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Abstract

This paper investigates the relationship between the changing patterns of bank's source of income and risk adjusted performance. A database of 77 banks over the period of 1999 to 2004 is constructed for the 27 public sector banks, 22 private banks, 25 foreign banks and 3 cooperative banks to compare their change in income composition. Bank's performance is measured by risk adjusted return on BIS risk allocated capital (RARORAC). To examine the relationship between ownership pattern and performance, we compare the difference between new generation private sector banks and foreign banks with their public sector and cooperative banks counterparts. We argue that in a competitive financial market in order to change the profitability drivers in banking, Indian banks need to improve their non-interest income and also augment risk adjusted interest income through better risk based pricing.

Keywords: Banking, Value creation and performance

JEL: F23, G21, L1

I. Introduction

Indian banking industry is going through a phase of metamorphosis and witnessing changing strategizing by different banks to adapt to the evolving competitive environment. The shift from traditional social banking to profit banking, implementation of prudential norms pertaining to capital adequacy, income recognition asset classification and provisioning, exposure norms etc have given rise to increased competition and thrown greater challenges in the banking sector. At the same time, the reduced regulatory controls, higher caps on foreign investment, and introduction of newer products and services facilitated by better technology and skill-sets have also opened up a host of opportunities for the banks to diversify its activities. The long-run impact of these changes in the Indian banking sector will be dependent upon how best a bank is able to adapt itself to and leverage maximum benefit out of this changing environment.

The assessment of bank earnings is an integral part of most models of supervision and supervisory rating systems (Couto & Brasil, 2002). Although traditionally banks were considered to be mere intermediaries between depositors and borrowers and its source of income to be the interest spread between the two activities, increasingly banks are diversifying their business as a means of profit maximization and risk mitigation. The increase in fee income to account for one-third to two-thirds of combined operating revenue in US banks has been brought out by Radecki (1999). However, studies of this nature in non-existent in the Indian context.

Performance in terms of profitability has come to be important for Indian Banks as well after the banking sector reforms. Literature is more abundant on determinants of bank performance in the Indian as well as other country context. Researchers have tried to analyze

bank performance based on external and internal variables in various country contexts (Gisycki, 2001). External variables include rate of economic growth, industry-wide developments, inflation, money supply and other macroeconomic factors; while bank specific internal variables included are nature of ownership, size, quality of assets, interest spread, business diversification, and productivity and growth parameters. Studies in Indian context have concentrated on analyzing the impact of ownership on bank efficiency and performance since reforms (Sarkar et al 1998, Arun and Turner 2002, Mohan 2002, De 2003, Das et al 2005, Mohan 2005). The business diversification impact on bank performance in the Indian context has not been the main focus of their research. De (2003) does include a business diversification variable in his analysis however reporting it to be irrelevant in determining the bank performance.

In this paper, we have analyzed the changing trends in the income pattern of Indian banking sector and its role in determining risk adjusted bank performance. The source of income generation by the bank actually reveals its business strategy which in turn determines the bank performance. The proposition of this study is that banks that have been able to diversify their income sources have been able to perform better than banks that depend more on traditional source of interest income. Our analysis reveals that there are not only inter-temporal changes in income patterns, but also that income behavior of banks varies across their ownership structure. Studies in the Indian context analyzing bank performance and ownership categories have come up with mixed findings. While some studies (Mathur 2002, Ram Mohan 2003, Das et al 2005) conclude performance of public sector banks statistically not different from the private sector banks, others like D'Sousa (2002) is more skeptical about the performance of public sector banks vis-à-vis private and foreign banks. Our own

analysis indicates that although in terms of return on asset (ROA) public sector and old private sector banks are doing better than new private sector and foreign banks, in terms of risk adjusted performance, the comparisons bring out very different picture. We find that in terms of risk adjusted return on risk adjusted capital (RARORAC) the new generation private and foreign banks perform on an average better than public sector and old private sector banks and the difference is also statistically significant.

The existing literature delineated above have used return on assets, return on equity, productivity etc as the measure of bank performance. However, with the implementation of Basel II norms, the concern of banks is now increasingly on their risk adjusted returns. Therefore, risk adjusted measures of banks have become more meaningful measures of bank performance. This implies that apart from the level of profits or earnings, the source of profit or income is also of importance as different activities of the banks are associated with different types of risk levels. Studies based on risk adjusted performance measures have been based on stock market returns data and as such limited to listed banks (Stiroh 2005, Ram Mohan 2003). Stiroh (2005) uses the methodology to assess the relationship between bank diversification and volatility of risk adjusted returns in US banks and concludes that volatility is higher for banks with higher non-interest income especially from trading activity. The latter study by Ram Mohan (2003) in the Indian context uses risk-adjusted return comparison to compare bank performance across ownership groups and concludes that there is no statistical difference between the performance of public sector and private sector banks. The study however does not analyze the determinants of the bank performance. The limitations of using risk adjusted measures derived from the stock market is the study then gets restricted to banks listed on the stock markets. We therefore derive risk adjusted performance measure

from balance sheet information details of which are discussed in the ensuing section. Our own analysis in this paper indicates that ROA and RARORAC give varying indications regarding the relative performance of banks depending on their group affiliation.

The impact of income sources on the risk adjusted bank performance is also assessed in a multivariate context. Our panel fixed effect regression results show that banks can improve its risk adjusted performance through diversifying their income towards non-interest sources of income, especially fee-based income and, also by undertaking better risk based pricing and credit risk management in its traditional activity of generating interest income.

The rest of the paper is organized as follows. Section II discusses data and variables used in this study. Section III analyses the recent trends in bank income across ownership groups over time. The multivariate panel fixed effect generalized least square models used to estimate the role of income sources in determining bank performance and the results of this analysis are presented in Section IV. The final section V brings up the summary findings and major conclusions of our empirical paper.

II. Data and Variables

The empirical analysis is based on the CMIE 'Prowess" balance sheet data for 77 banks in the Indian banking industry over the six year period (1999-2004). The sample consists of the 27 public sector banks, 22 private banks, 25 foreign banks and 3 cooperative banks. For purposes of multivariate analysis we have reclassified the banks in our sample into two broad categories of new and old generation banks. Banks incorporated after 1985 is defined as new generation while the rest constitute the old generation banks. This basically leads to classification of new private sector and foreign banks as new generation banks with public sector and old private sector banks constituting the old generation category.

One of the important concerns of our study is to find a more practical measure of bank performance. Traditionally bank performance has been measured in terms of its profitability with net interest income, fee income and operating expenses being the structural determinants of profitability. Other empirical works have used ROA (Return on Asset), ROE (Return on Equity), and NII (Net interest income) as the criterion for assessing bank performance. However these traditional measures do not indicate the risk incurred in generating these returns and therefore is not adjusted for the risk. Ratio such as RARORAC (risk-adjusted return on BIS risk adjusted capital) is an improvement over ROA in this respect. It is important to use RARORAC or RAROC (risk adjusted return on economic capital) as a measure of bank performance because it captures the risk involved which has implications for the capital requirements of Banks as envisaged in Basel I and II norms for capital adequacy. We have defined RARORAC as the ratio of bank's risk adjusted income over BIS risk adjusted assets. Risk adjusted income is obtained by subtracting the cost of funds, operating expenses and amount of provisions bank make for non performing assets (NPAs), bad and doubtful assets from the bank's gross income. Gross income includes fee based income plus fund based income and other operating income. Fee based income includes the income earned by banking industries through commission earning on brokerage activities and due to other financial activities (like wealth management for high net worth individuals, insurance products etc.). Fund based income includes interest income through advances, income through trading activities, income on bill discounting and income on foreign exchange transactions etc. The BIS risk adjusted asset is equal to the multiple of the stipulated 9% capital adequacy with the bank's total advances. Our RARORAC figure is a close proxy for risk adjusted performance measure of banks.

The major purpose of our study is to examine how the income pattern of banks impact their risk adjusted performance. Accordingly, we had to study sources of bank income from their audited balance sheet information available in the Prowess database. The CMIE Prowess database classifies bank income in two ways: 1) Interest income and Non-interest income and 2) Fund based income and fee based income. Interest income refers to income got through the core activity of lending as also interest received on investment assets held by bank. Non-interest income comprises of profits on account of trading, net gains on foreign currency transactions other than trading, income from fiduciary activities, fees and commissions received for payments and settlements business like issuing letters of credit and guarantees, fees from other financial services relating to syndication and underwriting, investment management, credit card, derivatives etc.

The other way of categorizing bank income is into fee-based and fund-based income. Fund based income includes interest received on advances and investments made, trading profits. The fees and commissions charged on account of services rendered without having to commit bank funds comprises of the fee-based income. It is evident that fee-based income forms a component of non-interest income while interest income forms a component of fund based income.

We reclassify the above categorization to isolate the three major sources of bank income viz., interest income, investment income[1] and fee-based income. The sources of income not falling in these three classifications are taken as "other income" for the purpose of this analysis. This constitutes interest income from deposits with RBI, tax refunds, gain on sale of assets, provisions written back, miscellaneous income etc. Appendix A lists the definitions of the variables used in our empirical analysis.

[1] Investment income is taken as the difference between the non-interest income and fee based income.

Besides these target variables, profitability, bank's asset quality industry performance may also be important determinant of bank performance which are needed to be used as control variables. Accordingly, we have taken the bank's return on asset (ROA) which is the ratio of operating profit over total assets as control for bank profitability. Similarly, overall industry risk profile may also affect bank's risk adjusted performance. Consequently, we estimate one yearly average of industry default rates (IND_EDF) from the transition analysis CRISIL's long term corporate bond ratings. The bond rating information of 542 corporates are obtained from the CRISIL's monthly rating scan. Here we have assumed that all the bank's have the uniform industry portfolio structure. Bank's asset quality is also an important factor of its risk adjusted performance. Hence, we have taken the bank's amount of net non performing assets as proportion of its net advances as proxy for its asset quality (ASSET_QUALITY). The higher ratio for a bank indicates that it is loaded with more of bad assets in its lending portfolio and is exposed to greater risk.

III. Recent Trends in Bank Income

There is no doubt that Indian banking industry as a whole is on an expansion mode reflected by the growth in the average income of banks from Rs.1234.3 crores in 1999 to Rs 2342.16 crores in 2004 (Table 1). A similar increase can also be found in the mean incomes of banks across various ownership groups (Table 1). The public sector bank on an average continues to be largest as compared to other ownership groups followed by private sector and foreign banks. The average rate of growth of income however has been highest among private sector banks and hence the difference in the average income sizes of public and private sector banks have narrowed over the years. While in 1999 the average size of private sector and foreign bank differed only marginally, the average size of private sector banks

became more than twice that of foreign banks by 2004. This is because of the high growth rate recorded by some of the new generation private sector banks which is compounded by an average negative growth recorded by foreign banks in the sample. One can notice from the Table 1 that there has been high variability in the growth of income among the foreign banks in recent years (mainly in 2003 & 2004). Despite the positive rates of average growth, a deceleration in the rate of average growth rate of bank income across ownership groups can also be noticed excepting a brief revival noticed in the year 2002. This is mainly because banks have made high levels of treasury profits during this period facilitated by the falling interest rate scenario. However this source of income could not be maintained with the reversal of trends in interest rates. Further, competitive pressures among banks also have pushed down their spread and the income growth.

The trends of average income can be better understood if we also analyze the movement of bank's various sources of income in detail. A breakup of total income of banks by its composition reveals the business strategy of the bank behind the income generation. Trends in income composition of all banks indicate that share of interest income in total income has been declining over the years (Table 2). The share of interest income has posted a negative growth rate of 5.5% while share of fee-based income also has declined by 1.1% (Table 3). The share of investment income on the other hand shows an increase by 2%. This has resulted in interest income being replaced by investment income as the single largest source of income of banks. These results at the industry level however hide the differences in the strategies of various ownership groups and therefore we next undertake inter-temporal as well as inter-sectoral comparisons across ownership groups.

Inter-temporal comparisons

The public sector and old private sector banks trends reflect that of the industry average. Despite the hardening of interest rates since 2004 and consequent losses on trading account, the 5.4% growth recorded in investment income of public sector banks has resulted in it accounting for more than 50% of total income (Table 3). This has been at the expense of interest income and fee income which posted compound growth rates of -2.34% and -6.3% respectively (Table 3). The old private sector banks mirror the same trends as public sector banks. The new private sector banks however indicate very different patterns. The only category of banks that has posted increase in share of interest income in total income is the new private sector banks whose interest income on an average rose by 2.3%. The share of interest income and fee income for the new private sector banks have increased from 36.8% in 1999 to 45.6% in 2004 replacing investment income as the single largest source of income. The share of fee income also grew by 2.2% to reach 8.3% of total income. The income composition of foreign banks indicates a different pattern. The share of fee based income has consistently been highest among foreign banks and it has shown an increase in its share in total income by over 5.5% over the years. Investment income has also increased though the fluctuating nature of this income source is visible in the wide swings in its share in total income over the years. The interest income has shown a sharp decline by almost 12% over the years. These trends indicate marked differences in the diversification strategies being followed by different groups of banks. The new generation private sector banks are going for aggressive credit expansion and at the same time trying to diversify through fee based income. This has led to increasing competition among banks and eaten up the interest income as well as fee based activities of both public sector and old private sector banks. The foreign

banks on the other hand seem to be concentrating more on fee income. The cooperative banks seem to be parking the funds with RBI.

Inter-sectoral comparisons

In Table 5, our univariate t-test and wilcoxon signed ranks test results show a significant difference between the income shares among public sector, old private and foreign banks. The old private banks, on average, have a higher share of interest income in their total income than the public sector banks (Table 5). In contrast, foreign banks and new private sector banks are seen to have lesser shares from interest income compared to the public sector banks. The difference in interest income shares is however not statistically significant. More or less the same pattern is observed in the case of investment income. Share of investment income in total income however is seen to be higher for public sector compared to old private sector banks. Foreign banks the have highest share of fee income in their total income vis-à-vis all other sectors and the new private sector banks have higher share compared to public and old private sector banks in this regard.

The difference in the income strategies of various sectors of banks can be better brought out by finding the entropy of income shares (Table 6). As the size of the banks both within and across sectors differs, the entropy share for a bank will tell us the relative contribution of each sector of banks in each income category. The entropy estimation involves generating the ratio of sector wise individual income share to the total income share of that sector in the industry. For example, an entropy share equal to 1 for fee based income of new private sector banks indicates that contribution of fee income in that sector in total banking industry fee income is in equal proportion to the relative total income size of the sectors in the industry. An entropy share greater than 1 indicates that the relative

contribution of bank to total fee income is greater than warranted by the size of the bank. It is clear from the Table 6 that public and old private sector banks are concentrating on fund based activities, specifically in lending activities while foreign and private sector contribute more through fee-based activities.

To sum up, the analysis so far indicates that there has been a change in the sources of income for banks over time. These changes are observed to be different for various sectors across ownership. The public sector and old private sector banks seems to be the least successful in diversifying to fee-based activities and continuing to derive its income through fund based activities. These sectors also indicate a shift towards investment income from interest income within their fund based activities. However, the new generation private sector banks seems to be following a different strategy with increasing fee based income but still relying heavily on fund based activities more specifically interest income with share of investment income have come down substantially. Finally foreign banks have been increasingly relying on fee-based activities and investment income.

The differences in the income diversification of different sectors of banks are quite interesting because it has implications on the risk the bank takes on by following these varied strategies. Accordingly, we have carried out bank wise income volatility analysis over time to understand the riskiness of various income streams according to their group affiliation. The riskiness of income is estimated by taking the standard deviation of negative values of income returns. Our analysis reveals that investment income tends to be the riskiest mode of income followed by interest income and fee based income (go back to Table 4). This pattern is consistent for all sectors of the banks. This is perhaps the reason why new generation banks have diversified into fee-based income which is more stable and brings lesser liability

on the bank. The trend indicated by public sector and old private sector banks of deriving income from investment income is therefore more risky. Now, whether the income diversification has an impact on the performance of the bank is an important empirical question which we have tested in a panel multivariate regression model in the next section.

IV. Determinants of Bank Performance: Multivariate Panel Regression Models

As evident from the existing literature, bank performance is determined by industry specific and bank specific factors. Industry specific factors include the macro economic conditions that have a bearing on banking as an industry while, bank specific factors include scale, scope, efficiency and riskiness of business. In our empirical analysis, we have taken the bank's risk adjusted performance as dependent variable and examined role of various income sources in determining bank performance. A number of industry specific as well as bank specific variables have also been taken as control variables. We estimate three models involving balanced panel data for the period 1999-2004. The first model includes all the 77 banks in our study while the second and third models estimate determinants of bank performance of new generation and old generation banks.

The first and most important control variable included in the three models we estimate is the traditional measure of performance viz. return on assets (ROA) to determine its role in determining risk adjusted bank performance. Other variables included are size of the bank measured by the natural log of asset size to capture existence of scale economies in bank performance (LNASSET) and the riskiness of the credit portfolio of the bank captured by the size of the net non-performing assets relative to net advances of the bank

(ASSET_QUALITY). The average industry probability to default (IND_EDF) is included to incorporate the industry effect on bank performance. All these control variables help us to estimate the individual impact of source of income on bank performance and test our premise that banks that diversify its income sources can improve its risk adjusted performance vis-à-vis banks that rely more on interest income.

Three source of income is included in three different forms in our models. Two of them are: the share of total fund based income to total income (FUNDINC_TOTINC) indicating traditional source of income through the traditional activity of credit exposure and investment income through treasury operations and fee income to total income (FEEINC_TOTINC) indicating income diversification through non-fund based activities. In our first model we also include an interactive dummy of non-interest income to total income ratio of new generation banks (D_{NEW}*NONINT_TOTINC) to see whether generation wise difference in income pattern matter for its overall risk adjusted performance. In models 2 and 3, this dummy variable is not of relevance as we estimate the determinants separately for new and old generation banks.

The Econometric Models

Since we are dealing with a balanced panel data set, the OLS estimates may give us biased estimates where unobserved bank specific effects α_is are correlated with the observed explanatory variables. The basic equation for panel data analysis may be characterized as follows:

$$Y_{it} = a + bX_{it} + e_{it} \qquad (1)$$

where *b* is a *1 x k* vector of constants and *a* is a *1x1* scalar constant representing the effects of those variables peculiar to the i[th] individual in more or less the same fashion over time. *B* is the coefficient for the set of explanatory variables X_{it}.

$$e_{it} = \alpha_i + \eta_{it} \qquad (2)$$

Where $i = 1...n$ is the list of company observations

$t = 1...T$ are the years over which observations are available for each company

The error term e_i represent the effects of the omitted variables that are peculiar to both the individual units α_i s and time periods η_{it}. α_i is a unit specific residual; it differs between units but for any particular unit its value is constant. η_{it} is the usual residual with the usual error term properties. We assume that η_{it} is uncorrelated with X_{it}. The first term of their decomposition in equation (1), α_i, is called an individual effect. This α_i may vary across individuals or the cross section units but is constant across time. This part may or may not be correlated with the explanatory variables X_{it}. The second part η_{it} varies independently across time and individuals. A large portion of panel data empirical applications involve one of the following assumptions about the individual effects: 1) Random effects model: α_i is uncorrelated with X_{it}, i.e., $E(\alpha_i, X_{it}) = 0$; or 2) Fixed effects model: α_i is correlated with X_{it}, i.e., $E(\alpha_i, X_{it}) \neq 0$. We therefore need to test either the random effects or fixed effects estimator is consistent and efficient. Accordingly, we run Hausman specification test (1978) to see the statistical significance of the difference. The chi-square Hausman test statistics for all the three

models have shown that fixed effects estimator is more appropriate than the random effects estimator.[2] Hence the fixed effect GLS estimates were chosen over the random effects.

Before we go for model estimation, one can see the descriptive statistics in Table 7. There is a significant distinction between the new generation and old generation banks except for the variable ASSET_QUALITY. Noticeably, new generation banks on average have higher RARORAC as against ROA. While they have higher share of fee based income, old generation banks have higher share in fund based income to total income. Table 8 gives the correlation of the main explanatory variables used in our regression analysis. One can clearly see that the correlation coefficients between them are not high to cause any multicollinearity problem for our regression estimates.

The results for all the three estimated regression models are presented in Table 9. The first model comprising of all the 77 banks in the study clearly brings out the impact of sources of income on risk adjusted bank performance. The four out of the seven coefficients of explanatory variables included in this model are significant and bring out interesting points. Share of fee based income in total income (FEEINC_TOTINC) is seen to have a positive impact on bank performance lending weight to our argument for income diversification. The new generation banks with high non-interest income to total income ratio (D_{NES}*NONINT_TOTINC) seem to be a positive determinants of risk adjusted bank performance indicated by the positive and significant coefficient of the interactive dummy. More interestingly, one can see that having higher share of interest income and investment

[2] The Hausman (1978) test statistic is asymptotically distributed as χ^2 with k degrees of freedom under the null hypothesis that the random effect estimator is correct. If the random effect model is correctly specified and α_i is uncorrelated with X_{it}, then the coefficient estimated by the fixed effect estimator and the same coefficients that are also estimated by random effect should not statistically differ. For an excellent discussions on fixed effect versus random effect estimates, see Greene (1993).

income in total income (FUNDINC_TOTINC) of bank does not improve its risk adjusted performance as indicated by the positive and insignificant coefficient of the variable. This may be because Indian banks have still not mastered the science of pricing its exposures based on the risk it entails and underlines the need for better and prudent pricing to ensure risk adjusted returns on its credit exposures. The industry probability of default variable (IND_EDF) also is as expected negative and significant indicating that in years of high industry probability to default; returns of firms in banking industry are low. The size of a bank (LNASSET) does not seem to have an influence on the risk adjusted performance. This goes against the emerging understanding in Indian banking industry that consolidation can lead to better performance of banks. Finally as expected, return on assets or the traditional measure of bank performance does have a positive and significant impact on risk adjusted bank performance. This model substantiates our point that source of income has a bearing on bank performance and underlines the need to diversify income towards non-interest sources.

To better understand the determinants of risk adjusted bank performance of the new generation banks over the old generation banks, we further estimate Model 2 and Model 3 (Table 9) and compare the effect of fee income to total income (FEEINC_TOTINC) and fund income to total income (FUNDINC_TOTINC). Our results show that fee based income pushes up the risk adjusted income for the new generation bank. Our regression results also indicate size does not play a significant role in determining risk adjusted bank performance for old generation bank, while it matters for the new generation banks. Similarly, the sign of the industry default risk is positively significant on RARORAC for the new generation banks where it is negatively significant for the old generation banks. This makes sense as new generation banks have better risk management system and can absorb the industry down-turn

better than the traditional banks. One can also note that the quality of asset (ASSET_QUALITY) is negatively significant on risk adjusted performance for the old generation banks while it is insignificant for the new generation banks which further strengthen our claims. The critical point to note here is that there is no significant difference between the quality of assets of old and new generation banks (Table 7). Therefore it is not the quality of credit portfolio per se, but the absence of scientific management of these assets that explains the lower RARORAC of old generation banks.

The coefficient of fee-based income (FEEINC_TOTINC) is positive albeit not significant for the old generation banks. This is not surprising given the small proportion of fee-based income to total income of this category of banks indicating very low level of income diversification. On the other hand, due to the higher share of fee income to total income, this ratio is a positive and significant determinant of RARORAC for new generation banks. The old generation banks seem to be depending in investment income rather than fee income to enhance their performance by keeping large chunk of their resources in government securities, banks have indirectly and silently become a conduit in raising public debt. However, reckless investment in government securities can result in complacency among banks because it involves no appraisal or supervision after investment (post-credit supervision), as in the case of advances. However, when the interest rate increases these banks experience value erosion on their investment book.[3] Banks with high credit exposures can expect high risk adjusted return only if they have a proper risk based pricing system. This is perhaps the reason why FUNDINC_TOTINC is not found a significant determinant of

[3] In the past, banks have regularly relied on treasury operations when interest rates were on the softening curve to boost their results and they made huge profits during the interest softening era. However, as the interest rates started going up since March 2004 the value of government securities that banks hold in their portfolio was seriously eroded.

RARORAC. With this insight, the banks should be looking at non-interest income especially from fee based activities to strengthen its bottom-line. More so because the near perfect competition has been bringing down the interest spread as a source of income for banks. However there is scope for augmenting risk adjusted interest income by adopting risk based pricing on its credit portfolio. This is especially important in the new Basel II era where differential risk weights are to be applied for estimation of capital requirements of banks.[4]

V. Summary and Conclusions

This study compared the risk adjusted bank performance across ownership groups and found the new generation banks consisting of new private sector and foreign banks to be having on an average higher risk adjusted returns as compared to the old generation banks consisting of public sector and old private sector banks. Further analysis indicates that that the reasons for the better risk adjusted performance of new generation banks has been their ability to diversify its income sources. This is brought out by their higher fee income to total income ratio as compared to old generation banks and reinforced by the multivariate regression analysis results. The higher dependence on traditional interest income seems to be a drag on bank's performance in the absence of adequate risk-based pricing practices of banks. The old generation banks have tried to get over this by greater dependence on investment income which is however extremely risky given the macro-economic factors that drive the interest rate movements. Our analysis corroborates the riskiness associated with this income source and shows that investment income is the most volatile across all ownership

[4] Under the standardized approach of Basel II (and also RBI prudential guidelines February 15, 2005), the risk weight for top AAA rated corporate is 20 per cent of 9 per cent capital adequacy as against 150 per cent weight of 9 per cent for poor CCC rated corporate. Hence, even if the spread is lower on AAA, the risk adjusted return would be higher due to lower capital requirement. The reverse is true for the lower quality corporates.

groups of banks. Therefore excessive dependence on this income source to compensate for the low returns associated with interest income is not healthy in the long run. This is because trading income derived from buying and selling of securities and treasury income earned mainly from lending in the call money market are subject to unpredictable variations. On the other hand, as the economy grows, the demand for fee-based services of banks services is certain to go up. Hence, initiating well-thought-out steps to enhance fee-based income may not be fraught with as much risk. In this context, RARORAC framework can be used to assess the risk adjusted return on capital for a specific product or line of business. Customer profitability analysis would enable the management target niches, develop new products and change pricing. Our analysis indicates that diversifying to fee based income is a more viable option for banks in the long run. This necessarily involves constant feel of the market requirement, innovation in banking products, and upgrading skills of personnel to meet these requirements.

Lastly we need to emphasize that despite falling interest spread because of falling interest rates and increased competition, banks cannot withdraw entirely from its traditional activity of generating interest income through continuing credit exposure. Therefore what is important is the need to set in place better risk adjusted pricing mechanisms and credit risk management systems in place that can ensure that credit exposure will not act as a drag on the bank performance. Together with this, healthy diversification to fee-based income will enable banks to pull up their risk based performance.

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Table: 1 Sector wise Mean Income and Mean Annual Growth Rate of Banks Across Years

	1999	2000	2001	2002	2003	2004
All Banks						
Income (Rs. Crores)	1234.29	1429.94	1644.55	1895.27	2177.25	2342.16
Growth %		16.43	13.18*	15.76	8.79**	4.14
			(-1.55)	(0.84)	(-1.84)	(-1.07)
Public Sector Banks						
Income (Rs. Crores)	2884.59	3323.31	3783.22	4288.65	4695.52	5020.49
Growth %		16.99	12.47***	13.55	8.7***	8.12
			(-3.69)	(1.09)	(-2.81)	(-0.36)
Private Sector Banks						
Income (Rs. Crores)	364.36	471.75	584.41	769.94	1219.80	1327.12
Growth %		27.48	20.1**	23.8	20.51	8.43
			(-1.9)	(0.79)	(-0.28)	(-0.85)
Foreign Banks						
Income (Rs. Crores)	352.69	384.11	446.91	506.23	535.95	595.34
Growth %		5.27	7.49	10.5	-2.22**	-4.86
			(0.426)	(0.356)	(-2.39)	(-0.53)
Cooperative Banks						
Income (Rs. Crores)	107.82	131.50	151.08	182.58	211.65	237.62
Growth %		23.24	16.28	19.9	15.36	11.92
			(-1.56)	(1.04)	(-1.34)	(0.73)

Notes: t-statistic of the difference in the mean growth rate is reported in the parenthesis.
*** Denotes significance at the 1% or better.
** Denotes significance at 1%-5%.
* Denotes significance at 5-10%.

Table:2 Sector wise Income Composition (as % of income)

Year	Interest income	Investment income	Fee income	Other income
All Banks				
1999	43.52	38.11	6.87	11.50
2002	39.54	40.48	6.29	13.69
2004	36.62	44.93	8.13	10.32
Public Sector Banks				
1999	42.48	42.60	6.76	8.16
2002	40.28	43.82	5.31	10.60
2004	37.38	51.84	5.15	5.62
Old Private sector banks				
1999	51.23	36.18	5.04	7.55
2002	42.04	45.34	4.29	8.32
2004	42.93	47.78	4.15	5.13
New Private sector Banks				
1999	36.83	45.92	6.98	10.25
2002	40.89	43.47	5.47	10.16
2004	45.61	39.15	8.33	6.92
Foreign Banks				
1999	43.82	34.73	8.52	12.93
2002	35.62	38.06	9.26	17.06
2004	30.74	41.15	14.22	13.89
Cooperative sector Banks				
1999	32.36	13.96	2.18	51.60
2002	50.26	0.00	2.09	47.65
2004	25.42	16.28	2.20	56.1

Table: 3 Compound Growth Rate of Income Ratios

	Interest Income/Gross Income	Investment Income/Gross Income	Fee based Income/Gross Income	Other Income/Gross Income
All Banks				
Growth rate	-5.47***	2.03	-1.12	-5.58**
	(-3.76)	(1.34)	(-0.69)	(-2.45)
Public Sector Banks				
Growth rate	-2.34***	5.4**	-6.3***	8.9***
	(-4.03)	(2.32)	(-3.46)	(-3.06)
Old Private Sector Banks				
Growth rate	-3.88***	5.96***	-5.22*	-7.64***
	(-5.45)	(3.40)	(-1.97)	(-2.67)
New Private Sector Banks				
Growth rate	2.31	-3.67	2.22	-7.21
	(1.35)	(-1.03)	(0.47)	(-1.08)
Foreign Banks				
Growth rate	-11.69***	1.72	5.55	-3.33
	(-2.93)	(0.57)	(1.58)	(-0.76)
Cooperative sector Banks				
Growth rate	-21.36***	-29.61	-1.66	19.62
	(-4.14)	(-1.8)	(-0.38)	(0.92)

Notes: Figures in the parenthesis are the t-values.
*** Denotes significance at the 1% or better.
** Denotes significance at 1%-5%.
* Denotes significance at 5-10%.

Table: 4 Comparison of Volatility across income sources

	Interest income	Investment income	Fee income	Other income
All banks	0.055	0.118	0.053	0.172
Public	0.009	0.118	0.007	0.179
Old Private	0.006	0.046	0.039	0.129
New Private	0.022	0.132	0.029	0.170
Foreign	0.132	0.140	0.123	0.200
Cooperative	0.153	0.235	0.001	0.077

Notes: Volatility is estimated as standard deviation of the negative values of relative changes in income

Table: 5 Univariate Tests: Sector wise Comparison of Income & Performance Variables

	Public (1)	Old Private (2)	New Private (3)	Foreign (4)	Cooperative (5)	(1)-(2)	(1)-(3)	(1)-(4)	(2)-(3)	(2)-(4)	(3)-(4)
Panel A: Means						**T statistics for Difference**					
Gross Income	3999.302	523.304	1255.525	470.21	170.38	5.45***	3.18***	7.36***	-2.84***	0.63	3.67***
Interest Income / Gross Income	0.405	0.456	0.400	0.370	0.365	-7.22***	0.422	2.81***	3.39***	5.06***	1.22
Investment income/ Gross income	0.445	0.425	0.432	0.373	0.087	1.42*	0.66	4.55***	-0.42	2.73***	2.34***
Fee Income/ Gross income	0.058	0.047	0.068	0.104	0.022	3.506***	-2.23**	-6.18***	-4.63***	-5.66***	-2.67***
Other Income / Gross Income	0.091	0.071	0.099	0.153	0.526	1.67**	-0.51	-3.9***	-2.13**	-4.19***	-2.05**
ROA	0.067	0.078	0.069	0.062	0.083	-8.25***	-0.87	1.43*	3.54***	3.48***	1.06
RARORAC	0.457	0.535	0.748	8.7	0.69	-1.89**	-4.89***	-1.90**	-3.94***	-1.35*	-0.97
Panel B: Medians						**Wilcoxon Sign Rank Z Statistic for difference**					
Gross Income	2377.4	419	487.45	81.46	155.21	11.34***	7.39***	13.115***	-2.76***	4.66***	5.105***
Interest Income / Gross Income	0.408	0.461	0.403	0.383	0.354	-6.68***	0.36	1.47	2.88***	4.47***	1.21
Investment income/ Gross income	0.466	0.427	0.454	0.378	0.00	3.09***	0.79	5.43***	-0.98	3.01***	2.75***
Fee Income/ Gross income	0.051	0.044	0.066	0.079	0.244	3.31***	-2.17**	-5.83***	-4.09***	-7.04	-2.33**
Other Income / Gross Income	0.059	0.058	0.062	0.076	0.497	0.37	-0.57	-3.77***	-0.99	-3.8***	-1.86*
ROA	0.068	0.08	0.07	0.071	0.084	-7.68***	-1.23	-1.614	3.59***	3.69***	-0.03
RARORAC	0.485	0.544	0.76	1.043	0.56	-1.97**	-5.48***	-6.48***	-4.17***	-4.76***	-1.9*

Notes: Sign rank tests the equality of matched paired of observations using the Wilcoxon matched-pairs signed-ranks test. The null hypothesis is that both distributions are the same. In panel A, t-values and in panel B, z-values are reported with their level of significance.
*** Denotes significance at the 1% or better, ** Denotes significance at 1%-5% and * Denotes significance at 5-10%.

Table: 6 Entropy shares of sectors in industry total

Year	Fee-based income	Fund based income	Non-interest income	Interest income
Public Sector Banks				
1999	0.977	1.001	1.011	0.984
2002	0.952	1.003	0.995	0.993
2004	0.876	1.011	1.034	0.952
Old Private Sector Banks				
1999	0.638	1.024	0.892	1.187
2002	0.642	1.021	0.975	1.090
2004	0.600	1.027	0.951	1.127
New Private Sector Banks				
1999	0.904	1.012	1.044	0.900
2002	1.131	0.995	1.146	0.868
2004	1.398	0.961	0.839	1.226
Foreign Banks				
1999	1.466	0.973	0.971	1.068
2002	1.613	0.957	1.006	1.071
2004	1.885	0.935	0.962	1.065
Cooperative sector Banks				
1999	0.276	1.064	0.430	0.970
2002	0.344	1.053	0.042	1.533
2004	0.321	1.062	0.394	0.889

Notes: Entropy estimation involves the ratio of sector wise individual income source to share of industry total of that income source standardized with the ratio of share of total income of the sector in the industry.

Table:7 Summary Statistics of Variables used in Analysis

	All Banks		**New Gen Banks**		**Old Gen Banks**		**Mean difference**
	(1)		**(2)**		**(3)**		**(2)-(3)**
Variable	Mean	SD	Mean	SD	Mean	SD	**t-stat**
RARORAC	3.20	31.68	6.86	48.43	0.50	0.31	2.14***
ROA	0.07	0.03	0.06	0.04	0.07	0.01	-3.2***
LNASSET	8.47	1.86	7.42	1.87	9.26	1.42	-11.98***
IND_EDF	5.25	3.63	-	-	-	-	-
FUNDINC_TOTINC	0.912	0.66	0.89	0.01	0.93	0.02	-7.51***
FEEINC_TOTINC	0.07	0.06	0.09	0.08	0.05	0.02	1.97**
ASSET_QUALITY	4.73	7.57	4.68	10.31	4.77	4.57	-0.12
No. of Banks	77		33			44	

Notes: t statistics report the mean equality test outcomes, *** Denotes significance at the 1% or better and ** Denotes significance at 1%-5%.

Table:8 Correlation Matrix

	ROA	LN ASSET	IND _EDF	FUNDINC_ TOTINC	FEEINC_ TOTINC	DEF PREM
ROA	1.0000					
LNASSET	0.17***	1.000				
IND_EDF	0.21***	-0.12**	1.0000			
FUNDINC_TOTINC	0.044	0.198***	0.091	1.0000		
FEEINC_TOTINC	-0.01	-0.18***	-0.06***	-0.21***	1.0000	
DEFPREM	-0.33***	-0.194***	-0.19***	-0.04	-0.03	1.0000

Notes: *** Denotes significance at the 1% or better and ** Denotes significance at 1%-5%.

Table: 9 Fixed Effect GLS Estimates

Dependent Variable: RARORAC	Sample Period: 1999-2004		
Independent Variables	All Banks	New Generation Banks	Old Generation Banks
LNASSET	11.452*** (3.56)	12.867** (2.15)	0. 139 (1.19)
ROA	315.15*** (7.14)	362.01*** (4.95)	20.13*** (14.07)
IND_EDF	0. 300 (0.98)	0.865 (1.33)	-0. 039*** (-4.80)
ASSET_QUALITY	-0. 205 (-1.54)	-0.175 (-0.76)	-0. 014*** (-3.81)
FUNDINC_TOTINC	-7.308 (-0.18)	38.68 (0.61)	-3.424 (-1.36)
FEEINC_TOTINC	485.242*** (9.70)	593.21*** (8.06)	4.563 (0.15)
D_{NEW}*NONINT_TOTINC	56.369*** (4.81)	------	------
INTERCEPT	-154.82*** (-3.64)	-205.78*** (-3.26)	1.46 (0.58)
No of observations	459	195	264
F test	115.75 (7)	56.35 (6)	55.75 (6)
Prob>F	0.000	0.000	0.000
R^2	0.23	0.27	0.42
Notes: z values are in the parentheses. ***: Significant at 1 per cent or better; **: Significance at 1-5 per cent; *: Significance at 5-10 per cent.			

Appendix A: Variable Definition

RARORAC: Risk Adjusted Return on BIS Risk Adjusted Capital=Risk adjusted income/BIS risk adjusted asset; Risk adjusted income=gross income-cost of funds-operating expenses-provisions for NPAs, bad & doubtful; BIS risk adjusted asset=9%*advances; cost of funds=interest paid (interest paid for short term and long term loans+ interest paid for accepting deposits+ interest on RBI borrowings & other interest expenses). Operating expenses=salaries & wages+ indirect tax+ VRS expenditure+ other operating expenses+ legal expenses+ depreciation

LNASSET: proxy for the size of the bank=natural logarithm of total assets.

ASSET_QUALITY=net NPAs/net advances.

IND_EDF: average industry probability default of long term corporate bonds.

Fee based income includes the income earned by banking companies other than fund based income.

Fee income is the commission earned on brokerage activities+ other financial services activities (like wealth management for high net worth individuals, insurance products etc.)

Fund based income includes interest received on advances+ income through trading+ income on bill discounting+ income on foreign exchange transactions etc.

Gross income: Total income=fee based income+ fund based income+ interest income from RBI deposits+ miscellaneous income.

ROA: Return on Assets=operating profit/total assets

NONINT_TOTINC: ratio of non interest income to interest income= Non-interest income is the income earned by banking companies excluding the interest earned on advances, deposits with RBI and other sources. This includes income from financial services activities, income from securities trading, income from leasing/hire purchase, income from bill discounting, income from forex transactions, income from commissions/brokerage and other income.

FUNDINC_TOTINC: Ratio of fund based income to total income.

FEEINC_TOTINC: Ratio of fee income to total income.