank Economic Review*, Vol.6(3), pp 353-98.
30. Downes, Patrick and Reza Vaez-Zedah (1991): *The Evolving Role of Central Banks*, International Monetary Fund, Washington D.C.
31. Driffill, J (1985): 'Macroeconomic Stabilization Policy and Trade Union Behaviour as a Repeated Game', *Scandinavian Journal of Economics*, Vol.87, pp 300-326.
32. — (1988): 'Macroeconomic Policy with Incomplete Information: A Survey', *European Economic Review*, Vol.32, pp 533-41.
33. Friedman, Milton (1968): 'The Role of Monetary Policy', *American Economic Review*, Vol.58(1), pp 1-17.
34. — (1982): 'Monetary Policy: Theory and Practice', *Journal of Money, Credit and Banking*, Vol.14(February), pp 98-118.
35. Friedman, James W (1971): 'A Noncooperative Equilibrium for Supergames', *Review of Economic Studies*, vol.38, pp 1-12.
36. Fischer, Stanley (1990): 'Rules Versus Discretion in Monetary Policy' in B.M. Friedman and F.H. Hahn (ed.s) *Handbook of Monetary Economics*, Vol.II, pp 1155-84, North Holland, Amsterdam.
37. Green, E and R. Porter (1984): 'Noncooperative Collusion under Imperfect Price Information', *Econometrica*, Vol.52(1), pp 87-100.
38. Grilli, Vittorio, D. Masciandaro and G. Tabellini (1991): 'Political and Monetary Institutions and Public Financial Policies in the Industrial Countries', *Economic Policy*, Vol.13(October), pp 341-92.
39. Goodfriend, M (1986): 'Monetary Mistique: Secrecy and Central Banking', *Journal of Monetary Economics*, Vol.17, pp 63-92.
40. Havrilesky, Thomas and James Granato (1993): 'Determinants of Inflationary Performance: Corporatist Strategy Vs. Central Bank Autonomy', *Public Choice*, Vol.76, pp 249-261.
41. Jensen, Henrik (1992): 'Time Inconsistency Problems and Commitments of Monetary and Fiscal Policies', *Journal of Economics*, Vol.56(3), pp 247-66.
42. Kreps, David. M (1990): *Game Theory and Economic Modelling*, Clarendon Press, Oxford.
43. — and Robert Wilson (1982a): 'Sequential Equilibria', *Econometrica*, Vol.50, pp 863-94.

44. — (1982b) : 'Reputation and Imperfect Information', *Journal of Economic Theory*, Vol.27(2), pp 253-79.
45. Kydland, F.E and E.C Prescott (1977) : 'Rules Rather than Discretion: The Inconsistency of Optimal Plans', *Journal of Political Economy*, Vol.85, pp 473-91.
46. Leone, Alfredo (1991) : 'Effectiveness and Implications of Limits on Central Bank Credit to Government', in Downes and Vaez-Zedah (1991), pp 363-413.
47. Lewis, Karen.K (1991) : 'Why Doesn't Society Minimise Central Bank Secrecy ?' *Economic Inquiry*, Vol.29(July), pp 403-15.
48. MacDonald, Ronald and Ross Milbourne (1990) : *Recent Developments in Monetary Theory*, University of New South Wales Discussion Paper, No.90/1.
49. Mckinnon, R (1984) : 'An International Standard for Monetary Stabilization ', *Policy Analysis in International Economics*, Vol.8, Institute for International Economics, Washington D.C.
50. Milgrom, Pand J.Roberts (1982) : 'Predation, Reputation and Entry Deterrence', *Journal of Economic Theory*, Vol.27(2), pp 280-312.
51. Nordhaus, W (1975) : 'The Political Business Cycle', *Review of Economic Studies*, Vol.42, pp 1-16.
52. Parkin, Michael (1987) : 'Domestic Monetary Institutions and Deficits', in J.M.Buchanan, C.K. Rowley and R.D. Tollisson (ed.s) *Deficits*, pp 310-331, Basil Blackwell, New York.
53. — and Robin Bade (1978) : 'Central Bank Laws and Monetary Policies : A Preliminary Investigation', in Michael A. Porter (ed.) *The Australian Monetary System in the 1970s*, pp 24-39, Monash University, Melbourne.
54. Persson, Torsten (1988) : 'Credibility of Macroeconomic Policy : An Introduction and A Broad Survey', *European Economic Review*, Vol.32, pp 519-32.
55. — and G. Tabellini (1990) : *Macroeconomic Policy, Credibility and Politics*, Harwood Academic Publishers, Chur, Switzerland.
56. Poole, W (1970) : 'Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model', *Quarterly Journal of Economics*, Vol.84, pp 197-216.
57. — (1982) : 'Comment' on Blinder(1982), in *Monetary Policy Issues in the 1980s*, A Symposium Sponsored by the Federal Reserve Bank of Kansas City.
58. Rogoff, K (1985) : 'The Optimal Degree of Commitment to an Intermediary Monetary Target', *Quarterly Journal of Economics*, Vol.100, pp 1169-89.
59. — (1989) : 'Reputation, Coordination and Monetary Policy' in R.Barro (cd.) *Modern Business Cycle Theory*, Basil Blackwell, Oxford.
60. — (1990) : 'Equilibrium Political Business Cycles', *American Economic Review*, Vol. 80(1), pp.21-36.

61. — and A Sibert (1988) : 'Equilibrium Political Business Cycles', *Review of Economic Studies*, Vol.55, pp 1-16.
62. Sargent, Thomas J and Neil Wallace (1981) : 'Some Unpleasant Monetarist Arithmetic', *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol.5(Fall), pp 1-17.
63. Sheffrin, John (1989) : *The Making of Economic Policy*, Basil Blackwell, Cambridge, Massachusetts.
64. Swinburne, Mark and Marta Castello-Branco (1991) : 'Central Bank Independence and Central Bank Functions' in Downes and Vaez-Zedeh (1991), pp 414-44.
65. Tabellini, G (1987) : 'Reputational Constraints on Monetary Policy ; A Comment', *Carnegie-Rochester Series of Public Policy*, Vol.26, pp 183-190.
66. Tullock, G (1988) : *Wealth, Poverty and Politics*, Basil Blackwell, Oxford.
67. Vickers, John (1986) : 'Signaling in a Model of Monetary Policy with Incomplete Information', *Oxford Economic Papers*, Vol.38, pp 443-55.
68. Wagner, R.E. (1989) : 'Liability Rules, Fiscal Institutions and Debt', in Buchanan et.al (1987), pp 199-217.
69. Waller, Christopher J (1989) : 'Monetary Policy Games and Central Bank Politics', *Journal of Money, Credit and Banking*, Vol.21, pp 422-31.

Macro-Economic Linkages in the Indian Economy: Inter-Links Between Imports, Output, Exchange Rate and External Debt

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A major objective of the study is to analyse the inter-links between imports, output, exchange rate and external debt in the Indian context by developing a small macro-economic model. Using this model, the impact of a downward adjustment in exchange rate on current account balance as also on external debt (or external debt output ratio) has been evaluated in a policy simulation framework. Policy simulation experiments were also conducted to evaluate the impact of a given rise in imports on output, prices and external debt and external debt output ratio. The study has pointed to the need for determining the minimal level of capital efficiency or growth in exports for maintaining the external debt output ratio at a desired level under a phased programme of import liberalisation.

Introduction

Beginning July 1991, India has adopted a far reaching economic reforms programme with a view to building up an economic system which could effectively integrate itself with the rest of the world. It is postulated on the basis that the economic reform measures would reduce the capital/output ratio and raise output levels. In order to test the veracity of this hypothesis, an understanding of the inter-links among major macro economic variables becomes imperative and has to be the first priority. It is only such an understanding that would be helpful in initiating necessary policy measures to lead the economy gently along the desired growth path. Accordingly, a small macro-economic model consisting of 14 behavioural equations, 1 statistical construct and 4 identities, has been developed and presented in this study. The major emphasis of the model is on the external sector, though it covers inter-links among all the major sectors of the economy viz., money, output, saving and investment and prices. For convenience of analysis, the study is divided into three sections. Section I is devoted to theoretical and empirical framework of the model while Section II discusses the

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results of some policy simulation exercises. The conclusions of the study are set out in Section III.

SECTION I

Theoretical and Empirical Framework of the Model

The theoretical underpinnings of the model have been set in the familiar Harrod-Domar frame-work. The gap between investment and domestic saving is financed by net inflow of capital from abroad. Thus, in the first instance, the excess of imports over exports along with domestic saving, determines the level of investment in the economy. The latter, i.e., investment, in its turn determines the level of capital stock and real output. The expected real output then determines government expenditure and government revenue. The fiscal and external factors feed into money supply determination. Money supply along with output then determines prices. The movement of other variables representing cost elements in the economy viz., implicit deflator for Gross Domestic Product (GID) and implicit cost of investment index (PCF) are functionally related to the wholesale price index (WPI).

The variables (endogenous and exogenous) used in the model are indicated in tables 1 and 2.

Table - 1: List of Endogenous Variables

(Amount in Rupees crores)

Sr. No.	Variable	Description	Unit
1.	GDPR	Gross domestic product	At factor cost, at 1980-81 prices
2.	GDPN	Gross domestic product	At current prices
3.	KR	Net capital stock	At 1980-81 prices
4.	IR	Investment during the year	- do -
5.	IN	Investment during the year	At current prices

Contd..

Sr. No.	Variable	Description	Unit
6.	SN	Net domestic saving	At current prices
7.	GID	Deflator for gross domestic product	Index, 1980-81 = 1.00
8.	PCF	Deflator for capital formation	- do -
9.	WPI	Wholesale price index for all commodities	1981-82 = 1.00
10.	M3	Broad money	At current prices
11.	$\Delta M3$	Increase in broad money	- do -
12.	G	Government expenditure (Central Government)	- do -
13.	RR	Revenue receipts (Central Government)	- do -
14.	TEXP	Total exports (both merchandise and invisibles)	- do -
15.	TIMP	Total imports (both merchandise and invisibles)	- do -
16.	EDBT	Total external debt	- do -
17.	DEBT(AE)	Change in external debt adjusted for exchange rate changes	- do -
18.	AMRT	Amortisation payments	- do -
19.	EIPE	Interest payments on external Debt	-do-

Table - 2 : List of Exogenous Variables
(Amount in Rupees crores)

Sr. No.	Variable	Description	Unit
1.	BCR	Real bank credit, (bank credit to the government and private sector adjusted for price level)	At 1981-82 prices
2.	NFEA	Net foreign exchange assets of the Reserve Bank of India	At current prices
3.	WGDP	World gross domestic product	Index (1985=100)
4.	IWP	Price index of industrial countries	Index (1985=1.00)
5.	DUM	Dummy variable	(10 for 1979-80 to 1981-82 and 1 for other years)
6.	EAVG	(Nominal) average exchange rate	Rupees per dollar
7.	XP	Unit value index of exports	Index (1978-79=1.00)
8.	MP	Unit value index of imports	Index (1978-79=1.00)

Data and Estimation Procedure Used in the Model

The model is based on the data for the period 1970-71 to 1989-90, collected from different issues of the *Report on Currency and Finance* of Reserve Bank of India, *Economic Survey of the Government of India* and *International Financial Statistics* of the International Monetary Fund. The individual equations have been estimated using Ordinary Least Squares (OLS) method. The goodness of fit of the regression equations is evaluated on the basis of the signs and sizes

of the regression coefficients, coefficient of multiple determination adjusted for $\frac{2}{n}$ degrees of freedom (R^2), t-statistics (t) and standard error of estimate (SEE). The specification of each regression equation is judged on the basis of h-test/Durbin-Watson test(D.W.), depending upon whether the equation is considered with or without a lag structure. The elasticities (denoted by 'E') are at mean levels of variables.

Real Sector

In the real sector, we have postulated a regression equation for determining the gross domestic product (GDPR) at the aggregate level. The behavioural equation for GDPR takes into account the impact of net capital stock and real bank credit. Real imports (deflated by the unit value index of imports) is also included in the output equation with a view to capturing the impact of a rise in imports on output. The empirical results of the equation are presented below :

$$GDPR = 28940.35 + 0.2395 KR_{-1} + 1.1424(BCR - BCR_{-1}) + 1.3304(TIMP/MP)$$

t	6.92	3.29	2.65
E	0.61	0.04	0.12

$$R^2 = 0.99 \quad DW = 1.45 \quad SEE = 3458 \quad Mean = 131210 \quad CV = 2.63... (1)$$

The elasticities indicate that with a 1 per cent rise in real imports (TIMP/MP), GDPR is expected to rise by about 0.12 per cent. Similarly, with a change in real bank credit (BCR-BCR₋₁) by 1 per cent, GDPR is expected to rise by a modest 0.04 per cent. The results also indicate that the lagged impact of a rise in preceding year's capital stock (KR₋₁) of 1 per cent on GDPR would be about 0.61 per cent.

Nominal Gross Domestic Product (GDPN)

The nominal gross domestic product which captures the impact of prices is given by the following identity.

$$GDPN = GDPR * PID \quad \dots\dots\dots(2)$$

Saving and Investment Sector

The saving and investment sector of the model consists of a behavioural equation explaining net domestic saving (SN), a statistical construct for explaining net capital formation (IN) and 2 identities. The desired level of investment targets are then determined keeping in view the broad dimension of domestic saving which is functionally related to output.

Saving

Total domestic saving has been estimated as a function of gross domestic output (nominal) in a partial adjustment frame-work. The estimated equation is given below:

$$SN = -953.46 + 0.0508 \text{ GDPN} + 0.7313 \text{ SN}_{-1}$$

t	2.02	2.89
E	0.42	0.63

_2

$$R = 0.96 \quad DW = 2.01 \quad SEE = 2556.24 \quad \text{Mean} = 19083 \quad CV = 13.91 \quad \dots(3)$$

Investment

The results indicate that with a 1 per cent rise in nominal output (GDPN), net domestic saving is expected to rise by about 0.42 per cent in the short-run and by about 1.55 per cent in the long run.

In a national accounting framework, net investment (IN) is equal to net domestic saving (SN) and net capital inflow. The latter term, i.e. net capital inflow could be approximated by the difference between total imports and total exports (TIMP - TEXP). In view of this approximation in equating the saving and investment gap with the external financing gap, it is felt that consideration of the macro-economic relationship between investment and saving as a statistical construct as depicted below would be in order.

$$IN = 2489.40 + 0.87 [\text{SN} + (\text{TIMP} - \text{TEXP})]$$

t	18.70
E	0.88

_2

$$R = 0.99 \quad DW = 1.24 \quad SEE = 3295.32 \quad \text{Mean} = 21137.32 \quad CV = 15.58 \quad \dots(4)$$

Thus, the investment equation captures the impact of foreign sector on net capital formation. It may also be noted that imports enter the real sector by directly affecting output equation and by influencing investment through current account balance. Investment (forming part of capital stock) in turn influences output level. The import elasticity of real output estimated through policy simulation is, therefore, expected to be somewhat overstated.

Net Capital Stock

Having estimated net capital formation, the identities relating to real investment (IR) and net capital stock (KR) are given below :

$$IR = IN/PCF \quad \dots(5)$$

$$KR=KR_{-1}+IR \quad \dots(6)$$

Price Sector

The feedback effect of real sector on the fiscal sector is primarily captured through changes in the price level. For this purpose, behavioural relationships have been formulated separately for the wholesale price index for all commodities (WPI), the deflator for gross domestic product (GDP) and the deflator for capital formation (PCF). In this model, the price index for all commodities is endogenised in terms of broad money (M3) and gross domestic product (GDP) in a partial adjustment framework. The empirical results of the equation are given below :

$$\begin{aligned} \text{Log WPI}_t = & 2.4522 + 0.3699 \text{Log M3}_{t-1} - 0.8266 \text{Log GDP}_{t-1} + 0.6713 \text{Log (WPI)}_{t-1} \\ & \quad \quad \quad 3.07 \quad \quad \quad 2.29 \quad \quad \quad 4.38 \\ R = & 0.98 \quad h = 1.82 \quad \text{SEE} = 0.038 \quad \text{Mean} = 0.9346 \quad \text{CV} = 4.09 \quad \dots(7) \end{aligned}$$

The estimated equation is in line with theoretical expectations. The results show that with a 1 per cent rise in broad money, WPI is expected to rise by about 0.37 per cent in the short-run. The long-run elasticity of prices with respect to broad money is estimated to be around 1.12. Similarly, with a 1 per cent rise in GDP, WPI is expected to decline by about 0.83 per cent in the short-run and by about 2.50 per cent in the long-run.

The wholesale price index has been taken as the *numeraire* for determining other prices. Accordingly, the price deflator for gross domestic product (GDP) and deflator for capital formation (PCF) have been estimated separately as functions of WPI in a lagged adjustment framework. The estimated relationships are given below :

$$\text{GID} = -0.0139 + 0.5001 \text{ WPI} + 0.6333 (\text{GID}_1)$$

t	3.69	5.28
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E	0.43	0.58
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_2

$$R = 0.99 \quad h = 1.26 \quad \text{SEE} = 0.02 \quad \text{Mean} = 1.09 \quad \text{CV} = 1.83 \quad \dots(8)$$

$$\text{PCF} = -0.0340 + 0.481 \text{ WPI} + 0.6908 \text{ PCF}_1$$

t	3.09	5.61
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E	0.39	0.63
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_2

$$R = 0.99 \quad h = -0.93 \quad \text{SEE} = 0.03 \quad \text{Mean} = 1.14 \quad \text{CV} = 2.63 \quad \dots(9)$$

The results show that a 1 per cent rise in WPI would cause a rise in GID and PCF of 0.43 per cent and 0.39 per cent, respectively in the short-run. The long-run responses of these two variables with respect to WPI works out to be 1.16 and 1.25 per cent, respectively. The goodness of fit statistics in respect of these equations are quite satisfactory and, therefore, these equations could be used for the purpose of policy simulation to obtain the feedback effect of price level on the deflators for gross domestic output and net capital formation.

Monetary Sector (M3)

The model also captures the impact of fiscal and foreign sectors on the monetary sector. Accordingly, in this model, a change in broad money ($\Delta M3$) is regressed on a change in net foreign exchange assets of the RBI (i.e. $\Delta NFEA$), fiscal deficit [i.e. (G-RR)] and change in bank credit to the commercial sector ($\Delta BCCS$). The estimated equation is given below :

$$\Delta M3 = -1257.73 + 0.6636 (\Delta NFEA) + 0.3983 (G-RR) + 0.8800 (\Delta BCCS)$$

t	1.86	4.07	5.30
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E	0.02	0.51	0.58
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_2

$$R = 0.98 \quad \text{DW} = 1.76 \quad \text{SEE} = 1399.35 \quad \text{Mean} = 11575.22 \quad C = 12.00 \quad \dots(10)$$

The above results suggest that with a rise in incremental net foreign exchange assets of Rs.100 crores, broad money will rise by about Rs.66 crores. Similarly, with a rise in fiscal deficit and incremental bank credit to the commercial sector by Rs.100 crores, broad money will rise by about Rs.40 crores and Rs.88 crores, respectively. In terms of elasticities, a 1 per cent rise in each of the variables viz., $\Delta NFEA$, (G-RR) and $\Delta BCCS$ would cause broad money to rise by 0.02, 0.51 and 0.58 percentage points, respectively. Having estimated

the change in broad money (ΔM_3), the money stock (M_3) is determined from the following identity :

$$M_3 = M_{3_{-1}} + \Delta M_3 \quad \dots(11)$$

Fiscal Sector

The fiscal sector of the model, which considers the fiscal operations of the Central Government only, has two regression equations; the first one explaining government expenditure (G) and the second one specifying government revenue receipts (RR). The estimated equations of the fiscal block are given below :

$$G = -2342.07 + 0.1281 \text{ GDPN} + 0.5461 (G_{-1})$$

t	3.28	2.95
E	0.59	0.47

_2

$$R = 0.99 \quad h = -3.04 \quad \text{SEE} = 1532.31 \quad \text{Mean} = 33997.21 \quad \text{CV} = 4.50 \quad \dots(12)$$

$$RR = -3393.02 + 0.1423 \text{ GDPN}$$

t	27.21
E	1.18

_2

$$R = 0.99 \quad \text{DW} = 1.71 \quad \text{SEE} = 987.94 \quad \text{Mean} = 19147.58 \quad \text{CV} = 5.16 \quad \dots(13)$$

The results suggest that with a rise in nominal gross domestic output (GDPN) of 1 per cent, government expenditure (G) is expected to rise by 1.30 per cent in the long run. As against this, there would be a rise in revenue receipts (RR) by about 1.18 per cent for a 1 per cent rise in nominal gross domestic output (GDPN). The results indicate that in long-run, government expenditure would be rising faster than government revenue receipts resulting in a widening of the fiscal deficit over time.

External Sector

The external block in this study has been dealt in a more detailed fashion by covering relationships in respect of exports (including invisibles) (TEXP), imports (including invisibles) (TIMP), external debt (EDBT), amortisation (AMRT) and interest payment expenditure in respect of external debt liabilities (EIPE). Exports have been estimated in a demand framework. Assuming that there are no supply constraints, exports are expected to be determined by world gross domestic output (WGDP) and real exchange rate (EAVG*IWP/WPI). The

real exchange rate used in this model is worked out by deflating the nominal exchange parity (Rupees per dollar) by the ratio of domestic price index to the price index of industrial countries. Theoretically, a rise in real exchange parity would cause exports to pick up. Besides, the model also takes into consideration the impact of second oil shock of 1979 and its spill over effects lasting up to 1981-82 by including an appropriate dummy variable to represent these years. The behavioural equation is estimated in a partial adjustment framework and empirical results are given below :

$$\begin{aligned} \text{Log (TEXP/XP)} &= 0.6837 + 0.7194 \text{ Log (WGDP)} \\ &\quad \underset{1}{} \quad \quad \quad \underset{1.13}{} \\ &+ 1.0628 \text{ Log (EAVG*IWP/WPI)} + 0.0909 \text{ Log (DUM)} \\ &\quad \underset{1.95}{} \quad \quad \quad \underset{2.76}{} \\ &+ 0.2191 \text{ Log (TEXP/XP)}_{-1} \\ &\quad \underset{1.17}{} \\ \underline{} &\quad \quad \quad \underline{} \\ R &= 0.92 \quad h = -2.05 \quad \text{SEE} = 986.82 \quad \text{Mean} = 9882.35 \quad \text{CV} = 9.98 \quad \dots(14) \end{aligned}$$

The results suggest that with a 1 per cent rise in world income (WGDP), exports are expected to rise by 0.72 per cent in the short-run and by about 0.92 per cent in the long-run. The impact of real exchange parity (i.e. nominal exchange parity adjusted for relative prices in domestic and foreign countries) works out to be significant indicating that with a 1 per cent rise in real exchange parity, total exports are expected to rise by about 1.06 per cent in the short-run and by about 1.36 per cent in the long-run. Thus, the results corroborate the hypothesis that depreciation could stimulate exports only in an environment of relative price stability. The dummy variable included in the relationship turned out to be statistically significant implying that the second oil shock resulted in a significant rise in exports due to demand pull factors.

The imports equation has also been postulated in a demand framework with gross domestic output (GDPR) as a scale variable. The equation also includes the real exchange parity as one of the explanatory variables. The estimated regression relationship (in a partial adjustment framework) is shown below :

$$\begin{aligned} \text{TIMP/MP} &= -552.09 - 926.2898 (\text{EAVG} * \text{IWP/WPI}) \\ &\quad \underset{1}{} \quad \quad \quad \underset{1.36}{} \\ &\quad \text{E} \quad \quad \quad \underset{-0.67}{} \\ &+ 0.1012 \text{ GDPR} + 0.6858 (\text{TIMP/MP})_{-1} \\ &\quad \underset{2.80}{} \quad \quad \quad \underset{4.40}{} \\ &\quad \underset{1.08}{} \quad \quad \quad \underset{0.64}{} \end{aligned}$$

2
 $R = 0.97 \quad h = -0.12 \quad SEE = 1041.00 \quad \text{Mean} = 12301.00 \quad CV = 8.46 \quad \dots(15)$

The above results suggest that with a 1 per cent rise in gross domestic product (GDPR), real imports are expected to rise by about 1.1 per cent in the short-run and by about 3.40 per cent in the long run. Though (real) exchange parity bears theoretically expected sign in relation to imports, its coefficient is not statistically significant. While this indicates that the impact of exchange rate on imports alone may not be effective in bringing about the necessary correction in the balance of payments position, this statistical outcome may be reflective of the import regime which was for a good part of the period covered in this paper, characterised by a number of quantitative restrictions.

Having discussed the impact of a rise in real exchange parity on exports and imports, we now turn to analyse the impact of current account deficit on external debt. For this purpose, change in external debt measured in rupee terms and adjusted for exchange rate changes denoted by DEBT(AE) is related to current account deficit. Empirical results of the equation are as shown below:

$$DEBT(AE) = 0.9021(TIMP-TEXP)$$

t	9.44
E	0.75

2
 $R = 0.83 \quad DW = 1.72 \quad SEE = 1784 \quad \text{Mean} = 2980 \quad CV = 59.87 \quad \dots(16)$

The regression coefficient of current account balance (TIMP-TEXP) turned out to be close to unity establishing that current account balances automatically feed into debt accumulation/decumulation. Thus, in the Indian context, this equation captures the impact of imports and exports on external debt accumulation. Further, the combined impact of both current account balance and changes in exchange rate on external debt outstanding as at the end of a year could be seen from the following identity:

$$EDBT = EDBT_{-1} + [(EAVG - EAVG_{-1}) * (EDBT_{-1} / EAVG_{-1})] + DEBT(AE) \quad \dots(17)$$

To have some idea about debt servicing, we have also included two more equations in respect of amortisation payments (AMRT) and interest payment on external debt (EIPE). These relationships have been estimated in a simple framework by relating them to the level of external debt (at the beginning of the year). Empirical results of these equations are given below :

$$\text{AMRT} = -169.0323 + 0.0545 (\text{EDBT}_1)$$

t	13.00
E	1.13

$$\text{R} = 0.90 \quad \text{DW} = 1.24 \quad \text{SEE} = 95.61 \quad \text{Mean} = 1270.58 \quad \text{CV} = 7.52 \quad \dots (18)$$

$$\text{EIPE} = -330.59 + 0.0448 (\text{EDBT}_1)$$

t	21.13
E	1.30

$$\text{R} = 0.99 \quad \text{DW} = 1.83 \quad \text{SEE} = 109.63 \quad \text{Mean} = 868.63 \quad \text{CV} = 12.62 \dots (19)$$

The above results suggest that with a rise in external debt of 1 per cent, AMRT will rise by about 1.13 per cent and EIPE will rise by about 1.30 per cent. Since the estimated elasticities in respect of AMRT and EIPE are individually greater than unity, it is necessary that we adopt a cautious approach to external borrowing and more importantly gear the external borrowing programme for freeing the economy of the impediments in the structural adjustment undertaken for generating growth. A strict monitoring of the use of aid in various key projects and augmenting the absorptive capacity of aid should therefore, form an integral part of the external debt strategy in years ahead.

It may be noted that in this study, external debt was considered in rupee terms rather than in dollar/real terms. The reason for the departure from the latter approach is that external debt computed in rupee terms gives an idea of the amount of domestic currency component that is required to finance debt owed to the rest of the world. The policy maker must know how much of domestic money resource has to be set aside for debt servicing.

SECTION II

Policy Simulation Experiments

The collective performance of the model which captures the feedback effects of various endogenous variables was ensured by simulating the model using Gauss-Siedel algorithm. The convergence of the model was attained within about 25 iterations. Judged by mean absolute per cent error (MAPE) and root mean square per cent error (RMSPE) of the endogenous variables (vide Annexure), the collective performance of the model turned out to be very satisfactory. The structural equation system postulated in this model is, therefore, considered to

be most appropriate for capturing the dynamic inter-links among the various sectors of the economy. Accordingly, the model has been employed for carrying out the following important simulation experiments:

1. Impact of a downward adjustment in exchange rate on other macroeconomic variables, particularly on exports, imports and external debt.
2. Impact of import liberalisation on other macro economic variables, particularly on output and external debt.
3. Minimal capital efficiency required to maintain a targeted external debt output ratio, under a phased programme of import liberalisation.
4. Minimal growth in exports required to maintain a targeted external debt output ratio under a phased programme of import liberalisation.

In policy simulation experiments 1 and 2, we present both impact multipliers and elasticities (the latter having been computed as a product of multiplier and mean values of relevant variables). While the multipliers represent the dimensions of change caused in other variables as a result of change in policy variable, the elasticities show responses in terms of percentage changes. The discussion of results in what follows is carried out in terms of elasticities only.

1. Impact of Downward Adjustment in Exchange Rate on the other Macro-Economic Variables particularly on Exports, Imports and External Debt

In our model, exchange rate enters the macro economic system through functional relationships specified for both exports and imports. The estimated model corroborates the hypothesis that a downward adjustment in exchange rate would encourage exports and discourage imports, causing an improvement in the balance of payments position. However, since external debt is denominated in rupee terms, downward adjustment in exchange rate has the effect of aggravating the external debt situation. Accordingly, this policy simulation experiment seeks to evaluate the simultaneous dual impact of exchange rate on both current account and external debt.

The impact multipliers and elasticities computed to quantify the impact of downward adjustment in the exchange rate on the other important endogenous variables are indicated in table 3 below.

Table 3 : Impact of 1 per cent Downward Adjustment in Exchange Rate on the Other Macro-Economic Variables

Variable	Static		Dynamic	
	M	E	M	E
TEXP	1946	1.02	1638	0.86
TIMP	-1218	-0.50	-2443	-1.00
EDBT	1453	0.30	1874	0.39
AMRT	—	—	63	0.29
EIPE	—	—	53	0.36

M : Multiplier E : Elasticity

The above results show that, following a 1 per cent depreciation of the local currency vis-a-vis a major hard currency, there would be a rise in exports by about 1.02 per cent in case of static simulation and by around 0.86 per cent in case of dynamic simulation. Similarly, for a 1 per cent depreciation of the local currency, imports would decline by about 0.50 per cent under static simulation and by about 1 per cent under dynamic simulation. Thus, the estimated overall effect of a downward adjustment in exchange rate on balance of payments situation appears to be favourable. However, the results show adverse impact in case of external debt. External debt is expected to rise by about 0.30 and 0.39 per cent, respectively under static and dynamic simulations on account of a 1 per cent downward adjustment in exchange rate. This suggests that while formulating a policy stance in regard to exchange rate due note has to be taken of its divergent impacts on current account balance as well as on external debt.

2. Impact of Import Liberalisation on other Macro-Economic variables particularly on Output and External Debt

To evaluate the impact of different degrees of import liberalisation on external debt, we initially exogenised imports and obtained the results of control (without altering imports) and policy runs by raising imports by 1 per cent. As may be seen from the frame-work of the model, imports are expected to raise gross domestic output and external debt simultaneously. The results of this policy simulation are given in Table 4.

Table - 4 : Impact of 1 Per cent Rise in Imports on the other Macro-Economic Variables

Variable	Static		Dynamic	
	M	E	M	E
GDPR	0.7671	0.15	0.9650	0.20
IR	0.4608	0.73	0.4428	0.70
IN	0.8082	0.68	0.5809	0.49
TEXP	0.1117	0.14	0.3356	0.43
EDBT	0.8020	0.41	1.9932	1.01
AMRT	—	—	0.0688	0.78

M = Multiplier E = Elasticity

Policy simulation results of a 1 per cent rise in imports indicate that growth in real domestic output would improve by about 0.15 per cent in the short-run and by about 0.20 per cent in the long-run. But, a rise in imports by itself would also simultaneously result in accumulation of external debt by 0.41 per cent and by 1.01 per cent respectively under static and dynamic scenarios (vide equation 16 which relates external debt to current account balance). Thus, the policy implications of this experiment are that though the process of import liberalisation would result in an improvement in output growth, it would simultaneously result in piling up of external debt as well. Hence, a policy stance of "thus far and no further" in case of import liberalisation particularly in a situation of rising external debt gains ample relevance in this context.

3. Capital Efficiency Vs. External Debt/Output Ratio under a phased programme of import liberalisation

In this policy simulation experiment, we tried to trace the scenarios relating to output, external debt and external debt output ratio that would unfold consequent on raising imports by 5, 10, 15 and 20 per cent, respectively, from its control level.

As may be seen from table 5, with a rise in imports, external debt output ratio tended to rise revealing that the favourable impact of a rise in imports on GDPR is not sufficient to offset the adverse impact of imports on external debt accumulation. Now, if the external debt output ratio is to be maintained at the level assumed for the control run, it could only be achieved either through an accelerated rise in GDPR (which could be brought about by an improvement in the capital efficiency of the economy) or by providing a big push to exports. Thus,

the first proposition relating to capital efficiency was tested in this policy simulation experiment by appropriately raising the capital efficiency, i.e., by altering the regression coefficient for capital stock (KR) whereas, policy simulation relating to the second proposition was taken up later. In this experiment, by maintaining imports at 20 per cent higher than the control run, the coefficient of capital stock was altered and the external debt output ratio was computed at steadily rising levels of capital efficiency. Table 5 presents these results.

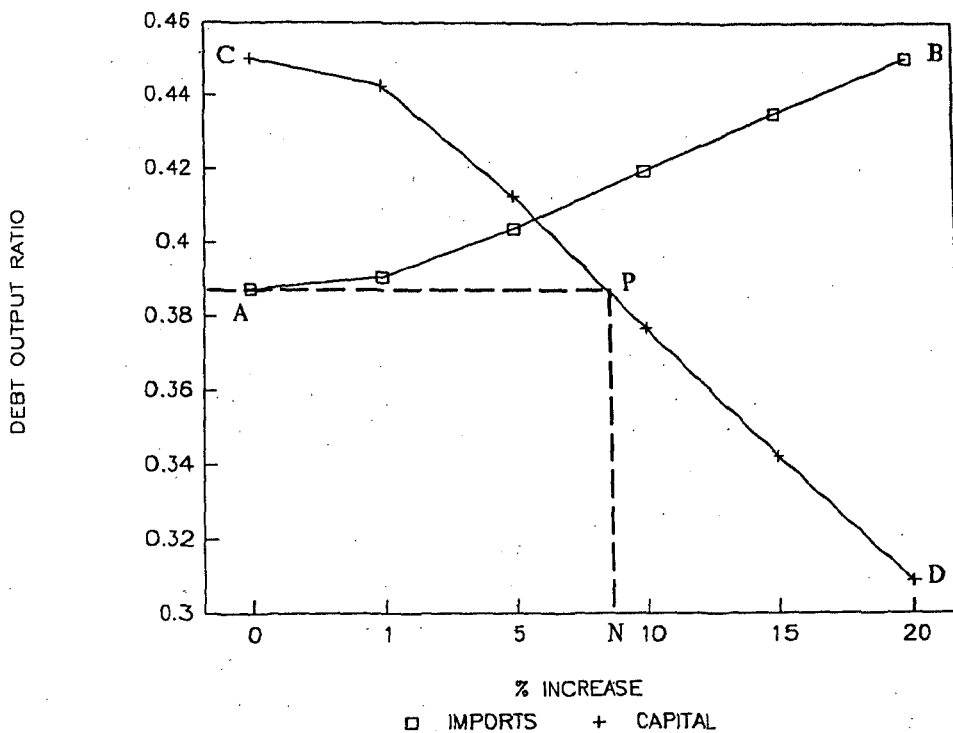
Table - 5 : External Debt Output Ratio-Imports V/s Capital Efficiency

Increase in Imports (per cent)	External Debt Output Ratio	Imports maintained at 20% higher than control run	
		Increase in Capital Efficiency (per cent)	External Debt Output Ratio
0	0.3872	0	0.4501
1	0.3906	1	0.4425
5	0.4036	5	0.4127
10	0.4195	10	0.3768
15	0.4350	15	0.3421
20	0.4501	20	0.3087

From Table 5, it may be inferred that if imports are raised by 20 per cent and simultaneously, capital efficiency is improved by about 9 per cent, the external debt output ratio could be maintained at the initial level of the control run i.e. around 0.3872. The policy implications of these results bear out that after liberalisation, if there is a steep rise in imports, and if there is not much improvement in capital efficiency, the country may land in an irreversible debt trap unless and otherwise the situation is countered by a sizable increase in exports. To have a precise idea of the impact of a rise in imports and improvement in capital efficiency on the external debt output ratio, the results of Table 5 have been transcribed in a graphical form (vide Figure 1).

Figure - 1

IMPORTS VS. CAPITAL EFFICIENCY
(DEBT OUTPUT RATIO)



The line AB in Figure 1 indicates a rise in external debt output ratio (y-axis) for a corresponding rise in imports (scaled along the x axis). Thus, the external debt output ratio could be monitored along the line AB for a give rise in imports. The line CD indicates the impact of an improvement in capital efficiency on the external debt output ratio, when the level of imports is fixed at 20 per cent higher than the control level. From the graphical representation of Figure 1, the required level of capital efficiency to neutralise the impact of a 20 per cent rise in imports could be read off by drawing a vertical line to the X - axis from point P which cuts it at point point N. This indicates that in order to maintain the external debt-output ratio at the targeted level, capital efficiency needs to be improved by about 9 per cent.

4. Exports Vs. External Debt under a phased programme of Import Liberalisation

Bringing about a desired improvement in the capital efficiency of the economy is indeed an arduous task involving multi-pronged efforts at adopting advanced

technology and development of human resources. Nevertheless, a study of policy option in regard to capital efficiency is a useful exercise in as much as it brings forth to the policy maker the dimension and enormity of the tasks ahead in achieving the set targets. The observations of Seeta Prabhu and Chatterjee (1993) that "mere existence of physical infrastructure is by no means an indication of the extent and efficiency of its utilisation. In fact, one of the major characteristics of the human development scene in India is its emphasis on achievement of physical targets with relatively little attention being paid to the quality of services rendered therein" gains immense relevance in this context. While Human Resources Development should increasingly receive a major policy thrust in years ahead, as a part of immediate strategy, effecting improvements in capital efficiency and providing necessary push to exports to contain the external debt output ratio at the desired level is *sine qua non*. In this context, it is imperative to know the degree of export thrust that is needed to contain the external debt output ratio at desired level. Keeping this objective in view, in this policy simulation experiment, exports were raised by 1,5,10,15 and 20 per cent, respectively, maintaining imports at 20 per cent higher than the control run. The results are presented in table 6.

Table-6: External Debt Output Ratio-Imports V/s Exports

Increase in Imports (per cent)	External Debt Output Ratio	Imports maintained at 20% higher than control run	
		Increase in Exports (per cent)	External Debt Output Ratio
0	0.3874	0	0.4760
1	0.3920	1	0.4721
5	0.4102	5	0.4564
10	0.4326	10	0.4368
15	0.4545	15	0.4171
20	0.4760	20	0.3974

The above results suggest that for neutralising the impact of a 20 per cent rise in imports on external debt output ratio, the minimal growth in exports should be above 20 per cent. In other words, the findings of this experiment corroborate the view that in the long-run, exports must pay for imports.

Figure - 2

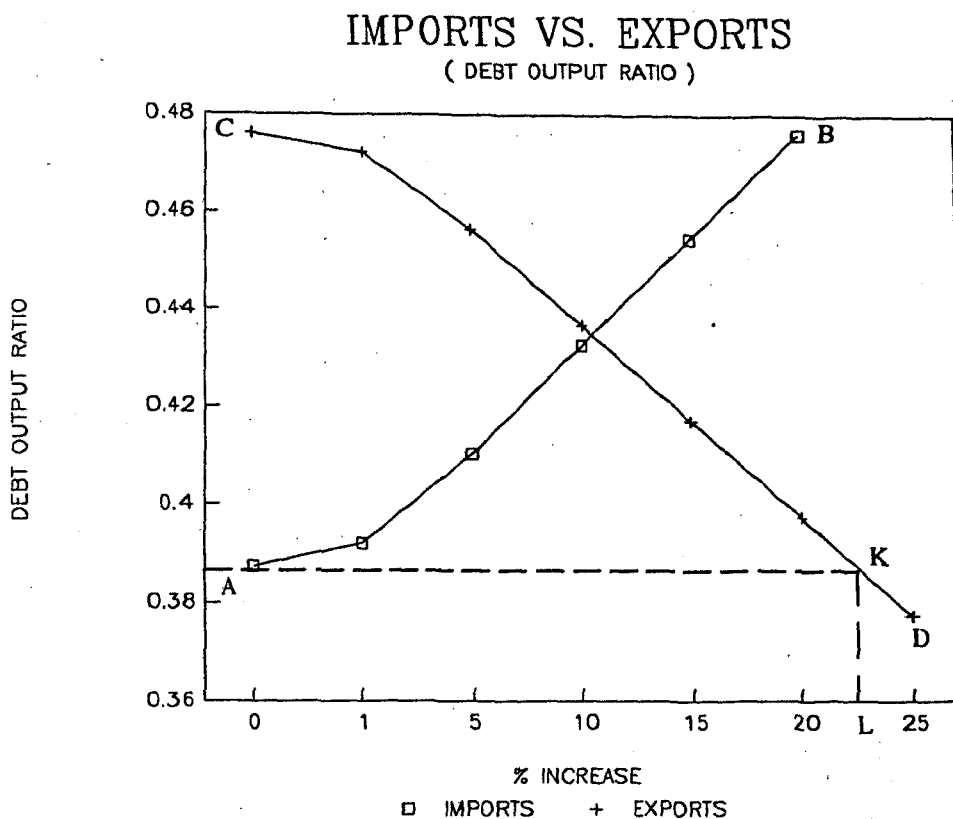


Figure 2, given above, is the transcript of table 6, with external debt output ratio scaled along the y-axis and increase in imports as well as exports scaled along the x-axis and traces the path of the impact of a rise in imports and exports on external debt output ratio. Using this figure, we can determine (moving along the CD line), the warranted rate of growth in exports needed to maintain the external debt output ratio at the control level for different degrees of import liberalisation. From the graphical representation of Figure 2, we can read off the level of exports required to neutralise the impact of 20 percent rise in imports on external debt output ratio by drawing a vertical line to X-axis from point K which cuts it at point L. This indicates that exports must rise above 20 percent level to achieve the required neutralising effect.

SECTION III

Summary & Conclusions

In this study, a small econometric model is constructed with a view to discerning the macro economic linkages among imports, output, exchange rate

and external debt. The model with 19 endogenous and 8 exogenous variables was estimated using OLS method and the collective performance of the model under both static and dynamic conditions was ensured using Gauss-Siedel algorithm. Both the mean absolute per cent error (MAPE) and the root mean square per cent error (RMSPE) of endogenous variables were found to be quite satisfactory. The model was, therefore, used for evaluating the impact of certain policy shocks on other endogenous variables.

The model has been employed for carrying out four important policy simulation experiments. The first two relate to an assessment of the impacts of (a) downward adjustment in exchange rate and (b) different degrees of import expansion on other macro economic variables while the other two tried to discern the degree of improvement required in (a) capital efficiency and (b) exports in maintaining the external debt output ratio at a predetermined level under different degrees of import liberalisation.

The results show that while a downward adjustment in exchange rate has a favourable impact on current account, it simultaneously causes a deterioration in the external debt (measured in rupee terms) output ratio. External debt is expected to rise by about 0.30 and 0.39 respectively on account of 1 per cent downward adjustment in exchange rate under static and dynamic simulations. Policy simulation experiments also revealed that though import expansion leads to increase in output, it also simultaneously leads to a rise in external debt output ratio. For a 1 per cent rise in imports while the growth in output would be of the order of 0.15 and 0.20 per cent respectively in case of static and dynamic simulations, the corresponding increases in case of external debt would be of the order of 0.41 and 1.01 per cent respectively. Further, policy simulation experiments conducted to trace the degree of neutralisation needed in exports and capital efficiency to maintain the external debt output ratio at a predetermined level under a phased programme of import liberalisation showed that if imports are raised by 20 per cent, debt output ratio could be maintained at the control level (i.e. at the level it was before the increase is effected in imports) either by improving capital efficiency by 9 per cent or increasing exports by 20 per cent. This implies that in the long-run exports must pay for imports. The ideal policy stance that should form the core of future strategy of structural adjustment process in India should therefore be towards achievement of significant improvement in exports with simultaneous efforts at stepping up capital efficiency.

Our study also indicates that we should adopt a cautious approach to external borrowings. It also points to the need for pursuing a policy of gearing our external borrowing programme towards freeing the economy of the likely impediments in structural adjustment undertaken for generating growth. A strict monitoring of

the use of aid in various key projects and augmenting the absorptive capacity of aid should, therefore, form an integral part of the external debt strategy in years ahead.

References

1. Brahmananda, P.R., Anjaneyulu D., Barman R. B., and Sastry D.V.S. (1992), "The Changing Monetary Process in the Indian Economy : The Inter-links between Money, Exchange Parity, Share Prices and Wholesale Prices," study 4 of *Development Research Group, Department of Economic Analysis and Policy, Reserve Bank of India, Bombay.*
2. Bergsten C. F. and Williamson J (1982), "Exchange Rate and Trade Policy," paper presented at Conference on Trade Policy in the Eighties, June 23-25, *Institute for International Economics, Washington, D.C.*
3. Challan, D.W. and A.J.Haggar (1983), "Macro-econometric Systems, Construction, Validation and Applications," *The Mac Millan Press Ltd.*
4. Government of India (1993), *Report of High Level Committee on Balance of Payments* (Chairman: Dr. C. Rangarajan, Governor, Reserve Bank of India).
5. Heliwell, John F, and Tim Padmore (1984), "Empirical Studies of Macroeconomic Interdependence," in *Jones and Kenen, eds., Handbook of International Economics, Vol.2.*
6. Kharas, Homi (1984), "The Long-run Creditworthiness of Developing Countries : Theory and Practice," *Quarterly Journal of Economics.*
7. McCabe, James L; and David Sibley (1976), "Optimal Foreign Debt Accumulation with Export Revenue Uncertainty," *International Economic Review*, Vol.17 (October, 1976), pp.675-86.
8. McDonough, Donough (1982), "Debt Capacity and Developing Country Borrowing : A Survey of the Literature," *IMF staff papers*, December, Vol.29, No.4.
9. Pani P.K. (1984), "An Econometric Model of Indian Economy with Special Reference to Output, Demand and Prices," *RBI Occasional Papers.*
10. Seta Prabhu K and Somnath Chatterjee (1993), "Social Sector Expenditure and Human Development," Study of *Development Research Group, Department of Economic Analysis and Policy, Reserve Bank of India, Bombay.*
11. Sarma, Y.S.R. (1982), "Government Deficit, Money Supply and Inflation in India," *RBI Occasional Papers.*
12. Singh, Balwant (1993), "Macro-econometric model of the Indian Economy with Special Reference to Monetary and Fiscal Sector" - *A study presented at the 29th Indian Econometric Conference, Kanpur.*

ANNEXURE

Collective Performance of the Model

Sr. No.	Selected Endogenous variables	Mean Absolute Per cent Error (MAPE)			Root Mean Square Per cent Error (RMSPE)		
		OLS	Static	Dynamic	OLS	Static	Dynamic
1.	2.	3.	4.	5.	6.	7.	8.
1.	GDPR	1.97	2.05	1.96	2.40	2.43	2.32
2.	IN	14.66	12.81	14.49	18.40	15.82	19.10
3.	SN	11.34	11.37	21.92	14.03	14.83	24.68
4.	WPI	3.45	2.63	3.64	4.50	3.74	5.35
5.	GID	2.37	3.10	4.62	3.27	4.25	6.01
6.	PCF	2.56	3.16	4.93	3.42	4.22	6.32
7.	M3	9.88	10.53	10.41	13.23	13.70	12.29
8.	G	3.96	3.78	7.22	4.81	4.55	8.63
9.	RR	8.37	10.02	14.11	10.81	13.10	17.33
10.	TIMP	6.65	6.87	6.76	9.19	8.86	8.13
11.	TEXP	6.64	8.19	9.22	8.30	10.37	11.40
12.	EIPE	21.68	21.68	66.78	34.93	34.93	82.30
13.	AMRT	18.80	18.80	37.98	26.02	26.02	46.30
14.	EDBT	6.01	6.17	28.93	8.61	7.05	34.03

NOTES

Analytics of the Recent Call Money Rate Behaviour in India

B. K. Bhoi *

The basic objective of this article is to analyse the behaviour of the call money rate in India in the context of recent policy changes. The functioning of India's call money market, particularly in the post-liberalisation period, suggests that there are structural imperfections leading to high volatility of call rate. The recent turbulence in call money market which emanates from 'window dressing' resorted to by the commercial banks and also reflects the unprecedented boom in the capital market and mismatch between demand for and supply of credit in other segments of the financial sector. As there is a move towards removing imperfections in the financial market, the volatility in call rate is expected to decline and it could be used as a reliable indicator of short-term interest rate in the economy.

Introduction

Money is perhaps one of the most unique human inventions. It has not only eliminated the difficulties associated with the barter system but also facilitated economic growth in a number of ways. In the process, it has helped create the modern financial system. It is currently viewed in terms of a number of concepts which include not only currency and demand deposits, but also a host of near-money and money-substitutes. The underlying causes of the financial innovations which form near-money, are partly development induced and more importantly lie in the creation of the financial system.¹ These instruments together with currency and demand deposits provide a range of options to the economic units insofar as holding of assets is concerned. Economic units would be interested in financial instruments not only for safety and profitability but also for liquidity of their savings. Thus, there is an imperative need for the growth of markets for instruments. The financial markets often grow as a natural concomitant to the growth of financial system.

* Shri B. K. Bhoi is Assistant Adviser in the Department of Economic Analysis and Policy. He is grateful to Dr. A. Vasudevan for his guidance in bringing out this article in this form. Valuable comments received from Shri T. R. Venkatachalam, Shri A. Seshan and Shri M. V. Raghavachari on the earlier version of this paper are gratefully acknowledged. The author alone is responsible for the views expressed.

The markets for money, near-money and money-substitutes are broadly categorised under two major heads, namely, money market and capital market. They are distinguished by the nature of instruments they deal in. While the money market deals in short-term instruments like money, treasury bills, trade bills, CDs, CPs, etc., the capital market is concerned with long-term instruments, such as, bonds, equities, debentures etc. Each of these instruments often has, a sub-market of its own within the broad heads of markets referred to above. The essential characteristics of a modern and well developed financial system are: (a) a high degree of specialisation with regard to dealings in instruments, (b) single price for each of the instruments, (c) free flow of funds from one sub-market to another, and (d) integration of sub-markets.² Under such ideal conditions, the central bank interventions percolate quickly from one segment to another and become more effective.

There are a number of studies available in the field of financial integration. Mention may be made in this context of a few like the studies by Hyman Minsky (1975), W. L. Silber (1975), Marc Lovoie (1984), R. J. Gordon (1984), V. Roley (1985) and P. A. Spindt (1987) who have tried individually to capture the impact of innovations and establish the linkages between financial markets. Most of them support the view that a new framework of monetary policy is needed in view of rapid changes of the financial system during the recent years. On the contrary, quite a few relatively established schools of thought like monetarists, neo-classicals and even new-classicals ignore the ripples created by the innovations and firmly believe in the stability property of demand for money function, at least in the long-run. A lot of empirical research is being currently conducted in this field with respect to developed countries. However, as a part of academic debate on this issue for the developing countries, there is almost near absence of such studies. When complete monetisation of the economy is yet to take place in these economies, researchers are more interested about the interaction of financial and real sectors, rather than the inter-relationship of various segments of the financial sector.

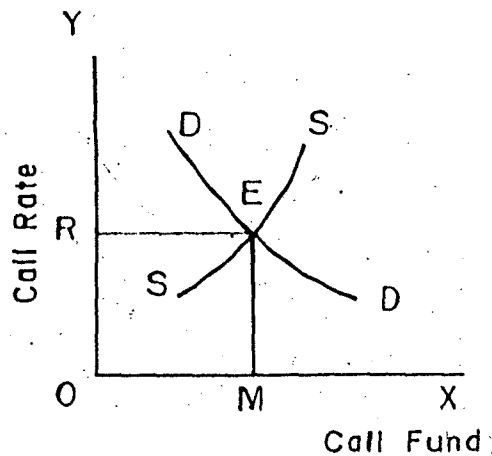
India's financial system, however, is elaborate and diversified. But there are very few detailed studies on each of the segments of the markets, let alone the interactions between the markets. This paper attempts to fill this gap by analysing and understanding the behaviour of the call money market in India in the context of the recent policy and structural changes in the economy. The choice of the subject is deliberate. It is the call market which has been the freest of the rates under the administered rate regime till almost this year. It is also the one rate which is most widely known and quoted and is published in most journals. Again it is probably the short rate which can explain the most crucial developments in regard to money demand.

II. Theoretical Framework

Money on hand is undoubtedly the most liquid asset. A saver holds not only money in pure cash form but also financial assets that earn nominal returns. The character of liquidity undergoes a change by switching over to financial assets. The assets, however, are not free of risk; in the least, they involve conversion costs. A saving unit therefore, has to strike a balance between holding of ready cash and return-generating monetary assets, depending on risk or conversion costs involved in these assets. This may be explained in terms of the conventional demand and supply framework. At the macro level, the aggregate demand curve for loanable funds slopes downward as it is negatively related to the rate of interest while the total supply curve for the same slopes upward with increase in current rates of interest. The equilibrium occurs at the point of intersection. Given the demand and the supply functions, the determined equilibrium interest rate would also be a competitive one. While this may sound too simplistic, this fundamental premise could withstand the emergence of sophisticated theories of interest rate determination under liquidity preference and IS-LM framework.

The call money rate determination can also be viewed in the framework of demand for and supply of funds, even though the considerations for which money is demanded in the call money market are somewhat different from those in other segments of the financial system.

Diagram 1



Nevertheless, the fund managers are influenced by the same logic of borrowing less and lending more at high rate of interest and *vice versa*. As may be seen from Diagram 1, the equilibrium rate is struck at point 'E'. If the shapes of the demand and supply curves are as *predictable* and *smooth* as in the diagram, the call rate would be in equilibrium with minor intra-day fluctuations.

The assumptions of predictability and smoothness of the demand and supply curves, however, need not hold good. Shifts could occur in demand/supply curves, and their slopes could also change, depending on the market reactions and policy changes. For instance, an outward shift in supply curve due to sudden increase in liquidity in the banking system could occur even as demand for funds remains unchanged. Similarly, a sudden spurt in demand for funds due to some policy announcement or due to a structural break in the supply function on account of an exogenous factor, could lead to a rise in the call rate. The impact on call rate and quantity of funds traded due to shifts of demand and supply curves will depend upon the relative elasticities of demand and supply. Illustratively, two cases of deviations from the ideal condition may be explained here through Diagrams 2 and 3. In Diagram 2, the supply curve having been elastic up to point 'N', turns into a relatively inelastic one, mainly because of monetary authorities' announcements of policy. If the announcements are allocative in nature, the supply of funds would get determined, irrespective of the shape of the demand curve. The demand for call funds may turn out to be more expansive partly because of the newly instituted allocative rules, and partly because of higher credit demand arising from higher levels of activity.

Diagram 2

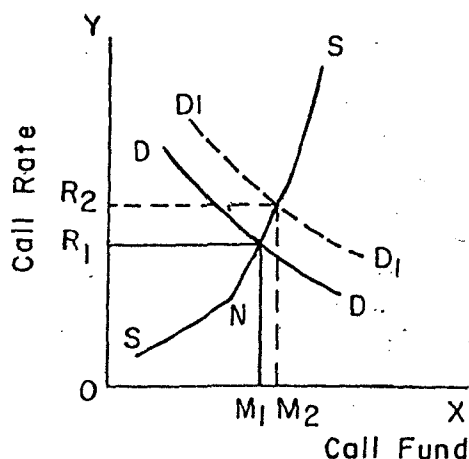
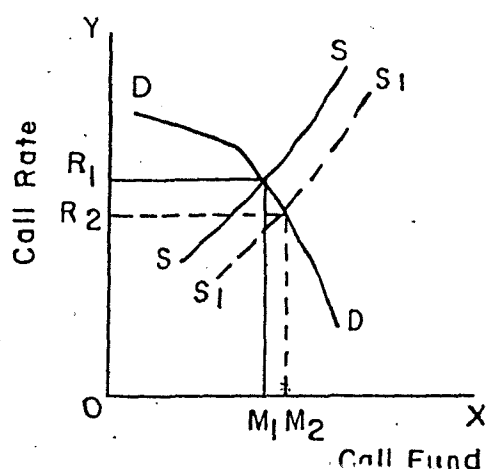


Diagram 3



The opposite set of arguments would apply in the case of Diagram 3 where the demand curve is inelastic after a certain point while the supply curve moves upward. The allocative rules here should be interpreted to mean not only quantity allocations of credit for certain economic sectors but also changes in the ratios of cash reserves and/or liquid investments to specified liabilities, as well as variations in procedures for working out minimum statutory ratios to be maintained, or in refinance facilities.

The above generalized theoretical framework needs to be seen in the specific Indian context where one would expect the call market rate to be determined by the supply of and demand for funds that are outside the preemptions. The amounts to be set aside for maintenance of the required cash reserves and the required statutory liquid investments are not known before hand and would change depending on the net demand and time liabilities, even though there is lagged reserve accounting. While one may not be able to exactly work out the required amounts on account of cash reserve ratio (CRR) and statutory liquidity ratio (SLR) early in the reporting period, a fairly good idea could be obtained as one moves towards the reporting Friday. Banks could therefore work out the required amounts on both these counts and accordingly make choices regarding their portfolio actions. Implicitly, the existence of such a situation would lead to considerable volatility within a reporting period but so long as this is anticipated, participants in the markets cannot take actions that could deviate in any significant manner from what may be regarded as the 'rational' expectation.

III. Basic Features of India's Call Money Market Before 1989

Call money market is the major segment of the money market in India, confined till recently in general to inter-bank business predominantly on an overnight basis, although a small amount of business, known as notice money, was also transacted side by side with call money for a maximum period of 14 days. Two term-lending institutions, namely, the LIC and UTI, however, have been allowed access to the call money market as lenders as early as in 1971. The participation in the call money market has been insulated from overseas participation.

Market forces generally helped determine call rates in India till 1973, with the exception of informal inter-bank understanding about rates in the 1950s. When, following the restrictive credit policy in the mid-1973, the call rate rose to an alarming level of 30 per cent in December 1973, the Indian Banks' Association (IBA) fixed a ceiling on call rates at 15 per cent in December 1973. After several rounds of revisions, the ceiling was placed at 10 per cent in April 1980. During the period from December 1973 to May 1989, the highest call money rate during any time of the year was shown as identical with the ceiling prevailing during the period. As a result, the actual behaviour of the money market has got distorted for a considerable period of time.

Recognising the inherent weakness of the call money market, the "Report of the Committee to Review the Working of the Monetary System" (Chakravarty Committee Report) recommended in 1985 that a 'Working Group' should be appointed to go into the details of the operations of money market in India and

suggest remedial measures. Accordingly, RBI appointed a 'Working Group' in 1986 under the chairmanship of Mr.N.Vaghul. The Vaghul Working Group in its report (1987) identified, *inter alia*, two major defects of the India's call money market, namely, (a) the limited number of participants has made the base of the call money market too narrow; and (b) the ceiling on call money rate fixed at 10 per cent (since April 1980) by the IBA was observed more in breach. As a natural corollary, the Working Group recommended (i) to widen and deepen the market by selective increase in the number of participants, and (ii) to withdraw the ceiling so that the call rate is determined by market forces of demand and supply. Furthermore, what is more important from the point of view of monetary authority is to find out whether call money market can be able to "provide a focal point for central bank intervention for influencing liquidity in the economy".³

IV. Recent policy changes

The Reserve Bank of India followed the recommendations by first setting up the Discount and Finance House of India Ltd., (DFHI) in April 1988 for widening the money market operations in general and call money market in particular. Then the ceiling on call money rate was withdrawn with effect from May 1, 1989. In order to augment the supply of funds, the call money market has been opened up in phases by increasing the lenders in the market. In addition to LIC and UTI, GIC, IDBI and NABARD were permitted to participate as lenders with effect from May 2, 1990. Other financial institutions/companies (namely, ICICI, ECGC, SBI Mutual Fund, LIC Mutual Fund, BOI Mutual Fund, Canbank Mutual Fund, IFCI, NHB, Shipping Credit and Investment Company of India Ltd., Tourism Finance Corporation of India Ltd., EXIM Bank and SIDBI) were also allowed entry into call money market as lenders effective October 20, 1990. The restriction imposed on the institutional lenders is that they would not be allowed to lend in the call money market, if they have short-term borrowings from the RBI.

Further liberalizations were effected in more recent period. Any entity could lend (with prior permission from RBI) in the call money market through DFHI with a minimum size of lending at Rs.20 crore, since April 1991. The spirit behind such an opening up of the market is to create a competitive market for call money and thereby moderate the sharp swings in the call money rates.* Moreover, the

* One of the criticisms which was recently levelled against the RBI was that it should outgrow the penalty syndrome⁴ on SLR and CRR defaults so that the deregulation of call money market would be real. Prior to credit policy announced on April 12, 1990, the graduated penalty on CRR default was exorbitantly high. A single default on CRR was sufficient to wipe out the full year's profit of the concerned bank.⁵ Commercial banks were panicked at the time of financial stringency and in fact, frantically searched for funds to borrow from the call money market at whatever rate available. This sort of panic-buying of funds from the call money market resulted in raising the call rates to stratospheric level which was neither useful for policy intervention nor healthy for commercial banks.

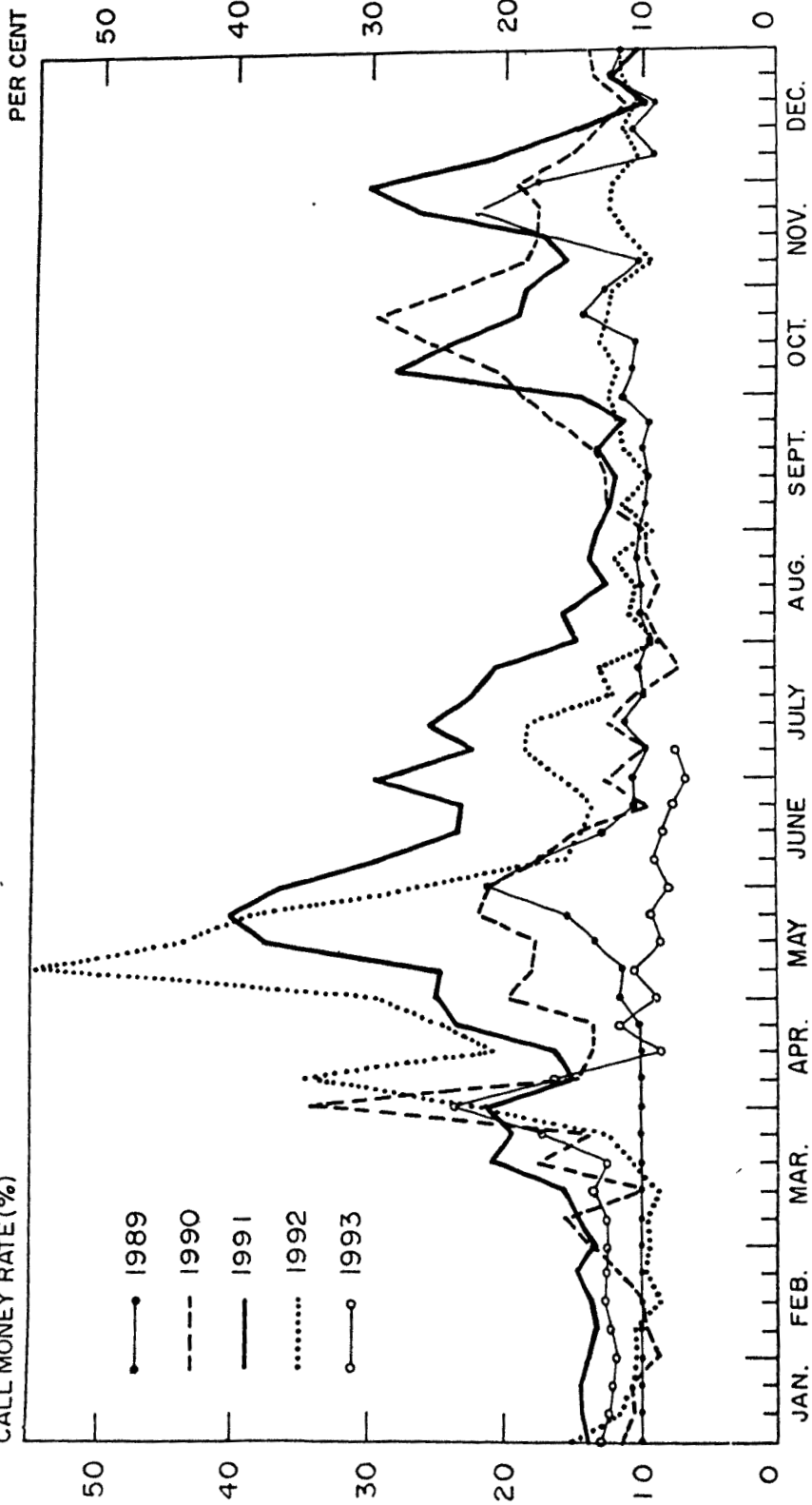
RBI switched from exorbitantly high graduated penalty system on CRR defaults prevalent till April 12, 1990 to a more rationalized and downward inclined system of graduated penalty on CRR. The cost of shortfall has been reduced to a uniform 25 per cent with effect from December 29, 1990 incorporating within it a penalty element. In the credit policy announced for second half of 1993-94, it has been decided to allow certain financial institutions namely IDBI, ICICI, IRBI, SIDBI, EXIM Bank and NABARD to borrow from the term money market for a maturity of 3 to 6 months within limits stipulated for each institution.

V. Call Money Rates - An Empirical Analysis

In the call money market as it has evolved in India, lenders are many and the dependence of scheduled commercial banks for funds from outside the banking system has been substantial: it is around 45 per cent at present compared to about 19 per cent in 1985 (Table I)⁶. The absolute amounts involved in the market have gone up substantially from about Rs.1,161 crore in 1985 to about Rs.5,924 crore in 1992. The high levels of activity in the market are seen in Bombay. The rates in Bombay generally represent the supply of and demand for funds fairly accurately, although the computerization of the banking system has brought down the inter-city differential in call money rates. One could therefore consider the Bombay rates as the best proxy for all-India call rates.

Data on call rates are given for the Bombay market in Table II. These are on a weekly basis. An examination of the movement of call money rates during the last four years (1989 to 1992) reveals that the call rates have been highly volatile since 1989 - the post-liberalization period. Graph 1 illustrates the high degree of volatility during these years. The mean call money rate which was 11.4 per cent in 1989, rose to 14.9 per cent in 1990 and moved further up to 19.4 per cent in 1991. During 1992, the average call money rate was 15.4 per cent. The standard deviation - a measure of variability - has also increased from 2.92 in 1989 to 5.49 in 1990 and further to 7.40 in 1991. The volatility has gone up still further in 1992, as the standard deviation stood at the high level of 9.41 in 1992. The trends in 1993 (up to June end) however did not follow the historical pattern for special reasons, one of which has got to do with the implementation of the capital adequacy norm. Month-by-month analysis for the period 1989 to 1992 shows that call rates have an upward trend starting from March up to May and thereafter a gradual downward movement sets in up to August (Table II). After a brief slowdown, the rates again move up for a few weeks in October-November coinciding with the onset of busy season and come down quite sharply towards the end of the calendar year. From January to March, the rates gently firm up. One explanation for the call money rate to rise towards the end of the financial year is that the requirement

WEIGHTED AVERAGE WEEKLY CALL MONEY RATE AT BOMBAY



SOURCE: WEEKLY STATISTICAL SUPPLEMENT TO RBI BULLETIN, VARIOUS ISSUES.

for cash goes up for settling government transactions, and for the practice of 'window dressing' followed by commercial banks, in respect of deposits. The latter, often effected by interest payments on deposits, places obligations upon the banks to meet higher SLR and CRR requirements. This implies larger dependence on call funds to avoid CRR defaults eventually raising the rates.

The movements in call rates - the variability in them in particular - still need to be explained - one may view the problem in terms of two components - the "anticipated" part of the movements based on the past experience and the "unanticipated" part which is seen in the significant deviation from the anticipated trend. Table III gives month-wise data on the mean call rate and standard deviations. The data show that standard deviations are high in a few months, April, May, June and October during the last four years from 1989 to 1992. The unanticipated rate would fall outside the zone of anticipated rates, which could be defined in terms of the trended standard deviation from the average call money rates for each of the months of the recent years (Table III). If the actual call rate deviates from the estimated anticipated zone, then that rate would represent the 'unanticipated' rate. The occurrence of such unanticipated rates was on as many occasions as 10 (on the higher side) and on 7 occasions (on the lower side) in the four years from 1989 to 1992. The main question to ask is: why do unanticipated changes occur in call rates? Could they be due to opportunities available for making higher yields on funds deployment, either for directly productive activities or for acquiring financial assets? As the banks' general lending rate is a known variable for the banks, the call rates must be driven by the rates of yields in other markets where the instruments are 'liquid'. For purposes of argument, we have here taken up as an alternative rate the total rate of returns on the equity shares, with the total rate of returns being defined as a combination of the dividend yield and capital appreciation/depreciation of the share.

Table IV gives month-wise data on total rate of returns during the period in question. Surprisingly enough, the total rate of returns on an average follows a pattern similar to that of mean call money rate on a monthly basis and are often substantially higher than the call rates. A simple regression which regards the average monthly call rate (MCMR) as a function of the monthly mean of the total rate of return (MROS) of ordinary shares during 1989-1992 shows that both are positively correlated. But the beta coefficient is significant only at 10 per cent level. The results obtained are as follows:

$$\text{MCMR} = 5.988 + 0.166 \text{ MROS} \quad R^2 = 0.25$$

(1.81)

While the results are not very satisfactory from the statistical point of view, and need to be interpreted with caution, the hypothesis that call rates are

influenced by other alternative rates appears to be upheld to a significant extent⁷. Obviously, there are also other factors at work influencing the call rate. For instance, policies such as reductions in CRR and/or SLR ratios or changes in refinance facilities influence the call rates, as the recent experience with policy changes, has shown. But as policies begin to reduce imperfections in the financial markets, and as information about the activities in different markets become clear, the volatility in the call money market would decline, with the result the call rates would reflect the short-end of the financial markets better than at present.

VI. Concluding Observations

India's call money market has taken a noticeable turn since 1989. Definite signals are traceable from the liberalisation that has taken place in call money market which could be used for policy purposes. The fluctuations in call money rate have been large but these reflected structural problems inherent with partial financial liberalization. The variability in call rates to the extent that it is unanticipated can be traced to rates prevalent elsewhere in the financial system and the prevailing policy framework. The authorities would need to be wary of the implications of the unanticipated portion of the call rate changes, since it could put pressure on the banking system to manage its loan and investment portfolios in a manner that does not expose itself to financial risks.

Notes

1. A detailed analysis of the various causes of innovations are discussed by W.L.Silber (1975).
2. V. A. Avadhani (1978) and L. M. Bhole (1982) have given individually a comparative picture of developed and underdeveloped financial systems.
3. Vaghul Working Group Report (1987), page 10.
4. N. A. Mujumdar (1990).
5. Ibid
6. Published data on the volume of transactions are not available. The average of Friday data are not representative of daily average transaction as most of the banks square up their transactions before Friday if it happens to be a reporting Friday, in order to reduce their liabilities under SLR and CRR.
7. The second and sixth Reports of the Janakiraman Committee have comprehensively analysed various methods through which funds were allegedly siphoned off from money market to capital market via brokers' accounts.

References

1. Avadhani, V.A. (1978), *Studies in Indian Financial System*, Jaico Publishing House, Bombay.
2. Bhole, L.M. (1982), *Financial Markets and Institutions: Growth, Structure and Innovations*, Tata McGraw-Hill, New Delhi.
3. Gordon, R. J. (1984), "The Short-run Demand for Money: A Reconsideration" *Journal of Money Credit and Banking*, 16.
4. Lovoic, Marc (1984), "The Endogenous Flow of Credit and the Post-Keynesian Theory of Money", *Journal of Economic Issues*, September.
5. Minsky, H.P. (1975), "The Financial Instability Hypothesis: Capitalist Process and the Behaviour of the Economy" in *Financial Crisis*, C.P. Kindleberger and J.P. Laffarge (eds), Cambridge University Press, 1982.
6. Mujumdar, N. A. (1990), "Money Market: Sins and Hybridisation", *Economic Times*, October 17, 1990.
7. Report of the Working Group on the Money Market (1987) (Vaghul Working Group Report), RBI.
8. Roley, V. (1985), "Money Demand Predictability", *Journal of Money, Credit and Banking*, 17.
9. Silber, W.L. (1975), "Towards a Theory of Financial Innovation" in *Financial Innovations* (1975) (ed.) W. L. Silber, Lexington Books, D.C. Health and Company.
10. Spindt, P. A. (1987), "On the supply of the Demand for Money" Special Studies, Paper 125, *Federal Reserve Board of Governors*.

Table - I
Sources of Call Money of Scheduled Commercial Banks

Last Friday of Month	(Rs. Crore)																			
	1985				1989				1990				1991				1992			
	Borrowings from		Borrowings from		Borrowings from		Borrowings from		Borrowings from		Borrowings from		Borrowings from		Borrowings from		Borrowings from			
	Banks	Others	Total	Banks	Others	Total	Banks	Others	Total	Banks	Others	Total	Banks	Others	Total	Banks	Others	Total		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16					
January	716	312	1028	423	258	681	627	1550	2177	833	813	1646	4001	2314	6315					
February	652	193	845	768	242	1010	622	1440	2062	600	469	1069	3050	2650	5700					
March	793	197	990	1925	262	2187	770	1055	1825	967	470	1437	1131	362	1493					
April	409	277	686	1091	1182	2273	3612	2340	5952	3433	2776	6209	6071	4045	10116					
May	868	258	1126	1459	748	2207	3063	2760	5823	735	535	1270	1141	373	1514					
June	1136	200	1336	520	667	1187	552	958	1510	960	1036	1996	1883	667	2550					
July	1217	206	1423	401	504	905	516	1261	1777	899	284	1183	5114	6100	11214					
August	538	323	861	553	1210	1763	2644	2046	4690	3995	2198	6193	4471	5914	10385					
September	1103	235	1338	1655	1655	3310	2560	1959	4519	4088	2158	6246	6255	6719	12974					
October	652	152	804	1912	1460	3372	3508	3751	7259	5750	2946	8696	1689	949	2638					
November	1768	131	1899	2365	1490	3855	756	728	1484	676	354	1030	2035	1129	3164					
December	1458	135	1593	652	1480	2132	793	789	1582	1029	284	1313	2340	688	3028					
Average	942.50	218.25	1160.75	1143.67	929.83	2073.50	1668.58	1719.75	3388.33	1997.08	1193.58	3190.66	3265.08	2659.17	5924.25					
Percentage	(81.20)	(18.80)	(100.00)	(55.16)	(44.84)	(100.00)	(49.24)	(50.76)	(100.00)	(62.59)	(37.41)	(100.00)	(55.11)	(44.89)	(100.00)					

Source : R. B. I. Bulletin, various issues.

Table - II
Weighted Average Weekly Call Money Rate at Bombay

		(Per cent)					
Week/Month		1989	1990	1991	1992	1993	
		1	2	3	4	5	6
January	1	10.00	11.20	13.89	15.01	12.67	
	2	10.00	10.26	14.21	11.35	12.33	
	3	10.00	10.69	14.29	10.61	12.00	
	4	10.00	8.71	13.71	10.31	11.77	
February	5	9.93	9.59	13.14	10.30	12.01	
	6	10.00	9.82	13.64	8.57	12.53	
	7	10.00	11.59	14.70	9.82	12.49	
	8	10.00	13.86	13.50	9.43	12.52	
March	9	10.00	15.77	14.41	9.58	12.56	
	10	10.00	9.89	15.50	8.93	13.31	
	11	10.00	17.74	20.89	10.59	12.43	
	12	10.00	13.79	19.50	12.39	17.25	
	13	10.00	34.29	21.29	22.33	23.64	
April	14	10.00	14.56	14.98	34.78	16.25	
	15	10.00	13.63	16.38	20.75	8.89	
	16	10.00	13.66	23.67	24.84	11.67	
	17	11.68	19.76	30.06	29.38	8.96	
May	18	11.29	18.01	29.75	54.50	10.34	
	19	13.52	17.85	37.94	43.42	8.65	
	20	15.54	21.99	40.33	38.84	9.41	
	21	21.46	21.33	36.45	26.12	8.03	
June	22	17.16	17.32	29.20	15.37	9.02	
	23	12.94	14.97	23.69	14.73	8.35	
	24	10.45	9.59	23.30	13.55	7.88	
	25	10.49	12.80	29.76	15.90	6.61	
July	26	9.61	9.77	22.05	18.79	7.31	
	27	11.05	12.63	25.70	18.46		
	28	9.91	10.29	22.36	12.05		
	29	10.03	7.15	20.87	13.01		
	30	9.14	8.62	14.81	8.05		

Contd..

Table - II
Weighted Average Weekly Call Money Rate at Bombay (Contd.)

		(Per cent)				
Week/Month	1989	1990	1991	1992	1993	
1	2	3	4	5	6	
August 31	10.00	9.76	15.62	10.88		
32	10.00	8.75	12.53	10.26		
33	10.13	9.61	13.80	11.96		
34	10.05	9.86	13.33	9.07		
September 35	9.86	12.74	12.17	11.29		
36	9.51	12.74	11.83	9.57		
37	9.54	13.52	13.25	11.27		
38	9.35	16.31	11.19	11.71		
39	11.29	18.85	14.39	12.28		
October 40	10.76	20.95	28.19	11.83		
41	10.45	25.85	24.27	13.11		
42	14.32	29.77	18.99	12.23		
43	12.94	24.03	18.56	12.16		
November 44	10.15	18.75	15.39	9.29		
45	17.14	17.84	17.93	11.23		
46	22.38	17.77	26.23	12.34		
47	17.79	19.25	30.15	12.19		
December 48	9.14	15.30	20.92	10.14		
49	10.90	13.30	14.92	11.37		
50	9.03	11.27	9.65	10.43		
51	12.20	13.80	12.41	11.32		
52	11.80	14.00	10.28	11.84		
Average	11.41	14.90	19.42	15.39	11.50	
St. Deviation	2.92	5.49	7.40	9.41	3.60	

Source : Weekly Statistical Supplement to RBI Bulletin, Various Issues.

Table-III
Monthly weighted Average Call Money Rate at Bombay

(Per cent)

Month	1989	1990	1991	1992	Mean	St. deviation	Anticipated Range
1.	2.	3.	4.	5.	6.	7.	8.
January	9.36 L	10.65	14.02 H	11.75	11.44	1.98	9.46 to 13.42
February	9.88	11.43	13.78 H	9.42	11.13	1.97	9.16 to 13.10
March	9.99 L	19.39	18.50	14.25	15.53	4.32	11.21 to 19.85
April	10.92 L	15.95	21.18	26.57 H	18.66	6.74	11.92 to 25.40
May	14.82 L	19.40	34.92	35.29	26.11	10.56	15.55 to 36.67
June	12.68	13.53	24.77 H	15.82	16.70	5.54	11.16 to 22.24
July	10.11	10.80	21.63 H	12.98	13.88	5.31	8.57 to 19.19
August	10.15	12.46	13.70 H	10.76	11.77	1.62	10.15 to 13.39
September	10.08 L	15.15 H	12.82	11.42	12.37	2.17	10.20 to 14.54
October	12.66	25.16 H	21.82	11.79	17.86	6.65	11.21 to 24.51
November	16.16	17.79	22.31 H	11.51 L	16.94	4.46	12.48 to 21.40
December	10.52 L	13.64 H	12.66	11.23	12.01	1.4	10.61 to 13.41
Mean	11.44	15.45	19.34	15.23			
St. deviation	2.17	4.35	6.57	7.74			

Note : H is higher than the maximum anticipated call rate.

L is lower than the minimum anticipated call rate.

Source : R.B.I. Bulletin, various issues.

Table-IV
Returns on Ordinary Shares

(Per cent)

Year/Month	1989	1990	1991	1992	Mean
1	2	3	4	5	6
January	42.94	43.06	19.78	81.31	46.77
February	51.23	31.45	32.51	106.56	55.44
March	60.88	28.16	43.06	153.08	71.10
April	80.29	22.05	41.29	193.17	84.20
May	72.19	22.27	40.22	140.02	68.68
June	61.68	24.77	40.15	104.89	57.87
July	68.37	31.26	37.30	89.38	56.58
August	59.88	52.99	43.40	51.69	51.99
September	57.32	73.37	30.87	58.91	55.12
October	39.49	74.36	25.34	56.83	49.01
November	30.79	64.29	38.20	32.19	41.37
December	35.06	37.58	57.34	26.45	39.11

Note : Returns are gross yields plus capital gains.

Source : RBI Bulletin, various issues.

BOOK REVIEWS

Informal Finance : Some Findings from Asia by Prabhu Ghatge and others, published for Asian Development Bank by Oxford University Press, 1992, pp IX+165, Price - not mentioned

The financial sector can be classified into two broad categories, *viz.*, "formal" and "informal". While there is a plethora of literature on the formal financial sector, there is a vacuum of information on the informal financial sector. The book under review is an "information lamp" throwing light on the working of the informal financial system. The book is an outcome of a research project sponsored by the Asian Development Bank to examine functioning of the informal financial sector in Bangladesh, India, Indonesia, the Philippines and Thailand. The book has sixteen chapters including a chapter covering introduction and summary of conclusions, the remaining fifteen chapters have been grouped into five different parts.

Chapters 2 to 5 are particularly revealing in that they contain basic information on the informal financial sector covering the major types of informal finance, the country-wise structure and segmentation of the informal financial markets, the size and importance of the informal sector and the network for regulatory environment to deal with the system. The studies covered under these Chapters (2 to 5) point to the highly heterogeneous nature of the informal financial sector. This sector encompasses huge short term flows in inter-corporate funds and curb markets in some countries as well as frequent lending and borrowing of small amounts among friends and relatives. It includes activities of finance companies, large wholesale traders, local pawn shops, village money lenders, organised credit unions and chit funds of various guises. Despite heterogeneity, these have some common characteristics like informality, adaptability and flexibility of operations. The informal sector lenders also enjoy some comparative advantages over formal lenders, like self manageable scale of operations, specialisation of operations and freedom from official hierarchy. The element of comparative advantage has placed the lenders in the informal sector in a unique position and helped them to score over their counterparts in formal sector.

The studies also estimated the relative size and involvement of the informal sector. As per these studies the share of informal credit, though declining in most countries, still accounts for about two-fifth of total rural credit in India and Thailand, one-third to two-third in Bangladesh and more than two-thirds in the

Philippines. The share of urban informal credit in India accounts for 57 per cent and about 45 per cent in the Philippines. These facts speak for the important place of informal finance in the economy of the respective countries. However, in the short-run, the size of the informal sector is directly linked to the policy stance regarding expansion or contraction in the formal sector. In the long-run its share is determined by its ability to improve over the transaction costs of the formal sector. The informal sector has certain in-built advantages of highly personalised transactions. Any attempt to regulate the size of informal sector through policy would be self-defeating, as the experience of all these countries under this project has shown. Therefore, the policy stance should be to identify the comparative advantages of each segment of the system and promote the expansion of each of the sectors according to their merits.

The macro implications of mobilisation of savings through informal finance, informal credit and consumption, informal credit and equity, besides the interaction and linkages between formal and informal sectors have been covered in Chapters 6 to 10. In this part, it is shown that informal credit is better distributed than formal credit and small and microenterprises and poor borrowers generally depend on it either exclusively or to a much greater extent than do their larger counterparts. These studies also observed that small borrowers often use credit more productively. This suggests that informal finance also contributes greatly towards growth and equity. Interestingly, the studies also show that informal sector has comparative advantage in areas which are transaction cost intensive such as small and short duration loans and the financing of credit requirements of urgent nature particularly of exports and large number of service activities where fixed assets are not available as collateral.

The studies in this part further reveal that inter-linkage of credit with marketing also gives informal sector a comparative advantage in financing of working capital needs for agriculture as well as small and tiny industries. On the other hand, these studies show that the formal sector is in a better position to accommodate large and long-term loans because of its greater reliance on pooling of deposits and maturity transactions. Obviously, it is better suited to cater to the needs of large and medium industries, organised trade and commerce, and well-to-do urban households. This suggests that both formal and informal sectors can grow simultaneously in their respective areas of comparative advantage.

It is necessary to make efforts to reap the benefit of comparative advantage of both the sectors through better linkages with each other. The successful experiments made in Bangladesh by the Grameen Bank through the Self-Help Groups and Community Credit Facilitator Scheme in Sri Lanka are worth replicating in other parts of Asia with modifications to suit the local conditions.

These links between formal and informal sectors have enlarged the quantum of credit especially to poor (who were hitherto rationed out of formal sector), perhaps with somewhat higher interest cost than that on formal credit. If policy makers are not willing to take the risk of experimenting with Community Credit Facilitators, they may begin with routing formal credit through Non-Governmental Organisations (NGOs) which combine merits of both the sectors with greater degree of informality, adaptability and flexibility of operations. If policy makers are not prepared to use these hybrid institutions, they may adopt what has come to be known as the satellite banking approach as advocated by Mujumdar and Lall (1993) by taking services of local unemployed/educated youth on agency basis for financing of informal sector to reduce the transaction costs of the formal financial sector. The Recovery Facilitator Scheme is one more institutional development which has some advantages of the involvement of the informal sector.

The macro aspects like components of interest rate in the informal sector and inter-linkages of credit with marketing, etc., have been discussed in Chapter 11 and 12. While policy implications have been delineated in Chapters 13 to 15, Chapter 16 deals with analytical aspects of borrowing and lending. This part of the book reveals that monopoly profit as a component of interest rate has occupied a back seat in the informal sector mainly due to keen competition among the lenders on the one hand and improved awareness of the borrowers on the other. In most of the cases, the rate is determined on the basis of transaction costs, opportunity cost and perception of risk. It has been observed that enactments relating to ceiling on interest rates have adversely affected the risk premium. Besides the 'ceiling enactments' have not served any useful purpose in curbing usury. It will be, therefore, desirable to discard these laws so that risk premium portion of the interest would be reduced considerably. Although the informal lenders are no longer "loan sharks", their "poor image" of the past still lingers on in the minds of many policy makers as well as academics in these countries. This explains the absence of recognition of informal lenders as catalytic agents of the economic development. Whether we recognise it or not, there exists informal sector which has potential and certain comparative advantages to contribute to development objectives. However, a word of caution is necessary here that the informal sector does not enjoy any comparative advantage in the field of deposit mobilisation and therefore prudential norms would have to be placed to safeguard the interest of depositors.

The book's value has increased with the inclusion of extracts from relevant material on the subject as box items. The policy makers as well as students of finance would not only find this book interesting but thought provoking as well.

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Growth with Equity : Economic Policymaking for the Next Century by Martin Neil Baily, Gary Burtless and Robert E Litan, The Brookings Institution, Washington D.C., 1993, pp 239

In recent years, the definition of economic growth has undergone noticeable expansion by incorporating questions of improvements in the quality of life and environmental sustainability along with the traditional concern for increasing material affluence. This recent work from the prestigious Brookings Institution, founded way back in 1927 through the merger of the Institute of Government Research, the Institute Of Economics and the Robert Brookings School of Economics and Government, makes an honest attempt to analyse the policies adopted by the American economy in the recent past under this expanded notion of economic growth. The study tries to find out the reasons for the ailment of the American economy in recent years reflected in its anaemic economic growth, slowdown in growth of productivity and declining share of manufacturing sector in national income amounting to a virtual deindustrialisation of the U.S. economy and attempts to put forward a pragmatic set of policy measures designed to take care of the various dimensions of the new view of economic growth. As the title of the book suggests, the authors feel that while the importance of growth of national income cannot be overemphasised, it should not be at the cost of social justice. In this review, we shall first look at the analysis in the book of the causes of sickness in the US economy. Then, the policy prescriptions offered by the authors will be discussed. We shall investigate whether there are lessons for India from the American economic experience and finally draw the major strengths and weaknesses of the book.

The American economy of the eighties was guided by Supply-side economics popularised by the Reagan administration. The basic feature of supply side economics was to provide fiscal incentives to producers to improve the rate of growth. Despite sufficient tax incentives, a clear decline in the output per hour by a labourer is visible since the 1980s. At the same time the share of the manufacturing sector in national income was found to be declining. This may not be a matter of serious concern when the rate of economic growth is reasonably high. However, in this case, the declining share of the manufacturing sector seems to be the result of loss of competitiveness. Over the last decade, United States has lost the economic leadership to Japan. Supply side economics of the 1980s failed to achieve a high rate of growth. On the other hand, it led to increased inequality of income. The Gini coefficient, which reflects the difference between the actual income distribution and a perfectly egalitarian income distribution, showed a noticeable rise in the 1980s going up from 0.38 per cent to 0.44 per cent.

During the period 1979 to 1989, the annual income of the lowest quintile (i.e., 20 per cent) of the population declined by 2.0 per cent per year while for the top quintile it increased by 0.7 per cent per year. The wage disparity between the black and the white workers widened. The greater inequality in the wage structure has been partially explained by a large number of new entrants in the labour market particularly women and immigrants accepting low paid jobs. The low skilled workers have not done justice to the growth of productivity. On the other hand, tax concessions to rich and cut on social security expenses led to greater inequality of income. The book under review criticised supply side economics for its failure in respect of growth and equity. Its assessment of Reagan's supply side policies is apparently not very high- "The problems (of the economy) cannot be slain with a magic bullet. The nation was promised a miracle cure for its economic ills in the early 1980s. Enthusiasts in the Reagan administration claimed that lower income tax rates across the board would release a surge of savings, investment, work effort and entrepreneurial enterprise, the combination of which would permanently raise the rate of economic growth..... We see little evidence that the tax cuts had their intended long run supply side effects. Meanwhile, the inequality increased throughout the 1980s. The tax and transfer policies of the Reagan presidency contributed to the widening inequality" (pp2,3).

Let us now look at the policy proposals of the authors. They feel that to compete successfully in the global economy, the U.S. economy must raise its level of productivity fast. For this, it is necessary to concentrate on three key areas where the Government is expected to play a key role. The Government must help in raising the rate of innovations (Chapter 4), promote skill formation, i.e., increase the quality of human capital (Chapter 5) and increase the rate of investment in the economy (Chapter 6). The authors are clearly not in favour of any kind of protectionism. Protection, they feel, hurts innovation and efficiency. However, a package of measures is necessary to retain competitiveness in a free trade regime. It is generally believed that liberalization in an economy will increase competitiveness through market mechanism. But the authors point out that an economy, guided by its Government, should strive for competitiveness by (a) increased expenditure on Research and Development which will boost the rate of innovations, (b) state funding of human capital formation which will promote productivity growth and (c) mobilising enough investible resources to implement the new technologies in industrial activity. Regarding innovations, the authors stress the role of the State in funding Research and Development in basic as well as industrial research. They point out that non defence R & D expenditure as per cent of GNP stagnated in the U.S. around 1.7 per cent during the period 1980-1987 while in Japan it rose from 2.2 per cent to 2.8 per cent of GNP over the corresponding period.

Technological progress, the authors feel, should go hand in hand with human capital formation. The authors feel that the Government must play an instrumental role in revamping the educational system in the country to improve the quality of education and take up joint ventures with the private sector to improve occupational skills. The areas to be acted upon include formal schooling, occupational training, need for nationally recognised credentials, increasing accountability of educationists and lastly, linking pay to performance.

For funding research and development and skill formation, there is urgent need to raise the rate of investment in the economy both in the Government as well as in the private sector. On the Government side, the study proposes reduction of fiscal deficit by combining increase in taxes and reduction in spending. Tax burden should, on equity grounds, fall on the richer sections. This, they feel, will raise investment in the long run, although in the short run, some disincentives to investment may result. The Government should channelise investments into activities where the social pay-off is larger. For this, investment and tax incentives in selected equipment and infrastructure maintenance are necessary. Thus the authors have suggested to do away with blanket subsidisation of industries and instead stressed the need for creating an environment where the industries can cope with international competition through productivity growth.

In such a regime it will be easier to address the equity issues. Growth of productivity will release funds for helping workers and weaker sections of society by creation of new jobs, strengthening the social safety nets and by imparting skill to the work force through training. Thus, the authors feel that their proposed set of policy measures will promote growth of productivity and greater distributional justice.

Let us now look at the implications of this study for the Indian economy, which is gradually moving towards a liberalized regime. For India, which aspires to become internationally competitive, the stress in the book on the concept of productivity growth is of unmistakable relevance. The U.S. experience shows that productivity growth will not result automatically from freeing the market. It has to be attained through encouraging technological innovations and skill formation. Indian performance in these two respects has been hardly satisfactory. The Indian planners should try to reverse the deteriorating quality of education and start more vocational training institutes (like the I.T.I.s which are too few in number as recently pointed out by the Ashok Mitra Committee on Education). Industry in India is hardly doing any research on its own and the Government therefore should take up the responsibility of promoting R & D in Industry.

Addressing equity issues will be much more difficult in a developing country like India due to high absolute level of poverty. However, since the basic objective of planning remains "growth with social justice", an attempt must be made to divert funds towards improving the quality of life. Thus, the policy prescriptions of the book for the U.S. economy has important implications for India in spite of the fundamental structural differences between the two economies. This is precisely due to the fact that ultimately both countries will have to withstand the same global competitive pressures.

In retrospect, the major assets of this book are its pragmatic policy prescriptions and its sustained concern for social justice. The authors have, very correctly, pointed out that competitiveness will not come by merely opening up the economy, the state must try to attain it through persistent efforts of skill formation and development of industrial technology. Interestingly, many prescriptions of this book coincide with the recent Clinton Plan, including, among others, increasing the tax on upper income groups and company profits, tax rebates for investment in research and development and selected equipment purchase, provision of extra resources for food stamp programme and child immunisation and proposal to cut defence spending. The U.S. seems to be realising that for a free market regime to be successful, a lot of homework is necessary to withstand international competition.

In its enthusiasm for attainment of growth with equity, the book overlooks the fact that there is a crucial trade-off between the two. Moreover, the issue of equity and quality of life has not been given as much attention as it deserves, and is made to look so simple that one would be tempted to believe that it is easy to realise it so long as growth is taken care of. Despite these shortcomings, the pragmatism of the book leaves a lasting impression on the readers. It has successfully differentiated between short term crisis management and long term planning which many developing nations going through structural adjustment should do well to remember.

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