Does activity mix and funding strategy vary across ownership? Evidence from Indian banks

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Abstract: Using data on Indian banks during 1996-2007, the paper examines the impact of bank activity and short-term funding for bank returns and risks. The findings indicate that larger, fast growing financial firms tend to have higher fee income shares. In addition, banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. In terms of bank riskiness, the evidence is consistent with the conjecture that big, cost efficient and capitalized banks are less risky. As in case of bank profitability, there is limited evidence on any non-linear relationship between risk and fee incomes as also between risk and non-deposit funding share. Finally, the analysis supports the fact that foreign and *de novo* private banks exhibit lower risk as compared to old private banks.

1. Introduction

In tandem with growing liberalization of financial systems worldwide, banks have increasingly veered towards wholesale funding at the expense of relatively stable retail deposits. Aggregate bank-level data for OECD economies indicates that in several of such countries (Germany, Italy, Portugal, Spain and Switzerland), deposits have steadily lost ground at the expense of non-deposit funds (ECB, 2008a; 2008b).

This change in the funding composition was called into question in the wake of the recent financial meltdown. In particular, such wholesale funding created significant maturity mismatches with banks devoting limited attention to the consequences of potential risks of drying up of such funds. As confidence withered and depositors began withdrawing their funds *en masse*, banks found it increasingly difficult to meet such large and sudden withdrawals and took recourse to inter-bank markets to fund maturity mismatches. With confidence in financial institutions having eroded, the inter-bank market also came to a standstill, leaving banks with no recourse but to seek government intervention. Across countries and continents, besides conventional (cuts in key policy rates, liquidity injections, *etc*) and unconventional (collateral swaps, introduction of foreign currency swap lines, quantitative easing, *etc.*) policy measures, governments

have heavily intervened in banks, including increasing government ownership, raising depositor protection limits, injecting capital in troubled banks, to mention a few.

In this article, we examine the implications of bank's activity mix and funding strategy for its risk and return, using India as a case study. We represent a bank's activity mix by its share of fee income in total income. On the sources side, we distinguish between deposits and non-deposit funding sources. The objective is to shed light on the risk-return trade-offs involved in the choice of different activity and funding strategy employed by the bank.

Extant theories of banking provide conflicting predictions about the bank's optimal asset or activity mix. Banks gather information about their clients in the provision of a financial service which could be utilized at a later date in the provision of other financial services to the same customers. This information-intensive nature of bank assets would suggest that banks combine activities of various kinds in an optimal manner (Diamond, 1991; Rajan, 1992; Stein, 2002).

On the funding side, a bank's composition of debt and its ability to fund itself in wholesale capital markets signals banks creditworthiness that are relevant to potential bank depositors. Therefore, although banks need to be part-financed through equity to provide bankers with appropriate incentives (Diamond, 1984), often banks resort to non-deposit funding sources such as subordinated debt which enables the holders of such debt to credibly monitor the bank (Calomiris, 1999).

Deposit and non-deposit funding tend to carry different risks. While the volume and price of wholesale funding tends to adjust quickly in response to bank riskiness, retail deposits tend to be relatively less price responsive, partly because of the presence of deposit insurance schemes. Fama (1985) and Rajan (1992) emphasize the advantage of monitored debt such as bank borrowings in reducing informational and monitoring costs as compared to arms' length debt, such as bonds and related debt instruments.

Several studies have, in recent years, explored the issue of banks wholesale funding and its role in the recent subprime crisis. Ratnovski and Huang (2009) examines the factors behind the unusual resilience of Canadian banks during the recent global

meltdown and finds that they relied less on wholesale funding than their peers in other advanced countries. Other studies show that banks that relied heavily on wholesale funds were more affected by the liquidity crunch, experienced a large abnormal decline in their share prices (Adrian and Shin, 2009). Using quarterly data on US banks during the subprime crisis, Cornett *et al*. (2011) finds that banks with lower reliance on wholesale funds were better able to continue lending. Cross country evidence advanced by Raddatz (2010) also supports the fact that investment banks relied more on wholesale funds as compared to commercial banks and therefore, were more prone to deposit-runs as compared to the latter. In effect, the evidence strongly suggests that greater use of wholesale funding exposed banks to new types of liquidity-related risks.

The paper has a three-fold purpose. First, we document the trend in the bank's activity and funding mix for an extended sample of banks across ownership categories for the period 1996-2007. This is interesting since it coincides with the financial sector reforms period and provides insights as to how banks' funding and activity mix has changed over this period. Second, we present empirical evidence on the determinants of fee and non-deposit funding shares, by examining how these variables are affected by a range of bank-specific, banking industry and macroeconomic factors. And finally, we assess how bank activity and funding patterns are associated with bank-level risk and return variables. We measure bank return by its profitability, defined as net profit to total asset or, return on asset (RoA). Our measure of bank risk is the Z-score, defined as the number of standard deviations that a bank's return on asset has to decline for the bank to become insolvent. Being an accounting measure of the "distance to default", it has been widely employed in the empirical banking literature in recent times (Laeven and Levine, 2009; Mercieca *et al*., 2007; Furlong and Kwan, 2005; De Nicolo, 2000).[2]

The paper fills a gap in the literature since empirical studies on the implications of bank's funding for its risk and return are limited. Several papers have however, examined the implications of combining various banking activities for bank risk. Stiroh

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[2]Contextually, the RBI utilized the Z-score measure as part of its assessment of financial soundness of Indian banks (See, RBI, 2009).

(2004) finds that Z-scores are the highest for US banks with a non-interest income share close to zero. Laeven and Levine (2009) consider a cross-country sample of banks from 48 countries to examine how bank risk, measured by the Z-score and stock return variability, is affected by bank level corporate governance factors and national banking regulations. The findings appear to indicate the importance of both these sets of factors in impacting bank risk. Laeven and Levine (2007) estimate the factors influencing bank diversification and their charter value. Using data for the period 1998-2002, their results provide support for the fact that well-diversified banks have low charters.

In a recent exercise, RBI (2007) examined the liability structure of banks and within the liability structure, the ownership and maturity pattern of deposits of commercial banks, during the entire post-reform period. The analysis finds (a) an unchanged share of borrowings in total liabilities of commercial banks during 1991-2007 and if any, an increase in the share of deposits; (b) a decline in the share of household sector in banks' total deposits, at the cost of increase in the share of government sector (a) a significant shortening of the maturity of term deposits, with a significant rise in the proportion of deposits with shorter (upto 1 year) maturities. Based on the findings, the study argues:

> *In this new environment, thus, banks face the challenge of proper assessment of risks associated with borrowed liquidity vis-a-vis stored liquidity inherent in core deposits. Regulators also need to be proactive in dealing with the emergence of any systemic risks arising out of increased recourse to borrowings*

The rest of the paper unfolds as follows. Section II provides descriptive evidence on the funding and liability structure of the banks. The following two sections delineate the empirical strategy and the results. The final section encapsulates the policy concerns.

II.   Funding mix and liability structure: Indian evidence

The time period of the study spans 1996, coinciding with the functioning of *de novo* private banks, through 2007, just prior to the onset of the global meltdown. The sample comprises of 66 banks including all state-owned, 6 *de novo* private, 15 old private

and 17 foreign banks, accounting, on average, for over 90% of banking assets. The data for the analysis are extracted from *Statistical tables relating to banks in India* (STB), a yearly publication by the Indian central bank that reports bank-wise balance sheet and profit and loss numbers. The ownership and related variables for banks are culled out from *Report on trend and progress of banks in India* (RTP), a statutory annual publication by the Indian central bank. Taken together, these two publications account for almost all of the bank-level variables employed in the analysis. The macro variables are drawn from the *Handbook of Statistics on Indian economy* (HBS), an annual central bank publication that reports time-series data on monetary and macro variables.

Table 1 enlists the activity mix along with bank risk and returns at four time points during the sample period. The first year of the sample coincides with the commencement of operations of *de novo* private banks, the year 1999-2000 marks the process of 'second generation' banking reforms, post Narasimham Committee II Report in 1998, the third period marks the beginning of a high point of global (and Indian) growth wherein banks in India also made windfall gains on their treasury portfolio riding on the back of a benign interest rate regime and the final year is just prior to the onset of the global meltdown (See Chart 1).

We measure activity mix as the ratio of fee income to total income. Across bank groups, the evidence appears to suggest that state-owned banks and old private banks broadly belong to one category, with lower than median fee incomes, whereas new private banks, from being slow starters, have gradually improved their fee income component.[3] Foreign banks have the highest fee income component, as also the highest non-deposit funding, as well, both being in excess of the sample median. State-owned and old private banks, in contrast, tend to exhibit the lowest reliance on non-deposit funds.

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[3] The median values for fee income and non-deposit funding are respectively, 0.146 and 0.048, respectively (See Table 2).

Table 1. Bank risk and activity indicators according to bank groups

Panel A	1995-96	1999-2000	2003-04	2006-07
All banks				
Fee income	0.144	0.146	0.228	0.204
Non-deposit funding	0.102	0.096	0.078	0.085
RoA	0.002	0.007	0.011	0.009
Z-score	0.230	0.229	0.261	0.262
State-owned banks (SOBs)				
Fee income	0.133	0.135	0.201	0.159
Non-deposit funding	0.097	0.093	0.076	0.078
RoA	-0.001	0.006	0.011	0.008
Z-score	0.182	0.181	0.206	0.199
New private banks (NPBs)				
Fee income	0.135	0.176	0.240	0.202
Non-deposit funding	0.105	0.109	0.114	0.131
RoA	0.020	0.008	0.012	0.009
Z-score	0.383	0.172	0.161	0.156
Old private banks (OPBs)				
Fee income	0.150	0.165	0.223	0.128
Non-deposit funding	0.096	0.089	0.064	0.079
RoA	0.011	0.008	0.012	0.007
Z-score	0.002	0.010	0.031	0.004
Foreign banks (FBs)				
Fee income	0.184	0.217	0.313	0.281
Non-deposit funding	0.182	0.243	0.247	0.238
RoA	0.016	0.012	0.016	0.016
Z-score	0.352	0.327	0.428	0.471

Panel B	Correlation matrix (p-Value)			
	Fee income	Non-deposit funding	RoA	Z-score
Fee income	1.000			
Non-deposit funding	0.723 (0.00)	1.000		
RoA	0.054 (0.71)	-0.309 (0.00)	1.000	
Z-score	0.612 (0.00)	0.635 (0.00)	-0.485 (0.00)	1.000

The Z score variable is scaled by 100

Chart 1: Bank activity and funding
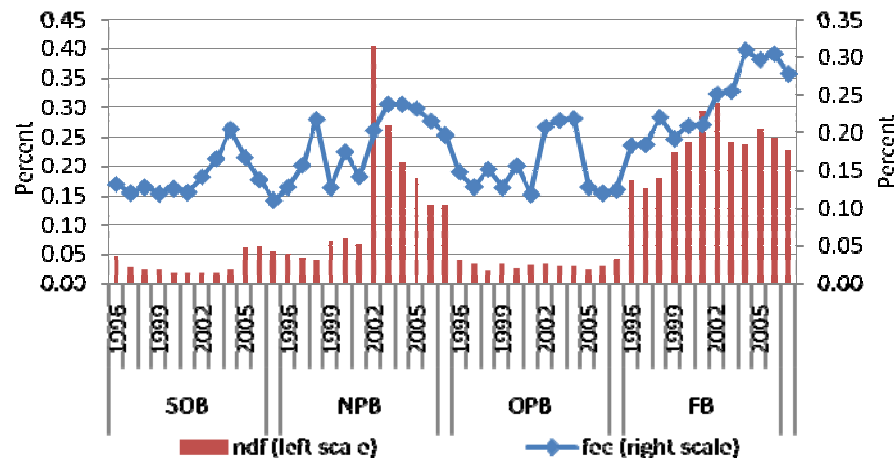
The position with regard to bank returns appears to indicate a gradual convergence in profitability across bank ownership, although foreign banks display the highest profitability ratio. In terms of bank risk as well, it is the old private bank group

that appear to be the most vulnerable; state-owned and new private banks, as a group, appear to be having similar Z-scores, the figure for foreign banks being well higher than that obtaining for these bank groups.

The correlation matrix among these variables is presented in Panel B of bank return on assets and its income mix. The correlation between bank risk and fee income is positive and significant, indicating that banks with greater reliance on fee incomes tend to have lower risk. Fee income and non-deposit funding have a positive correlation which is statistically significant as well. Thus, banks which are non-traditional in having a relatively high fee income share tend to be non-traditional in the sense of high non-deposit funding share. This is consistent with the analytical framework advanced by Rajan and Stein (2002) which justifies the co-existence of lending and deposit-taking within the same financial institution. These raw correlations however, do not control for bank-specific or business cycle effects.

A number of factors make the banking sector in India an interesting case to study the interlinkage between bank risk and funding strategy. First, over the 1990s, India has undergone liberalization of the banking sector with the objective of enhancing efficiency, productivity and profitability (Government of India, 1991). Second, the banking sector has 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). Third, most studies on bank income mix pertain to developed country markets (Stiroh, 2004; Lins and Servaes, 1999; Laeven and Levine, 2007). The issue as to the interplay between funding strategy and bank risk in emerging markets as India where the financial system is pre-dominantly bank-based and government-owned remains a moot issue. To the best of our knowledge, this is perhaps the first study for India to systematically explore the association between funding strategy and bank risk.

The present article augments the empirical literature in several distinct ways. First, we contribute to the debate as to whether funding mix matters for bank risk and return. Evidence suggests that short-term wholesale funding was the prime culprit that

helped to sink Northern Rock, a leading mortgage bank in the UK. The bank's failure in September 2007 is indelibly associated with images of Britain's first retail bank run since the late 1800s. Second, the paper contributes to the debate on bank ownership. Empirical research appears to suggest that ownership matters for bank performance (Megginson and Netter, 2001; Megginson, 2005; Bonin *et al.*, 2005; Sapienza, 2004; Dinc, 2005). In the Indian case, research uncovers a gradual convergence in the performance of state-owned *versus* other bank groups (Das and Ghosh, 2006), although there appears to be wide divergence in profit efficiency across bank ownership (Das and Ghosh, 2009). Whether there exists any such variation in funding strategy across bank ownership categories remains an issue of empirical investigation. Third, by linking bank funding and bank risk and returns to bank ownership, we also contribute to the ownership-performance-bank risk debate, an aspect hitherto unexplored in the Indian context. Finally, the study belongs to the broader literature that focuses on the financial intermediation role of banks. Empirical studies have examined the link between lending and deposit taking activity of banks. Berlin and Mester (1999) suggest that core deposits, *i.e.*, deposits with inelastic interest rates, represent an important basis for relationship lending. In the Indian context, research uncovers that bank-firm relationship vary significantly by ownership : while foreign banks are more likely to be associated with listed (and hence, transparent) manufacturing firms, state-owned banks typically forge relationships with small firms having limited credit access (Berger *et al.*, 2008). These papers build on the theoretical models that propose the co-existence of lending and deposit-taking that is based on information or liquidity shortages (Kashyap *et al.*, 2002; Mester *et al.*, 2005).

III. Empirical strategy

As a starting point, we first conduct univariate tests to examine the differences in the relevant bank-level variables across bank ownership. Later in the analysis, we employ dummy variables to control for ownership.

Table 3. Univariate tests of bank-level variables: Means and standard deviation (SD)

Variable	RoA		Z-score		Fee income		Non-deposit funding	
Bank group	N.Obs	Mean (SD)	N.Obs	Mean (SD)	N.Obs	Mean (SD)	N.Obs	Mean (SD)
SOB	336	0.006 (0.008)	324	0.053 (0.029)	336	0.137 (0.042)	335	0.028 (0.063)
NPB	72	0.009 (0.011)	60	0.051 (0.094)	72	0.178 (0.048)	71	0.078 (0.096)
OPB	180	0.008 (0.009)	168	0.048 (0.092)	180	0.149 (0.067)	179	0.056 (0.142)
FB	195	0.009 (0.026)	149	0.049 (0.097)	195	0.217 (0.116)	193	0.234 (0.179)
t-test for difference								
SOB *vs.* NPB	-2.193**		18.054***		-6.718***		-4.201***	
SOB *vs.* OPB	-2.499***		-0.577		-2.184**		-2.509***	
SOB *vs.* FB	-1.569		9.851***		-9.284***		-15.446***	
NPB *vs.* OPB	-0.685		-14.818***		-3.843***		1.413	
NPB *vs.* FB	-0.261		-7.069***		-3.881***		-9.070***	
OPB *vs.* FB	-0.505		-8.654***		7.016***		10.663***	

The Z-score variable is scaled by 100

*** and ** denote statistical significance at 1 and 5%, respectively

The univariate results in Table 3 are strongly supportive of significant differences, primarily in activity and funding strategy. Take, for instance, non-deposit funding. On average, roughly 3 percent of funding for SOBs is from non-deposit sources as compared to well over 20 percent for foreign banks. This difference is statistically significant at the 0.01 level. Fee income demonstrates the greatest difference across bank groups. On average, fee income constitutes roughly 22 percent of total income for foreign banks, which are over 60 percent higher as compared to SOBs and 22 percent as compared to NPBs. Similar differences are in evidence across bank risk, although the differences in terms of bank returns are much less compelling.

These univariate tests do not take into consideration several bank-specific variables. By way of example, funding strategy could differ across bank size. The risk appetite of fast-growing banks could differ from others. Similarly, the state of the banking industry as also the macroeconomic environment could impinge on bank activity and funding mix. Taking these concerns on board, we employ a multivariate regression framework, by specifying a reduced-form equation for bank s at time t of the following form:

$$y_{st} = \varphi_0 + \varphi_1 B_{st} + \varphi_2 Z_t + \varphi_3 M_t + \varphi_4 OD_t + \varepsilon_{st} \tag{1}$$

where s indexes bank and t denotes year; φ s' are the parameters to be estimated.

In (1), the dependent variable (y) is assumed to be a function of bank-level controls (B), time-varying banking industry specific variables (Z) and macroeconomic

controls (*M*). The bank-level controls include the following. First, the log of bank assets is employed as a proxy for bank size. Second, the equity-to-asset ratio is employed to measure bank capitalization. Third, we construct the bank (real) asset growth variable to allow for the possibility that fast growing banks could have different funding and income profiles. Finally, the cost-to-income ratio controls for bank-level efficiency.

At the banking industry level, we control for the asset share of foreign banks and deposit concentration variables. Higher foreign bank presence could engender higher competition, leading to lower fee incomes. Alternately, higher competition could lead certain bank groups to undercut others, leading to unequal distribution of fee incomes across bank ownership. Finally, we control for the macroeconomic environment by introducing controls for the real GDP growth and the interest rate. To moderate the influence of noise in the macroeconomic variables, we employ dummies instead of the continuous variables. Finally, following from the univariate results, we utilize ownership dummies (OD), since bank income and funding mix are found to differ across ownership. Throughout, the reported standard errors take on board the possibility of serial correlation and heteroskedasticity pertaining to the same bank (i.e., bank-level clustered standard errors).

IV. Discussion of the results
IV.1 Determinants of interest income shares and funding pattern

Table 4 presents the results of regression that relates fee income to a set of bank-level variables and macroeconomic controls. Larger, fast growing financial firms tend to have higher fee income shares. On the whole, controlling for everything else, fee-generating activities appear to be associated with greater equity. Fee incomes are higher in an environment of low interest rates and GDP growth. Across bank ownership, state-owned banks rely less on fee incomes, whereas foreign banks tend to exhibit greater reliance on fee income as compared to old private banks (the omitted category).

In specifications (2)-(3), we include indicators of the market structure of banking systems. Specifically, the variable *concentration* is defined as the deposits of top 5 banks

in a given year, while *foreign* denote the fraction of banking sector assets that are owned by foreign banks, respectively.

The coefficient on *foreign* is negative and statistically significant. In economic terms, everything else equal, greater dominance of foreign banks appear to lower fee incomes presumably by weaning away more creditworthy customers, consistent with "cherry picking".

Table 4. Regression analysis : Fee income and non-deposit funding

Variable	Dep. Var =Fee income			Dep. Var = Non deposit funding		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.036 (0.057)	0.257 (0.077)***	0.709 (0.135)***	-0.039 (0.126)	-0.013 (0.118)	-0.163 (0.172)
Size	0.033 (0.010)***	0.030 (0.010)***	0.023 (0.011)**	0.016 (0.022)	0.016 (0.021)	0.018 (0.021)
Equity/Asset	0.309 (0.074)***	0.301 (0.073)***	0.258 (0.076)***	0.018 (0.199)	0.017 (0.199)	0.027 (0.201)
Asset growth	0.008 (0.002)***	0.008 (0.002)***	0.008 (0.002)***	0.025 (0.011)**	0.025 (0.011)**	0.025 (0.011)**
CIR	-0.029 (0.019)	-0.025 (0.018)	-0.020 (0.018)	0.019 (0.039)	0.019 (0.039)	0.018 (0.039)
Foreign		-0.354 (0.051)***			-0.317 (0.895)	
Concentration			-0.161 (0.023)***			0.269 (0.318)
dy_GDPGR	-0.004 (0.004)	-0.029 (0.006)***	-0.017 (0.004)***	-0.002 (0.009)	-0.004 (0.013)	0.008 (0.010)
dy_Interest	-0.001 (0.005)	-0.016 (0.006)***	0.015 (0.004)***	0.009 (0.008)	0.008 (0.011)	0.006 (0.008)
dy_SOB	-0.038 (0.014)***	-0.036 (0.014)***	-0.029 (0.014)**	-0.033 (0.025)	-0.033 (0.025)	-0.034 (0.026)
dy_NPB	0.009 (0.012)	0.012 (0.011)	0.016 (0.011)	0.013 (0.025)	0.013 (0.025)	0.012 (0.025)
dy_FB	0.055 (0.023)***	0.057 (0.023)***	0.059 (0.023)***	0.178 (0.042)***	0.179 (0.042)***	0.177 (0.042)***
dy_merger	-0.002 (0.017)	-0.002 (0.016)	-0.0001 (0.016)	0.055 (0.060)	0.055 (0.061)	0.055 (0.061)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	779; 66	779; 66	779; 66	779; 66	779; 66	779; 66
R-squared	0.252	0.286	0.313	0.324	0.324	0.324
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

In specification (3), *concentration* is negative and significant with a point estimate equal to 0.16. In other words, an increase in concentration (and thus lower competition) by 1 percent lowers fee incomes by roughly 0.2 percent, perhaps because banks under-cut each other through price wars.

The remaining three regressions have the non-deposit funding share as the dependent variable and are otherwise fully analogous to the previous regression. Among the independent variable, it is only the association with asset growth which matters. This suggests that fast-growing banks appear to be relatively heavily financed through non-deposits, increasing leverage. Additionally, the coefficient on *dy_foreign* is significant and positive, conforming to anecdotal evidence that this bank category relies more on non-deposit funds as compared to others (See Table 3 above).

Since all models control for the business cycle and the monetary policy as also for bank mergers, it seems less likely that these results are driven by macroeconomic or such related considerations.

IV.2 Evaluation of bank risk and return

Next, we examine the relationship between fee income and non-deposit funding shares on the one hand and bank risk and return, on the other. To start with, Table 5 reports the results of regression with return on assets as the dependent variable. Regression 1 includes fee income share, in addition to a range of bank level and macroeconomic controls, including controls for bank ownership. The fee income share obtains a positive coefficient of 0.038 that is statistically significant. This implies that banks with focus on generating fee income tend to exhibit higher profitability. Besides the statistical significance, the economic magnitude of the coefficient is important as well: a one standard deviation rise in fee incomes raised return on asset by 0.2 standard deviation. Among the controls, *size* and *equity* are positive, whereas *CIR* is negative. All of these are statistically significant at the 0.05 percent or lower. This would indicate that big, well-capitalized and cost efficient banks tend to be more profitable. The ownership dummies indicate that profitability of all bank groups is higher as compared to old private banks.

Regression 2 relates RoA to the non-deposit funding share and other controls, as earlier. The variable is estimated to have a negative but insignificant impact on bank profits. The sign and significance of control variables are the same as earlier.

The specification in regression 3 includes both fee income and non-deposit funding shares in the regressions. While fee income retains its positive and significant sign, non-deposit funding has an observed negative coefficient with a point estimate equal to -0.012; in other words, a 10 percent rise in non-deposit funding lowers bank profitability by roughly 0.1 percent. This indicates that notwithstanding the higher profitability of banks from fee income, greater reliance on non-deposit funding dampens profitability. This implies that a change in the funding mix towards relatively costly

market funding raises the overall cost of funds, putting pressure on their profitability. This concurs with evidence proffered in the Indian context which suggests that reliance on non-deposit funding may raise costs for banks by making them rely on more expensive funding.

Table 5. Determinants of Return on Asset

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.002 (0.008)	-0.004 (0.009)	-0.002 (0.008)	-0.001 (0.009)	-0.017 (0.007)***	-0.062 (0.023)***
Size	0.003 (0.001)***	0.004 (0.001)***	0.003 (0.001)***	0.003 (0.001)***	0.003 (0.001)***	0.003 (0.001)***
Equity/Asset	0.037 (0.016)**	0.045 (0.017)***	0.036 (0.015)***	0.036 (0.015)**	0.035 (0.015)**	0.037 (0.015)***
Asset growth	0.0002 (0.0004)	0.0007 (0.0004)	0.0005 (0.0004)	0.0005 (0.0006)	0.0005 (0.0005)	0.0005 (0.0005)
CIR	-0.023 (0.008)***	-0.024 (0.007)***	-0.023 (0.008)***	-0.023 (0.008)***	-0.023 (0.008)***	-0.024 (0.007)***
Fee income	0.038 (0.020)*		0.043 (0.021)**	0.029 (0.036)	0.034 (0.035)	0.040 (0.039)
NDF		-0.005 (0.005)	-0.012 (0.006)**	-0.009 (0.016)	-0.011 (0.016)	-0.013 (0.015)
Squared fee income				0.031 (0.049)	0.025 (0.049)	0.022 (0.052)
Squared NDF				-0.003 (0.026)	-0.002 (0.026)	0.0007 (0.024)
Foreign					0.189 (0.113)*	
Concentration						-0.133 (0.035)***
dy_GDPGR	0.0003 (0.0008)	0.0002 (0.0007)	0.0003 (0.0008)	0.0002 (0.0009)	0.002 (0.0009)*	0.001 (0.001)
dy_Interest	0.0008 (0.0008)	0.0009 (0.0005)*	0.0009 (0.0008)	0.001 (0.0008)	0.002 (0.002)	-0.0003 (0.0009)
dy_SOB	0.002 (0.001)**	0.004 (0.001)***	0.003 (0.001)**	0.003 (0.001)**	0.003 (0.001)**	0.003 (0.001)***
dy_NPB	0.003 (0.001)**	0.003 (0.001)**	0.003 (0.001)**	0.003 (0.002)*	0.003 (0.002)*	0.004 (0.002)**
dy_FB	0.004 (0.002)**	0.001 (0.002)	0.002 (0.001)	0.002 (0.002)	0.002 (0.002)	0.003 (0.002)
dy_merger	0.001 (0.004)	0.001 (0.004)	0.002 (0.004)	0.001 (0.004)	0.001 (0.003)	0.002 (0.004)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	779; 66	779; 66	779; 66	779; 66	779; 66	779; 66
R-squared	0.258	0.230	0.266	0.267	0.269	0.277
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

To account for possible non-linearities in the estimation, regression 4 includes linear as well as quadratic terms for both the fee income and non-deposit funding variables. Post inclusion of these variables, both the linear as well as the quadratic terms lose their statistical significance, suggesting that the relation between profitability and fee income on the one hand, and between profitability and non-deposit funding on the other, do not have any non-linearity.

Models 5 and 6 sequentially include the banking industry variables, as earlier. It appears that higher presence of foreign banks improves profitability by compelling domestic banks to explore alternate ways of improving bottomlines. Higher competition, as expected, dampens bank profits.

The regressions control for the macroeconomic environment, including GDP growth and real interest rates. Whenever significant, these exhibits expected signs. Thus, profitability is higher in a boom as also under a high interest rate regime.

Table 6. Determinants of Z-score

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.0006 (0.030)	-0.002 (0.029)	-0.0008 (0.030)	0.001 (0.029)	-0.043 (0.036)	-0.098 (0.054)*
Size	0.012 (0.005)***	0.013 (0.005)***	0.012 (0.005)***	0.012 (0.005)**	0.012 (0.005)***	0.013 (0.005)***
Equity/Asset	0.055 (0.031)*	0.060 (0.031)**	0.054 (0.033)	0.056 (0.034)*	0.054 (0.034)	0.058 (0.035)*
Asset growth	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.001)***	-0.003 (0.001)***
CIR	-0.039 (0.007)***	-0.040 (0.007)***	-0.038 (0.007)***	-0.039 (0.007)***	-0.039 (0.007)***	-0.041 (0.008)***
Fee income	0.033 (0.023)		0.038 (0.024)	0.010 (0.048)	0.028 (0.049)	0.033 (0.049)
NDF		-0.005 (0.017)	-0.012 (0.016)	0.007 (0.043)	0.002 (0.041)	-0.002 (0.041)
Squared fee income				0.062 (0.080)	0.039 (0.083)	0.040 (0.081)
Squared NDF				-0.029 (0.050)	-0.023 (0.043)	-0.019 (0.048)
Foreign					0.543 (0.176)***	
Concentration						0.217 (0.077)***
dy_GDPGR	0.003 (0.001)***	0.002 (0.001)**	0.003 (0.001)***	0.002 (0.001)**	0.006 (0.002)***	0.004 (0.001)***
dy_Interest	0.005 (0.001)***	0.005 (0.001)***	0.005 (0.002)***	0.005 (0.001)***	0.007 (0.002)***	0.003 (0.001)**
dy_SOB	-0.011 (0.007)	-0.012 (0.008)	-0.012 (0.007)	-0.011 (0.007)	-0.012 (0.007)	-0.012 (0.008)
dy_NPB	-0.049 (0.007)***	-0.049 (0.007)***	-0.049 (0.007)***	-0.049 (0.007)***	-0.050 (0.007)***	-0.051 (0.007)***
dy_FB	-0.032 (0.008)***	-0.029 (0.008)***	-0.030 (0.009)***	-0.032 (0.009)***	-0.032 (0.009)***	-0.032 (0.009)***
dy_merger	0.014 (0.011)	0.014 (0.012)	0.015 (0.011)	0.014 (0.011)	0.014 (0.012)	0.014 (0.012)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	701; 59	701; 59	701; 59	701; 59	701; 59	701; 59
R-squared	0.346	0.342	0.348	0.349	0.355	0.356
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

The Z-score regressions in Table 6 are similar to those obtained under the profitability regressions. Specifically, big, cost efficient and capitalized banks have higher Z-scores (low insolvency risk). Unlike the findings related to bank return however, fast-growing banks are found to display lower Z-score. Unbridled expansion of the loan book to fund asset expansion comes could manifest itself in high delinquent loans at a future date, with adverse implications for bank solvency. This is consistent with cross-country evidence which suggests that high credit growth could act as a potential harbinger for financial stability (Demirguc-Kunt and Detragiache, 1998; Borio and Lowe, 2002; Cottarelli *et al.*, 2005).

In regressions (1) and (2), the coefficients on *fee income* and *non-deposit funding* are not statistically significant. Allowing for non-linearity in Models (3) and (4) does not alter the results. Thus, it appears that while banks income and funding strategy impacts

its return, its influence on bank risk is limited. Examining bank risk by ownership, the results indicate that risk varies across ownership. More specifically, foreign and *de novo* private banks appear to exhibit lower risk.

Summing up, the findings indicate that larger, fast growing financial firms tend to have higher fee income shares. In addition, banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. In terms of bank riskiness, the evidence is consistent with the conjecture that big, cost efficient and capitalized banks are less risky. The results are summarized in Table 7.

Table 7. Summary of empirical findings

Variable	Impact on banks'			
	Activity	Funding mix	Risk	Returns
Size	+	..	+	+
Capital	+	..	+	+
Asset growth	+	+	-	..
Efficiency	-	..	-	-
Activity			..	+
Funding mix			..	..
Ownership				
State-owned	-	..	..	+
New private	..	..	-	+
Foreign	+	+	-	+

"`..`" no discernible impact

V. Concluding remarks

The recent global meltdown has witnessed the demise of leading banks across several developed and emerging markets. One prime suspect of such bank failures has been their funding strategy. In particular, banks that encountered financial distress were the ones that relied more heavily on non-deposit resources to fund asset expansion. These observations led us to examine this aspect in a comprehensive manner, using India as a case study. Accordingly, we use a cross-section of banks during 1996-2007 spanning across ownership categories to explore this issue.

The findings have important ramifications for policy. For one, it appears that traditional banks – with a reliance on non-deposit funding - are relatively safe as

compared to those with have a high proportion of market resources in their funding strategy. Therefore, in conjunction with other monetary and prudential ratios, the banks' funding mix can also provide important signals to policy makers regarding their health and viability. Second, uncontrolled expansion of the loan book in the quest for garnering market share could be a recipe for future problems. Across countries, over-stretched financial systems and "search for yields" has been found to lead to riskier banking systems, leading commentators to seek for imposition of "speed limits" (Honohan, 1997), either on their loan book or on segments that appear in danger of over-extension. Third, while the literature provides ample evidence that ownership matters for bank profitability, there is little by way of research to suggest whether ownership affects for bank income mix and funding strategy or for that matter, for bank risk. Judged thus, the evidence proffered in the paper provides insights of the importance of ownership for bank funding strategy. Bank groups which show signs of greater reliance on market funding mixes could be potential candidates for close scrutiny. Finally, the analysis emphasizes the role of prudent liquidity management for a sound bank balance sheet. At the macro level, theoretical research has veered around towards making an explicit distinction between *funding liquidity* – ability to meet cash obligations when due – and *market liquidity* – ability of financial investors to literally liquidate a non-cash asset. These two liquidity risks are mutually reinforcing: shocks to funding liquidity can lead to asset sales and depress asset prices, with dire consequences for market liquidity. The loop is established when lower market liquidity leads to higher margin calls (margins are typically higher in an illiquid market), which increases funding liquidity risk as outflows rise. A downward spiral begins as a new round of asset sales is triggered off so that banks can remain liquid, leading to *liquidity spirals* (Brunnermeier and Pedersen, 2009).[4] In essence, the results are a pointer to the fact that there are limits as to how far can

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[4] For example, holding a liquid instrument may be of little value in an emergency situation if suddenly, no trading partner willing to buy the supposedly liquid asset at a reasonable price can be found in the market.

banks veer away from traditional banking models, especially if they are to conduct their business in a safe, sound and cost-efficient manner.

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