Depositor discipline in Indian banking: Separating facts from folklore

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ABSTRACT

The paper traces the determinants of depositor discipline in Indian banking. Using data for the period 1997:1 to 2002:4, the findings reveal that, while bank-specific factors are dominant in case of state-owned banks, systemic variables tend to overwhelm bank-specific factors in explaining behaviour of depositors of private banks. In case of private and foreign banks, policy announcements have an important bearing on the dependent variable. For state-owned banks, larger asset translates into higher deposit growth, suggesting that depositors are sensitive to the 'too-big-to-fail' effect. Finally, insured depositors tend to exercise discipline by compelling banks to pay a higher price on deposits.

Key words: depositor discipline, contagion effect, deposit insurance, state-owned banks, India

INTRODUCTION

Over the last two decades or so, both developed and developing countries alike have endured severe banking crises. The U.S. Savings and Loan (S & L) debacle in the early eighties, the Latin American banking crisis in the mid-eighties and more recently, the financial stress in Asian economies and subsequently in Argentina and Turkey are only a few examples. The costs of such crises have often been large, ranging from 3 per cent of GDP for the US S & L crisis to around 40-45 per cent of GDP for Thailand and Indonesia during the period 1997-99 (World Bank, 2001). At all times and, particularly, in order to avoid banking crises, authorities need to find ways to promote prudent behaviour by banks.

There are two primary ways of monitoring banks. The one traditionally employed in the banking industry is regulation and supervision of banks (Mishkin, 2001). The other is corporate governance, which enables suppliers of finance to the bank assure themselves of getting a return on their investment. However, the fact that supervisory standards may be lax

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has been vividly illustrated in some of the crisis-ridden Asian economies. The lessons from the *Barings* debacle and the more recent accounting irregularities in the United States have provided graphic evidence that corporate governance standards by themselves might not be adequate to stave off failures. A suggestion has, therefore, been made that supervisors should rely on 'depositor discipline' to supplant the traditional procedures. This enables market assessment of banking firms on a closer and continuous basis, enabling authorities to act sooner (thus avoiding costly delay) in case of any eventuality, because they can marshal independent evidence about the firm's condition.

The paper presents evidence from India regarding the existence of depositor discipline. We choose India as a case study for two main reasons: first, it is one of the most important developing countries of the world, and second, it has had a rich history of various types of banking sector controls (Demetriades and Luintel, 1996). Since the initiation of economic reforms in the 1990s, these controls have gradually been dismantled, allowing greater role of market forces in the resource allocation process.

The highlights of the paper can be stated as follows. First, the study is the first for India, a country which has witnessed no major banking crisis in the 1990s, to test the existence of depositor discipline in the banking sector. Second, the database employed in the study comprises quarterly data on balance sheet and income and expenditure statement of commercial banks in India and to that extent, represents an improvement on earlier studies that rely on annual data. Third, in line with recent developments in econometric techniques, we employ dynamic panel data estimation procedures and therefore, represent an improvement over earlier studies for other emerging markets which employ static panel data approach.

The findings reveal that, while bank-specific factors have an important bearing on the dependent variable in case of public sector banks, systemic factors, and in particular, policy announcements, in addition to bank-specific indicators, tend to be dominant in case of private banks. For foreign banks, the macroeconomic condition tends to overwhelm bank-specific factors in explaining depositor behaviour. In case of public sector banks, bigger banks (defined in terms of their total assets) translate into higher deposit growth, suggesting that depositors are sensitive to the 'too-big-to-fail' effect. For public and foreign banks, there exists evidence of contagion effects influencing the deposit accretion process. In sum, depositors 'punish' banks for risky behaviour, either by withdrawing deposits or and more importantly, by extracting higher price on deposits.

The paper is structured along the following lines. Section I presents a brief overview of the relevant literature. Section II provides an overview of the financial repression process in India and the gradual move towards a market-oriented regime. A description of the data sources and measurement is provided in Section III. The empirical methodology used in the study in detailed in Section IV. Section V presents and discusses the empirical results. The concluding remarks are gathered in Section VI.

LITERATURE ON MARKET DISCIPLINE

Market discipline in banking is a process by which investors (bondholders/ depositors/investors) assess changes in bank risk and take actions leading to the adoption of

those measures needed to control the institution's level of risk. The idea of leveraging depositor discipline to supplement supervisory efforts and corporate governance practices is by no means new. As Greenspan (2001) has remarked, 'the real pre-safety-net discipline was from the market, and we need to adopt policies that promote private counterparty supervision as the first line of defense for a safe and sound banking system'. Even the proposed capital Accord of the Basel Committee has designated market discipline as one of the three pillars on which future financial regulation should be based, because '[market] discipline imposes strong incentives on banks to conduct their business in a safe, sound and efficient manner' (BCBS, 1999).

Most studies on depositor discipline focus on the experience of the developed banking markets, particularly the United States. The majority of the studies have primarily followed three different approaches. The first set of studies adopts the yield-based approach. In particular, they employ yield spreads (the difference between the market yield on bank debt and a risk-free asset like Government paper) as an indicator of the market's perception of bank risk (Baer and Brewer, 1986; Ellis and Flannery, 1992, Flannery and Sorescu, 1996; Jagtiani and Lemieux, 2000). Overall, these studies support the hypothesis that yield on uninsured deposit contains risk premia. This, in effect, implies that uninsured depositors charge higher interest rates to riskier banks.

A second set of studies adopts the quantity-based approach by analyzing to what extent a bank is able to raise (uninsured) debt. Covitz *et al*. (2000) find that relatively weak banks are unwilling (or unable) to issue sub-ordinated debt in bad times. Birchler and Maechler (2001), examining depositor discipline in the Swiss banking sector, find that depositors are sensitive to bank-specific fundamentals and to institutional changes in the Swiss depositor protection system. Two recent studies pertain to developing economies. The first, a case study of depositor discipline in Colombia finds that depositors prefer banks with stronger fundamentals and that banks tend to improve their fundamentals after being 'punished' by depositors (Barajas and Steiner, 2000). A second study for Argentina, Chile and Mexico, observes that even small, insured depositors exert depositor discipline by withdrawing deposits from weak banks (Martinez Peria and Schmukler, 2001).

The final set of studies combine both the price- and quantity-based approaches. These papers examine depositor discipline by looking at the effect of depository's institution risk on both the pricing and growth of uninsured deposits (Park, 1995; Park and Peristiani, 1998). Overall, these studies find that riskier banks pay higher interest rates, but, at the same time, attract smaller amounts of uninsured deposits.

However, examining whether depositors 'punish' banks by withdrawing their deposits *or* extract a higher price *in isolation* may not suffice to draw inference regarding the existence of depositor discipline. In the absence of alternate investment opportunities, the depositors might perforce entrust their deposits with banks, but extract a higher price on deposits. In models that combine both the price and the quantity approaches, the existence of depositor discipline is inferred by testing the significance of the coefficient on the *expected* probability of default, after accounting for controls in terms of regulatory dummies and bank fundamentals. However, by directly including the probability of default, it is difficult to discern which of the bank indicators may be providing the strongest signals to depositors that banks are, in fact, assuming high risks (Martinez Peria and Schmukler, 2001). This, in essence, limits the empirical appeal of such models. Third, banking systems in several developing markets still

tend to be predominantly Government-owned, with a process of gradual divestment of Government holding being evidenced in recent years, which tests of depositor discipline needs to take cognizance of. Finally, there also lies the question of endogeneity of bank fundamentals, which needs to be tackled in order to arrive at consistent inferences.

Market discipline is however, not an issue for developed countries alone. Nakaso *et al*. (2000), for instance, argue that depositor discipline did not operate efficiently in Japan due largely to insufficient financial infrastructure (weak accountancy norms, inadequate disclosure standards, *etc*). Even for the United States, evidence suggests that neither supervisors nor rating agencies nor equity investors are unambiguously more timely and accurate in their assessment of risk than others. All three groups produce valuable complementary information that contributes towards improving the performance of large banks (Berger *et al.*, 2000).

There are a number of potential benefits from enhancing depositor discipline in a country's banking sector. First, by punishing excessive risk-taking by banks, increased depositor discipline may reduce moral hazard incentives. Second, depositor discipline may improve bank efficiency by pressurising some of the relatively inefficient banks to become more efficient or to exit the industry (Berger, 1991). Third, evidence indicates that markets give signals about the credit standings of financial firms, which, combined with inside information gained by supervisory procedures, can increase the efficacy of the overall supervisory process. Flannery (1998), for instance, suggests that market information may improve two features of the overall process for regulators by (a) enabling them to identify incipient problems more promptly, and (b) providing them an incentive and justification to take prompt action, once problems have been identified. He concludes that market information should be incorporated into the process of identifying and correcting problems. Finally, depositor discipline might be able to supplement traditional supervisory assessments to distinguish 'good' banks from 'bad' ones and therefore, lower overall social costs of bank supervision (Flannery, 2001).

INDIAN BANKING AND MARKET DISCIPLINE

The scheduled commercial banking system comprises Indian banks in public and private sectors and foreign banks operating in India.[1] In the 1950s, the financial system in India was fairly liberal with limited control on interest rates and low statutory pre-emptions. The disconcerting findings of the All-India Rural Credit Survey Committee (RBI, 1954) of the inequitable distribution of bank credit raised misgivings about the ability of markets to

[1] The banking system in India comprises of commercial and co-operative banks, of which the former accounts for around 98 per cent of banking system assets. The commercial banks, in turn, comprise of the 19 nationalised banks (majority holding with the Government) and the State Bank of India (majority holding being with the Reserve Bank of India, the country's central bank) and its 7 associate banks (majority holding being with State Bank of India). These 27 banks comprise the state-owned banking system in India and accounted for, on average, over 80 per cent of commercial banking assets over the sample period. In addition, there are the old private banks and the new private banks (established post initiation of reforms in 1991-92) and the foreign banks. The entire segment is referred to as Scheduled Commercial Banks, since they are included in the Second Schedule of the RBI Act, 1934.

efficiently allocate resources.[2] As a consequence, the Government tightened its control over the credit allocation process to ensure adequate credit flow into genuinely productive activities in conformity with Plan priorities. Towards this end, controls on lending rates were introduced, liquidity requirements were raised and a system of development banks, catering to various segments of industry and agriculture were established. The process culminated with the nationalisation of 14 largest commercial banks in 1969 and subsequently in 1980, with the nationalisation of 6 major commercial banks.[3] The expansion of banking facilities purported to not only mop up potential savings, but also meet the credit gaps in agriculture and retail trade, thereby enabling to bring large stretches of economic activity within the organised banking system. At the same time, a strategy for agrarian development, which laid considerable emphasis on the provision of adequate credit to the agricultural sector, was initiated (Chakravarty, 1987). This led to intense pressure on the state-owned banking system to lend to 'priority sectors' (comprising agriculture, small-scale industry, retail traders and craftsmen). These lending requirements, initially stipulated at 33 per cent of a bank's total credit, was, over a period of time, raised to 40 per cent.

In addition, the financial sector suffered from several inefficiencies, the salient among which can be stated as follows:

- First, financial institutions had significant restrictions on application of funds. By July 1991, commercial banks had to hold in cash reserves and government debt instruments as much as 63.5 per cent of increases in deposits in 1991-92: 25 per cent as cash reserve ratio (CRR), deposited with the central bank as reserve requirement and 38.5 per cent as statutory liquidity ratio (SLR), to be invested in eligible government securities. While the RBI introduced a Health Code System in 1985 to classify bank loans according to their performance, income recognition rules were highly subjective and reduced incentives for maintaining a high quality loan portfolio.
- Second, the government regulated the use of financial instruments and access to financial markets, as well as all interest rates on deposits and loans-lending rates were fixed both for priority and non-priority sectors.
- Third, competition was limited. Since nationalisation, the banking system was dominated by state-owned banks which accounted for over 90 per cent of total commercial banking assets and around 85 per cent of bank branches; the number of private banks remained stagnant and their branch expansion was restricted.

All commercial banks, whether public, private or foreign, are regulated by the Reserve Bank of India (RBI). A process of liberalisation of the financial sector was initiated in 1991-92, which aimed at creating a more diversified, profitable, efficient and resilient banking system (Government of India, 1991). The underlying philosophy was to make the banking system more market-oriented and to that end, engendered a shift in the role of the RBI from micro-management of banks operations to macro governance. While these reforms were

[2] The All-India Rural Survey Committee observed that out of the total borrowings of Rs.750 crore for the cultivators in 1951-52, agriculturalist money lenders and professional money lenders accounted for 24.9 per cent and 44.8 per cent, respectively.

[3] The number has since been reduced to 19 with the merger of two banks in 1993.

being implemented, the world economy also witnessed significant changes, 'coinciding with the movement towards global integration of financial services' (Government of India, 1998). Against such backdrop, a second Government-appointed Committee on banking sector reforms provided the blueprint for the current reform process (Government of India, 1998). The noteworthy developments in the financial system over the period were as follows (Bhide *et al*., 2001):

a) financial repression through statutory pre-emptions have been lowered. Illustratively, at end-March 2002, the CRR stood at 4.5 per cent (legal minimum of 3 per cent) and SLR was 38.5 per cent (legal minimum).
b) The administered interest rate regime has been dismantled, allowing banks the freedom to choose their deposit and lending rates.
c) Competition has been infused by allowing more liberal entry of foreign banks and permitting functioning of new private banks.
d) A set of micro-prudential measures (capital adequacy requirements, income recognition, asset classification and provisioning norms for loans, exposure norms, accounting norms) has been stipulated.

Until 1991-92, all state-owned banks were fully owned by the Government. Since the onset of reforms, several of the relevant acts were amended to enable the state-owned banks to raise capital upto to 49 per cent from the public. As many as 12 state-owned banks accessed the capital market and raised around Rs 65 billion till end-March 2002. A hallmark of the reform process in India has been its 'gradualism', which was the outcome of India's democratic and highly pluralistic polity in which reforms could be implemented if based on a popular consensus (Ahluwalia, 2002).

Evidence of competitive pressures on the Indian banking industry is evidenced from the decline in the five bank asset concentration ratio from 0.51 in 1991-92 to 0.44 in 1995-96 and thereafter to 0.41 in 2001-02 and by the increasing number of private and foreign banks (Table 1).

A number of factors make the banking sector in India an interesting case to study depositor discipline. First, over the 1990s, India has undergone a liberalisation of the banking sector with the avowed objective of 'enhancing efficiency, productivity and profitability' (Government of India, 1991). Second, most studies on depositor discipline pertain to countries with a history of banking crises. The present study is possibly the first of its kind for a country with no major banking crisis. Third, the banking sector witnessed important transformation, driven by the need for 'creating a market-driven, productive and competitive economy' in order to 'support higher investment levels and accentuate growth' (Government of India, 1998). Finally, it seems appropriate to conduct a study of depositor discipline for India, since it has made significant efforts to promote the role of market forces in regulating banks. Illustratively, since the late 1990s, supervisors have undertaken steps towards improving the quality and availability of information on banks. The importance of depositor discipline has also been recognised by the Reserve Bank wherein it has observed that 'processes of transparency and market disclosure of critical information describing the risk profile, capital structure and capital adequacy are assuming increasing importance in the emerging environment…these processes enable

banks to strike the right balance between risks and rewards and to improve the access to markets' (Jalan, 2002).

Table 1. Summary of the Banking Industry: 1990-91 to 2001-02 (in Rs. billion)

Year /Bank Group	1990-91			1995-96			2001-02		
	SOB	Pvt.	Forgn.	SOB	Pvt.	Forgn.	SOB	Pvt.	Forgn.
No. of Banks	28	25	23	27	35	29	27	30	40
Total Deposit	2087	94	85	3908	361	306	9687	1694	645
Total credit	1306	50	51	2075	219	225	4807	1164	486
Credit-deposit ratio	0.63	0.52	0.60	0.53	0.61	0.75	0.49	0.68	0.75
Share (in per cent) of									
Total Deposits	92	4	4	85	8	7	80	14	6
Total Credit	93	4	3	82	9	9	74	18	8
Total Income	271	10	22	536	53	61	1172	208	130
Total Expenses	266	9.7	20	539	48	54	1089	190	115
Total Profit	5	0.3	2	-3	5	7	83	18	15

SOB. State-owned Banks; Pvt. Private Sector Banks; Forgn: Foreign Banks
Source: RBI a, b (various years).

DATA: MEASUREMENT AND SOURCES

The study employs quarterly off-site monitoring and surveillance (OSMOS) data for commercial banks over the period 1997:1 to 2002:4. Two features about the data are in order. Firstly, consequent upon the introduction of off-site returns for banks since 1997, banks operating in India have been directed to submit data on mandated aspects of liquidity, solvency and asset quality on a quarterly basis. Second, the data have to be submitted within one month after the close of the quarter, and therefore, the timeliness of the information obtained enables the authorities to monitor and understand trends in important banking variables (Ghosh *et al*., 2003).

Since depositors can exercise depositor discipline either by requiring higher interest rates and/or by withdrawing their deposits from riskier banks, accordingly, the dependent variable can either be a quantity or price variable. In case of quantity, the first difference of the log of time deposits is taken as the dependent variable, since this is the major (around 65-70 per cent) component of aggregate deposits. In case of price, since banks offers a multitude of rates, depending on classes of customers and types of products supplied, we define an implicit deposit rate defined as the *change* in the interest paid on deposits by *change* in total deposits.[4]

The independent variables employed in the study comprise bank-specific, systemic (or banking industry-specific) and macroeconomic variables. The bank-specific variables are guided by the CAMEL methodology and covers the five major parameters of bank operations.[5] The systemic variables seek to ascertain the impact of significant banking

[4] Alternately, one could have worked with average cost of deposits, defined as interest rate on deposits to total deposits. That would have been less than ideal, because it is likely that a bank might be confronted a large marginal effect without showing a high overall average rate of interest paid.

[5] CAMEL is the acronym for Capital adequacy, Asset quality, Management, Earnings and Liquidity.

industry-specific changes impinging on the depositor discipline. Finally, the macroeconomic variables control for the influence exerted by the state of the overall economy. The bank-specific data have been obtained from the OSMOS database of the Reserve Bank of India. The systemic and macroeconomic variables have been obtained from *Handbook of Statistics on Indian Economy* (RBI, 2003).

A Bank-specific Variables

Capital Adequacy

Capital adequacy is measured by the ratio of capital to risk-weighted assets (CRAR). As a sound capital base should strengthen depositor confidence, we expect the capital adequacy variable to exert a positive influence on bank deposits and a lower interest outgo.

Asset Quality

A clear signal of asset quality is the ratio of non-performing loans to total loans. We employ the ratio of non-performing loans to total advances (NPL). As higher NPL is indicative of poor credit decision-making, we expect this variable to have a negative influence on deposits and an adverse outcome in terms of higher interest rates.

Management

To account for management quality, we include the ratio of non-interest expenditures to total assets (MANAGEMENT). This variable, which includes a variety of expenses, such as payroll, workers compensation and training in investment, reflects the management policy stance. A high level of expenditures in not-directly productive activities may reflect an inefficient management. We expect this variable to have a negative relationship with deposits and a positive linkage with the interest rate variable.

Earnings

We measure bank earnings (EARNING) by the return on asset ratio. In general, assuming we are adequately controlling for risk, we expect this variable to have a positive effect on deposits and an inverse relation with interest rate.

Liquidity

The cash with banks *plus* balances with central bank to asset ratio is included as an indicator of bank liquidity (LIQUIDITY). In general, banks with a larger volume of liquid assets are perceived to be safer, since these assets would allow banks to meet unexpected withdrawals. This would imply a positive relation between time deposits and liquidity and a negative movement between this variable and interest rate.

In order to control for bank size, the natural logarithm of total asset (SIZE) is included in the regression to examine whether depositors respond to the ‘too-big-to-fail’ effect.

Bank-industry Specific Variables

To control for the behaviour of the banking sector, the estimation procedure includes the ratio of cash outside banks to system deposits (CASH). This variable provides a preliminary way of testing for contagion effects. Contagion refers to a situation in which individual depositors at a given bank act according to what the rest of the banking system appears to be doing, after controlling for bank-specific and macroeconomic factors. This variable reflects the individual preference for holding currency relative to bank deposits. If depositors perceive an increase in systemic risks, they might decide to withdraw their deposit from banks, regardless of bank fundamentals. The value of cash outside banks over system deposits will increase and individual bank deposits will fall. Therefore, a negative correlation between individual bank deposits and CASH can be interpreted as evidence of contagion effects. A reverse argument holds between the interest rate variable and CASH.

Secondly, we include the end of quarter yield on 364-day treasury bills (YLD364) as a proxy for monetary policy stance. A monetary contraction lowers the supply of funds, and thereby raises yield. In such a situation, depositors could end up parking more of their funds with banks or invest in alternate avenues, by comparing the risk-return trade-off. In case they choose to invest in bank deposits, they would seek a higher return. This would mean that the relationship between time deposits and YLD364 is not clear, *a priori*; however, its relation with interest rates is expected to be positive.

Thirdly, similar to Demetriades and Luintel (1996), we include a dummy variable for policy (POLICY), indicating specific quarters when significant liberalisation measures impinging on depositor behaviour were undertaken. Accordingly, we assign a dummy variable which assumes value 1, if important policy measures were undertaken during that quarter and zero, otherwise. Illustratively, during 1997:2, the Bank Rate (the rate at which the central bank refinances commercial banks) emerged as a signaling rate and all important interest rates in the system were linked to it. Over the course of the quarter, the Bank Rate was reduced across the board. Data on such changes in policy have been culled out from the *Annual Reports* of the Reserve Bank of India. [6]

Macroeconomic Variables

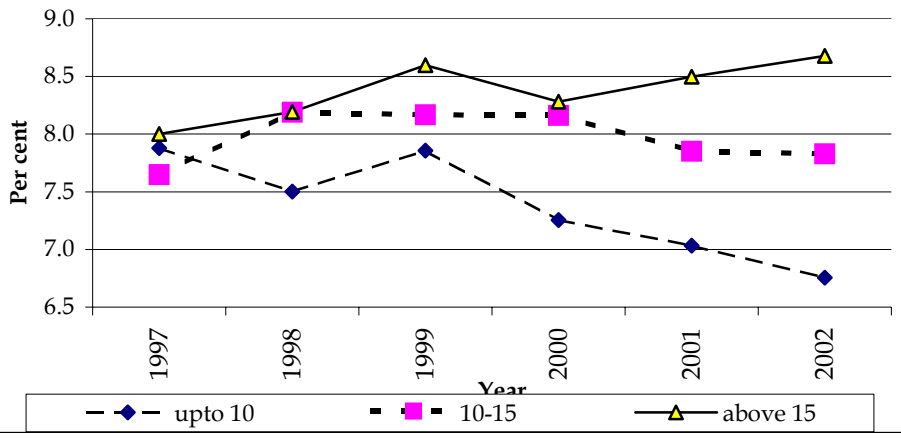
Deposits at individual banks can also be influenced by the state of the overall economy. In particular, we evaluate the effect of real GDP growth rate (GDPGR) and the consumer price index (CPI). The former variable reflects the relative strength of the economy, we expect it to have a positive relationship with the quantity variable and a negative relation with the price variable. As regards the latter, a higher value reflects greater uncertainty. Hence, we expect it to bear a negative relation with quantity (depositors seek to invest in alternate, high-return sources) and a positive relation with the price variable (depositors seek higher return on deposits).[7]

[6] It may be noted that such a dummy is introduced only for select quarters when important liberalisation measures were undertaken that might affect deposits or interest rates, in order to capture separate effects from the macro variable, e.g., GDP.

[7] Instead of employing CPI directly, we also tried with variability of CPI over the quarter. The results were unaltered with such specification.

Before embarking on an empirical analysis, we present some graphical evidence. Chart 1 presents the implicit deposit interest rate for banks classified according to their non-performing loan ratio: upto 10 per cent, above 10 and upto 15 per cent and above 15 per cent. First, the implicit deposit rate for banks with relatively low quantum of sticky assets (upto 10 per cent) has been declining over time. And more importantly, the dispersion of the deposit rate between banks with high non-performing loans (above 15 per cent) *vis-à-vis* banks with low non-performing loans (upto 10 per cent) has been increasing over time. This would suggest that depositors have become more discerning to bank risk-taking, manifested in greater dispersion in terms of the deposit rate.

Chart 1: Gross NPA and Implicit Deposit Rate



EMPIRICAL METHODOLOGY

The panel consists of 72 commercial banks (cross-section), comprising of 27 state-owned banks, 20 private sector and 25 foreign banks, for which consistent data is available from 1997:1 through 2002:4 (time period), the most comprehensive time frame for which data on the concerned variables are available. The data on 'outlier' foreign banks (those with exceedingly high capital ratios and/or single bank branches) have been excluded from the sample. This omission is of negligible importance, since these omitted banks accounted for less than 1 per cent of the total assets of commercial banks.

The reduced-form equation for the dependent variable assumes the following form:

$$\Delta TD_{i,t} = \mu_i + \lambda BANK_{i,t-1} + \delta SYS_t + \gamma MACRO_t + \varphi_{i,t} \qquad (1)$$

such that i=1,2,…,N (number of banks) and t=1,2,…,T (number of quarters) and Δ indicates first difference. The panel is balanced, so T is the number of observations per bank.

In equation (1), ΔTD represents the first difference of the logarithm of time deposits held by bank i at time t. The systemic and macroeconomic variables, which change only over time, are denoted as SYS and MACRO respectively. BANK is a vector of bank-specific

fundamentals, which is generally included with a lag to account for the fact that balance sheet information is available with a certain delay. μ_i is the bank-specific or fixed effect.

A common test of depositor discipline is whether the estimates of λ are individually or jointly different from zero. If depositor discipline is not existent, deposit growth should be correlated with bank risk characteristics, and one would fail to reject $\lambda=0$. However, this, in itself, is not enough to conclude that depositor discipline is at work. Depositors can also discipline banks by requiring them to pay higher interest rates on their deposits. Therefore, if depositor discipline exists, then risky banks would be expected to pay higher deposit rates. This prompts us to also consider an alternate equation (2): i.e.,

$$\Delta INTDEP_{i,t} = \mu_i + \lambda' BANK_{i,t-1} + \delta' SYS_t + \gamma' MACRO_t + \xi_{i,t} \quad (2)$$

where the variable ΔINTDEP is the change in the deposit rate paid by bank i on its deposits (normalised by change in total deposits) at time t.

The specifications (1) and (2) closely follows Martinez Peria and Schmukler (2001), with one major difference. In their specification, they do not explicitly include controls for systemic and macro variables, but instead, introduce a time specific effect to capture the same. It is assumed that the error terms φ_{it} and ξ_{it} in equations (1) and (2) are independently distributed with zero mean and finite variance, σ_{it}^2. Owing to the differencing of the dependent variable, observation for one quarter is lost from the sample. As a consequence, the effective sample period spans 1997:2 to 2002:4.

The estimation procedure needs to tackle two major issues. First, rather than distort the available information by using arbitrary phase length (average of certain number of quarter), we choose to work with the original annual data in order to retain all the information. Thus, in turn, means that we need to use a dynamic specification in order to allow for inertia, very likely to be present in the dataset. Second, changes in deposit at time *t* are most likely to affect bank fundamentals from time *t* onwards. In that case, if one had contemporaneous bank fundamentals, the estimates are likely to be biased. In most specifications of this genre, bank fundamentals are lagged to account for this contemporaneity (Martinez Peria and Schmukler, 2001). If, however, bankers are forward-looking, it is likely that they will anticipate that bank fundamentals at time *t-1* affect deposits at time *t*. Therefore, banks might try to adjust their risk characteristics to prevent future deposit withdrawals.

To address these issues, the empirical analysis is based on the generalised method of moments (GMM) estimators applied to dynamic models using panel data (Arellano and Bond, 1991). First differencing (1) yields equation (3):

$$TD_{i,t} - TD_{i,t-1} = \lambda'(BANK_{i,t-1} - BANK_{i,t}) + \delta'(SYS_t - SYS_{t-1}) + \gamma(MACRO_t - MACRO_{t-1}) + (\xi_{i,t} - \xi_{i,t-1}) \quad (3)$$

We assume that bank fundamentals are weakly exogenous, i.e, $E(BANK_{i,t}\xi_{i,s})=0$ for s>t. In that case, values of bank fundamentals lagged two or more periods are valid instruments in the equations in first differences. We assume that the systemic and macroeconomic variables are exogenously determined, in the sense that they do not react to bank individual deposits or the interest rate paid thereon. A similar transformation can be effected for equation (2).

The assumptions that the error term is serially uncorrelated and that the explanatory variables are weakly exogenous imply a set of moment restrictions that can be employed in the context of the GMM to generate consistent and efficient estimates of the parameters of interest. The consistency of the GMM estimator depends on whether the lagged values of the bank fundamentals are valid instruments in the regression procedure. A necessary condition for the validity of such instruments is that the error term, $\xi_{i,t}$ be serially uncorrelated. To address these issues, we present two specification tests suggested by Arellano and Bond (1991). The first is the Sargan test of over-identifying restrictions, which tests for the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term differenced regression, $\xi_{i,t} - \xi_{i,t-1}$ is not second-order serially correlated, which implies that the error term in the level regression, $\xi_{i,t}$ is not serially correlated. The failure to reject the null hypotheses in both cases provides support to the model.

EMPIRICAL RESULTS

This section evaluates whether depositors respond to bank risk-taking. Before proceeding to discuss the results, Table 2 presents the summary statistics of the relevant variables at the bank group level.

It is observed that CRAR, on average, is the highest for foreign banks and the lowest for state-owned banks. Likewise, NPLs are also the highest for the state-owned bank group. EARNING tends to be the highest for private banks, whereas state-owned banks have the highest quantum of LIQUIDITY: double the amount of that for foreign banks. Finally, the average real GDP over the sample period has been 5.86 per cent.

Table 2. Summary Statistics: Mean values of the Variables

Variable	State-owned	Private	Foreign	All
Bank specific Variables				
CRAR	10.520	12.970	22.020	15.430
NPL	15.560	11.480	14.340	13.770
MANAGEMENT	21.630	12.040	10.530	14.480
EARNING	0.470	0.700	0.410	0.520
LIQUIDITY	7.670	7.220	3.610	6.070
Number of observations	648	480	600	1728
Systemic Variables				
CASH		22.980		
YLD-364		8.200		
Macroeconomic Variables				
GDP growth		5.863		
CPI		6.875		

The results of the analysis lend credence to the finding that deposits respond to bank risk taking (Table 3). Among the *bank-specific factors*, a rise in the CRAR fosters deposit

growth. Secondly, higher the sticky assets of the bank, lower the deposit growth. Thirdly, banks with relatively more liquid assets experience a fall in their deposit base, probably mirroring the fact of holding low yielding short-term assets as reflective of poor cash management. Fourthly, the coefficient on the SIZE variable is positive and significant at conventional levels, suggesting that larger banks are perceived as more 'stable' and consequently, depositors entrust their deposits with such banks.

At the *bank-industry level*, there is limited evidence to support the presence of contagion. The coefficient on the CASH variable is positive and significant, alluding to the fact that deposits with the entire banking system grew at a slower rate than cash outside banks. The rapid growth of cash outside banks might be a consequence of increase in system-wide liquidity in the face of declining interest rates on bank deposits and limited alternative avenues for parking of funds by depositors.

The validity of lagged values of time deposits and interest paid of deposits and the explanatory variables as instruments is crucial to the consistency of the GMM estimator. The results show that we are not able to reject the Sargan test. Moreover, we are not able to reject the null hypothesis of no second-order serial correlation. In other words, this suggests that the GMM model is well specified.

The results pertaining to the interest rate variable also depict a similar story (Table 3). Banks with low capital adequacy and lower managerial ability pay higher interest rates. Also, banks with limited profitability end up paying higher implicit price. Finally, banks with higher liquidity pay higher interest rates on deposits, attesting to the fact that higher liquidity position in normal times is reflective of poor cash management.

The next obvious question which arises is: how do these effects vary by bank ownership? Tables 4 and 5 provide some evidence on this issue.

Table 3. Response to Bank Risk Characteristics

Dependent Variable: Log (ΔTD)		**Dependent Variable: (ΔInterest Paid on deposits/ΔTotal deposits)**	
Regressor	**Coefficient (t-ratio)**	**Regressor**	**Coefficient (t-ratio)**
Intercept	-0.033 (-2.11)	Intercept	1.520 (17.30)
Bank-specific Variables		*Bank-specific Variables*	
CRAR	0.002 (2.30)	CRAR	-0.019 (-2.35)
GNPA	-0.003 (0.08)	GNPA	-0.015 (-0.88)
MANAGEMENT	0.004 (0.80)	MANAGEMENT	-0.047 (-1.96)
EARNING	-0.004 (-0.81)	EARNING	-0.202 (-3.96)
LIQUIDITY	-0.005 (-2.49)	LIQUIDITY	0.254 (8.04)

SIZE	0.32 (4.04)	SIZE	-2.827 (-4.98)
Systemic Variables		*Systemic Variables*	
CASH	0.024 (1.84)	CASH	-1.428 (-19.03)
YLD364	-0.006 (-0.59)	YIELD	0.142 (2.65)
POLICY	-0.007 (-0.28)	POLICY	0.106 (0.97)
Macroeconomic Variables		*Macroeconomic Variables*	
GDPGR	0.011 (1.49)	GDPGR	-0.302 (-0.98)
CPI	0.014 (1.58)	CPI	-1.003 (-1.19)
Diagnostics Tests			
Tests of GMM consistency		Tests of GMM consistency	
Sargan test[1] (p-value)	0.40	Sargan test[1] (p-value)	0.62
Serial Correlation test[2] (p-value)	0.32	Serial Correlation test[2] (p-value)	0.35
R^2	0.59	R^2	0.71
Number of banks	72	Number of banks	72
Number of observations	1656	Number of observations	1656

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

Table 4. Response to Bank Risk Characteristics–Bank Group-wise Analysis

Bank group/ Regressor	State-owned Banks	Private Sector Banks	Foreign Banks
	Coefficient (t-ratio)	Coefficient (t-ratio)	Coefficient (t-ratio)
Intercept	-0.024 (-3.49)	-0.025 (-2.75)	-0.082 (-1.98)
Bank-specific Variables			
CRAR	0.001 (2.68)	0.005 (1.39)	0.008 (0.43)
GNPA	-0.002 (2.63)	-0.008 (-2.85)	-0.001 (0.83)
MANAGEMENT	0.010 (3.78)	-0.0009 (-0.51)	0.028 (2.27)
EARNINGS	0.008 (1.86)	0.022 (2.14)	0.036 (2.42)
LIQUIDITY	-0.002 (-1.95)	-0.001 (-0.43)	-0.013 (-0.83)

SIZE	0.426 (4.27)	0.229 (1.16)	0.339 (2.18)
Systemic Variables			
CASH	-0.009 (-1.83)	0.006 (0.74)	0.071 (1.96)
YLD364	-0.002 9-0.50)	-0.012 (-2.31)	-0.007 (-0.23)
POLICY	0.023 (1.09)	0.103 (2.67)	0.137 (2.54)
Macroeconomic			
GDPGR	0.003 (1.06)	0.05 (1.22)	0.022 (1.89)
CPI	0.004 (0.66)	0.004 (0.90)	0.050 (2.15)
Diagnostics Tests			
Tests of GMM consistency			
Sargan test[1] (p-value)	0.30	0.41	0.39
Serial correlation test[2] (p-value)	0.36	0.24	0.21
R^2	0.57	0.52	0.51
Number of banks	27	20	25
Number of observations	621	460	575

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

Dependent variable: log (ΔTD)

For the public sector bank-group, for high capital adequacy is associated with significantly higher deposit growth, lending credence to this risk-weighted variable in explaining depositor behaviour (Table 4). Among others, poor asset quality and inefficient management practices tend to lower deposit growth in the concerned bank, while greater profitability encourages depositors to entrust their deposits with banks. Finally, greater liquidity tends to lower deposit growth. In normal times ample liquidity is often reflective of poor cash management; which acts as a negative signal to depositors about cash management practices of the concerned bank. This supports the work of Barajas and Steiner (2000) who, in their study of the Colombian banking system, found that higher liquidity in normal times is associated with lower rate of growth of deposits. At the bank-industry specific level, the coefficient on CASH is negative but significant, hinting at the possibility that when there is a generalised shift of deposits towards currency outside the banking sector, the average state-owned bank is negatively affected, even after controlling for fundamentals. This evidence is consistent with the presence of contagion. Finally, neither of the macro variables seems to exert any influence on deposit growth, hinting that the macroeconomic environment has insignificant effect in explaining depositor behaviour in state-owned banks. The diagnostics tests suggest that the model is well specified.

The results are, however, distinctly different in the case of private and foreign banks. For private banks in particular, deposit growth is mostly driven by capitalisation and profitability to the exclusion of other bank-specific variables. More importantly however, systemic variables play a crucial role in determining deposit growth among private banks. In particular, Deposit growth also responds negatively to YIELD, suggesting that a contractionary monetary policy prompts depositors to park their funds in alternate avenues.

In case of foreign banks, on the other hand, the results seem to demonstrate that neither of asset quality, capital adequacy or liquidity play an influential role in harnessing deposit growth. Only managerial competence and profitability are important in influencing deposits, hinting at the possibility that depositors take limited cognizance of the overall soundness of foreign banks in entrusting their deposits. Since, more often than not, foreign banks mobilise wholesale deposits of high net worth individuals and corporates, it seems that capital position of foreign banks is of limited concern for these groups of depositors, possibly because they expect these banks to be bailed out by their parent company in case of exigencies. Unlike in the case of private banks, there is limited evidence to suggest the presence of contagion among the foreign banks as evidenced by the positive and significant coefficient on CASH. It is of interest to observe that deposit accretion in both private and foreign banks is significantly impacted by policy announcements: a favourable policy statement leading to larger deposit growth.

The findings pertaining to the interest rate variable is presented in Table 5. The lower the quantum of sticky loans, the greater is the compensation required for depositors of state-owned and foreign banks. In case of private banks, however, this sign is found to be opposite. Given the relatively low quantum of non-performing loans of this bank group *vis-à-vis* their state-owned counterparts, it seems that the magnitude of their sticky assets are of limited concern to depositors. Bank capitalisation plays a crucial role in determining the interest rate paid by state-owned and foreign banks: greater the capital levels, lower the interest outgo. Interest rate paid by state-owned and private banks are driven negatively by non-interest expenses: lower expenditures tend to be associated with higher interest outgo. Lower non-interest expenses imply lower overhead costs (wage bill, printing and advertisement cost, etc). This, in effect, adversely affects customer sentiment regarding the service provided by the bank, so that the bank has to perforce pay higher deposit rates to attract customers. Earnings are important in explaining interest paid by state-owned and private banks. For all banks, increased liquidity is associated with higher interest outgo, which suggests that depositors 'punish' banks for poor liquidity management. Size is of concern to depositors of state-owned banks, possibly reflecting the public perception that larger banks have lower probability of failure ('too-big-to-fail") and can afford to pay lower interest rates. The bank-industry specific factors are of important concern to most bank groups, with POLICY announcements having an important bearing on interest outgo for private and foreign banks. The macroeconomic variables play an important role in determining interest paid by private and foreign banks: expectedly, lower GDP growth is associated with higher interest rates. An uncertain economic environment as reflected in higher prices (CPI) is associated with lower interest

paid, reflecting consumer preferences to park their funds in bank deposits, irrespective of interest paid, in the face of uncertainties.

Summing up the foregoing discussion, bank-specific factors are dominant in case of state-owned banks, systemic variables tend to overwhelm bank-specific factors in explaining behaviour of depositors of private banks. In case of state-owned banks, larger size of banks translates into higher deposit growth, suggesting that depositors are sensitive to the 'too-big-to-fail' effect. In case of private and foreign banks, policy announcements have an important bearing on the dependent variable. For state-owned and foreign banks, there exists evidence of contagion effects influencing the deposit accretion process. Therefore, we can conclude that there exists depositor discipline in the Indian banking system.

Two additional issues assume relevance at this juncture: first, does the existence of depositor discipline differ between insured and uninsured depositors? The significance of the question stems from the fact that assuming a credible deposit insurance scheme, one can expect insured depositors to have fewer incentives to monitor bank risk-taking *vis-à-vis* uninsured ones. Second, does the divestment of Government ownership in state-owned banks have any bearing on depositor discipline? Dilution of Government shareholding in state-owned banks enables greater private participation, thereby *possibly* exerting greater prudence in their functioning.

In case of the first question, the only available variable is the ratio of insured deposits to assessable deposits (DEPINS). The economic significance of this ratio lies in the fact that it captures the proportion of *overall* deposits of the concerned bank group covered by deposit guarantee. Illustratively, this figure for nationalised banks in 1997:2 was 0.778, implying that 77.8 per cent of the deposits of nationalised banks was covered by deposit guarantee, leaving 22.2 per cent of the deposits as uninsured. In India, since 1993, deposits upto Rs.1 lakh are insured.[8]

Table 5. Response to Bank Risk Characteristics –Bank Group-wise Analysis

Bank Group/Regressor	Public Sector Banks	Private Sector Banks	Foreign Banks
	Coefficient (t-ratio)	Coefficient (t-ratio)	Coefficient (t-ratio)
Intercept	1.159 (9.96)	1.072 (9.49)	1.571 (7.92)
Bank-specific Variables			
CRAR	-0.064 (-1.70)	-0.072 (-1.48)	-0.024 (-2.04)
GNPA	0.196 (3.62)	0.125 (3.58)	-0.067 (-2.75)
MANAGEMENT	-0.238 (-5.33)	-0.062 (-3.04)	-0.044 (-0.70)
EARNINGS	0.981	0.433	0.136

[8] 1 billion=10000 lakh.

	(5.59)	(3.25)	(1.60)
LIQUIDITY	0.054 (1.77)	0.203 (5.79)	0.409 (4.84)
SIZE	-3.984 (-2.26)	-0.193 (-0.32)	-1.080 (-1.33)
Systemic Variables			
CASH	-1.099 (-12.77)	-1.165 (-12.15)	-1.710 (-9.95)
YLD364	0.190 (3.29)	0.121 (1.84)	0.187 (1.45)
POLICY	0.116 (0.96)	0.108 (1.97)	0.032 (2.01)
Macroeconomic			
GDPGR	-0.362 (-1.18)	-0.272 (-5.14)	-0.291 (-2.79)
CPI	-0.709 (-1.61)	-0.762 (-12.36)	-1.082 (-0.978)
Diagnostics Test			
Tests of GMM consistency			
Sargan test[1] (p-value)	0.64	0.58	0.53
Serial correlation test[2] (p-value)	0.39	0.30	0.29
R^2	0.76	0.68	0.62
Number of banks	27	20	25
Number of observations	621	460	575

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

Dependent variable: (ΔInterest paid on deposits/ΔTotal deposits)

Table 6. Response to Bank Risk Characteristics –Insured versus Uninsured Depositors

Bank Group/Regressor	Public Sector Banks	Private Sector Banks	Foreign Banks
Intercept	-0.022 (-3.01)	-0.027 (-2.38)	-0.062 (-1.36)
Bank-specific Variables			
CRAR	0.002 (1.71)	0.006 (1.54)	0.009 (0.69)
GNPA	-0.023 (1.96)	-0.009 (-3.66)	-0.004 (-0.78)
MANAGEMENT	0.011 (3.74)	-0.002 (-0.63)	0.028 (2.29)
EARNINGS	0.008 (0.83)	0.024 (2.41)	0.036 (2.44)
LIQUIDITY	-0.002	-0.001	-0.009

	(-0.86)	(-0.38)	(-0.53)
SIZE	0.428 (4.22)	0.179 (4.32)	0.341 (2.20)
Systemic Variables			
CASH	-0.008 (-1.72)	0.004 (0.65)	0.078 (2.11)
YLD364	-0.0005 (-0.15)	-0.013 (-2.14)	-0.008 (-0.29)
POLICY	0.060 (0.79)	0.046 (1.99)	0.167 (2.02)
Macroeconomic			
GDPGR	0.002 (0.84)	0.007 (1.35)	0.026 (1.22)
CPI	0.001 (0.43)	0.005 (1.04)	0.036 (1.34)
DEPINS	0.003 (0.73)	-0.004 (-1.11)	-0.027 (-0.92)
Diagnostics Tests			
Test of GMM consistency			
Sargan test[1] (p-value)	0.38	0.34	0.32
Serial correlation test[2] (p-value)	0.19	0.14	0.12
R^2	0.58	0.54	0.51
Number of banks	27	20	25
Number of observations	621	460	575

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

Dependent variable: log (ΔTD)

Table 7. Response to Bank Risk Characteristics –Insured versus Uninsured Depositors s

Bank Group/Regressor	Public Sector Banks	Private Sector Banks	Foreign Banks
Intercept	1.354 (10.93)	1.679 (11.93)	1.439 (6.33)
Bank-specific Variables			
CRAR	-0.018 (1.79)	-0.050 (1.09)	-0.023 (-1.01)
GNPA	0.326 (6.37)	0.101 (3.03)	0.017 (0.74)
MANAGEMENT	-0.242 (-5.51)	-0.054 (-2.74)	-0.011 (-0.62)
EARNINGS	0.978 (5.67)	0.378 (2.98)	0.128 (1.72)

LIQUIDITY	0.069 (2.28)	0.222 (6.61)	0.377 (4.26)
SIZE	-3.472 (-2.00)	0.592 (1.16)	-3.995 (-4.27)
Systemic Variables			
CASH	-1.062 (-12.49)	-0.956 (-9.96)	-1.747 (-10.06)
YLD364	0.283 (4.61)	0.379 (5.13)	0.177 (1.38)
POLICY	0.016 (1.09)	0.421 (2.36)	0.232 (2.39)
Macroeconomic			
GDPGR	-0.407 (-8.66)	-0.521 (-8.42)	-0.322 (-3.06)
CPI	-0.771 (-14.43)	-0.918 (-14.62)	-0.986 (-7.34)
DEPINS	0.251 (4.10)	0.311 (6.83)	-0.027 (-0.92)
Diagnostics Tests			
Test of GMM consistency			
Sargan test[1] (p-value)	0.66	0.62	0.60
Serial correlation test[2] (p-value)	0.41	0.28	0.26
R^2	0.86	0.79	0.74
Number of banks	27	20	25
Number of observations	621	460	575

1.The null hypothesis is that the instruments are not correlated with the residuals.

2.The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

Dependent variable: (ΔInterest paid on Deposits/ΔTotal Deposits)

Table 8. Response to Bank Risk Characteristics –Divestment of State-owned Banks

Regressor	Dependent Variable: log (ΔTD)	Dependent Variable: (ΔInterest paid on Deposits/ΔTotal Deposits)
	Coefficient (t-ratio)	Coefficient (t-ratio)
Intercept	-0.014 (1.86)	1.263 (11.21)
Bank-specific Variables		
CRAR	0.002 (1.96)	-0.001 (-0.21)
GNPA	-0.004 (-1.03)	-0.276 (-5.62)
MANAGEMENT	0.009 (0.36)	-0.289 (-6.74)

EARNINGS	0.008 (0.85)	1.001 (6.54)
LIQUIDITY	-0.001 (-2.57)	0.054 (1.94)
SIZE	0.611 (5.55)	-7.641 (4.48)
Systemic Variables		
CASH	0.004 (1.96)	-0.937 (-11.51)
YLD364	-0.0002 (-0.05)	0.241 (4.38)
POLICY	0.056 (0.67)	-0.044 (-1.21)
Macroeconomic		
GDPGR	0.020 (1.69)	-0.375 (-8.43)
CPI	0.003 (0.83)	-0.661 (-13.03)
DIVEST	-0.020 (-0.73)	-0.637 (-1.36)
Diagnostics Tests		
Test of GMM consistency		
Sargan test[1] (p-value)	0.36	0.49
Serial correlation test[2] (p-value)	0.24	0.29
R^2	0.59	0.72
Number of banks	27	27
Number of observations	621	621

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is the errors in the first difference regression exhibit no second-order serial correlation.

It is observed that the quantitative analysis with respect to deposits is materially unaltered after introduction of DEPINS (Table 6). In other words, the disciplining effect of markets in influencing deposit growth is not affected by the presence or absence of deposit insurance. The results are, however, altered when we consider the price variable (Table 7). While most variables retain their significance at conventional levels, it is observed that DEPINS turns out to be significant at conventional levels. This would suggest that insured depositors tend to exercise depositor discipline on banks not much by withdrawing their deposits from banks, but more by compelling them to pay a higher price on their deposits. This is also evidenced from the data which reveals that the share of bank deposits, on average, at around 36 per cent over the period 1997 through 2002 constituted the largest source of financial assets of household sector as compared to other alternatives like shares and debentures or contractual savings whose average share over the same period were around 5 per cent and 22 per cent, respectively (RBI, 2003).

As regards the second issue, we construct a variable DIVEST, which assumes value 1 in the particular quarter and all subsequent quarters in which the bank has made an equity

offering; and zero, otherwise. Illustratively, if a bank had made equity offering in 1997:4, the variable DIVEST takes a value of 0 in the first three quarters and 1, thereafter. The advantage of such a variable is it enables to consider *all* banks, irrespective of whether they have made an equity offering or not. The disadvantage of such a variable lies in the fact that it does not discriminate the *extent* of divestment. Notwithstanding its limitation, DIVEST enables an inference of the impact of Government shareholding on depositor discipline.

The finding, after inclusion of this variable, is exhibited in Table 8. It can be observed that lowering of Government ownership in state-owned banks seems to have had limited effect on depositor discipline. The economic intuition behind the same can broadly be summed up as under: the amendments to the Banking Companies (Acquisition and Transfer of Undertakings) Acts, 1970/80 in July 1995 have permitted state-owned banks to raise capital up to 49 per cent from the market, and at the same time, the minimum capital adequacy ratio which banks have to maintain has been raised to 9 per cent. This, in effect, has implied that the divestment process in state-owned banks has been driven essentially by the need to augment their capital base, with the Government, being the majority shareholder, still having a major say in corporate governance practices in bank boards. Consequently, although the Government shareholding in state-owned banks have declined, it has not had a significant impact on depositor discipline. The proposed amendments to the Banking Companies (Acquisition and Transfer of Undertakings) Bill, 2000 which seeks to reduce the minimum shareholding by Government in state-owned banks to 33 per cent is a welcome step in this regard.

CONCLUDING REMARKS

The purpose of the paper has been to examine the existence of depositor discipline in the banking sector in India in the 1990s. Towards this end, we employed bank level data to estimate reduced form equations, in which the dependent variable has been modeled as function of bank fundamentals, systemic and macroeconomic variables.

The results enable us to conclude that depositors in India 'punish' banks for risky behaviour, judged in terms of either the quantity or the price variable. This provides testimony towards the existence of depositor discipline in the banking sector in India.

Prima facie, the results lend support in favour of regulatory efforts to increase the reliance on depositor discipline to control risk-taking behaviour by banks in the Indian context. However, there are several caveats regarding the findings in the paper and we venture to point these out for the informed reader.

First, a more comprehensive test of the existence of depositor discipline involves understanding whether banks respond positively to the signals provided by depositors. Calomiris and Powell (2001) explore this issue for the Argentine banking system by testing

whether there is a tendency for individual banks' deposit rates to revert to their mean, a behaviour consistent with depositor discipline; if interest rates rise too much (i.e., fundamentals fall out of line), then banks must take corrective action to ensure that interest rates fall again. This 'mean reversion' aspect is beyond the scope of the present study.

Second, as pointed out by Martinez Peria and Schmukler (2001), the study has not identified the specific channels through which depositors obtain information regarding bank fundamentals. Depositors might access such information from a variety of sources: bank balance sheet, newspaper articles, internet or even from financial advisors. The differential access to these different sources might shed light on what mechanisms promote more efficient depositor discipline.

Finally, the quantity variable employed in the study is the first difference of the natural logarithm of time deposits, whereas the price variable is the implicit interest rate paid on *all* deposits. It would have been useful, in the absence of bank-wise data on deposit interest rate paid across the entire spectrum of deposits, to proxy the implicit interest rate paid by the change in *interest expenses on time deposits alone* divided by change in time deposits. Data constraints however prevent from taking such finer classification of the implicit interest rate paid into account.[9]

Thus, while there are clear limitations of the usefulness of depositor discipline, the global trend is towards placing increased emphasis on market data in the supervisory process. The idea is not that market monitoring can effectively replace official supervision, but that it has a potentially powerful role within the overall regulatory regime. In a recent contribution, Caprio and Honohan (1998) remind us, in a similar vein, 'broader approaches to bank supervision reach beyond the issues of defining capital and accounting standards, and envisage co-opting other market participants by giving them a greater stake in bank survival. This approach increases the likelihood that problems will be detected earlier…[it involves] broadening the number of those who are directly concerned about keeping the banks safe and sound'.

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[9] We have also considered the case where the dependent variable is change in aggregate deposits. The results are materially unaltered in that case and available upon request from the authors.

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