RESPONSE TO REFEREES:

Economics Discussion Paper No. 2015-27

"Modeling Bank Asset Quality and Profitability - An Empirical Assessment"

My grateful regards to the two referees for taking the time to read, review and assess the manuscript. I submit here below the responses to their comments, though in some cases I may disagree.

Referee Report No. 1

The structure of this paper seems in some mess and needs to be better organized. For instance, Part III, Part IV, and Banking Profitability in Part V could be combined, and serves as literature review. Part II and Part V (Asset Quality in Indian Banking) could be put together, and serves as background. There are also some typos through the paper. For instance, the first sentence in Part V is weird.

Response: The structure of the paper is designed in such a way to address the two important research issues - *bank asset quality* and *bank profitability*. The present structure provides focused presentation of the study on the two issues dealt with. In case, if we merge the study sections as suggested by the referee, we are afraid, the presentation might perhaps loose its sharpness. We would again go through the manuscript to find out the typos if any. The first sentence in Part V states about the presentation of results. However, there is always scope for rephrasing the sentence.

Moreover, it is better for the paper to focus on Indian banking industry and stress that it contributes to literature on emerging economies. Currently, the abstract and the introduction seem like that the analysis is a panel of emerging economies, causing some confusion, and does not read fluently as well.

Response: The suggestion is already taken care of in the paper. The paper offers stylized facts about the emerging economies including India in section III. Literature review linking the discussion focussing on India as well is offered in section II (page 6, 7, 8, and 12). Before submitting to the journal, the manuscript was reviewed by faculty colleagues and they did not find any confusion in the flow.

In the regression estimation for analyzing the determinants of asset quality in in table 5A and 5B, the dependent variable is gross non-performing assets (GNPA), which is very likely to have something to do with the total assets of a bank (ASSET). However, the size of the bank is not controlled in table 5A or 5B. To fix this problem, the authors could either use the ratio of NPAs to ASSET as the proxy for bank asset quality, or control ASSET. Considering some control variables, the ratio may be a better indicator

Response: The dependent variable - GNPA has straightforward correlation with explanatory variable - bank ASSET. Hence, instead of ASSET, CREDGR controls for the size of the growth in assets and fits well in the model (table 5A and 5B). This is established after several iterations of the regression model. Adequate attempts have been made to incorporate the appropriate explanatory variables in arriving at robust results.

In the results report, it is not clear how large the sample size is, the frequency of the data, and how many banks in each bank group. As a result, the referee is even not sure about whether each observation actually represents a bank or a group of banks in the regressions.

Response: It is furnished in the beginning of the section IV that the data set includes five distinct groups of banks in Indian banking viz., State bank group, nationalised banks, old private banks, new private banks and foreign banks. Each observation represents the bank group. To clarify further based on the suggestion of the referee, the results report would be further strengthened in ensuing revision. We thank the referee for the useful observation.

In analyzing the determinants of asset quality, it needs to provide some explanations for adopting different explanatory variables in table 5A and 5B. GDPGR is indeed an alternate variable of IIPGR. But INFLA should also be controlled in table 5A. Similarly, CDR shows up in 5A, but not in 5B, while LR, MCAP shows up in 5B, but in 5A. In addition, it is useful to provide some explanations as well for the differences between the determinants of bank asset quality and bank profitability.

Response: The paper presents the adequate explanation for each of the variable that enters the model in section IV and further discussion on the significance of the variables in section V. As rightly observed by the referee, we consider IIPGR in concert with other macroeconomic variables as an alternative for GDPGR. The explanation in this regard is provided in page 21 as we discuss the alternate specification. INFLA, IIPGR, LR and MCAP appear in the alternate specification (table 5B). The difference between the determinants of bank asset quality and bank profitability is evident from the discussion on the results section. Further discussion in this regard would unwarrantedly elongate the size of the paper and might lose its preciseness.

Some results and the analysis in table 5-7 are not reasonable. For instance, in table 5A, the sign of credit-deposit-ratio (CDR) is opposite to expectations, as CDR indicates the aggressive lending activity of the bank and is predicted to have a positive effect on the NPA levels. It is also hard to explain the significant and positive signs of OER and ROI, as well as the insignificance of GDPGR in all tables. In addition, unlike the authors' claim, the findings about rural branches are consistent with, rather than contrary to, the general perceptions as the regression results of RUSUBRA imply that it will positively affect the NPA levels.

Response: Theoretically credit-deposit ratio suggests the level of credit as against the level of deposits mobilised by the banks. CDR is dependent not necessarily on the credit (loans) alone but on the level of deposits as well. Hence, we beg to differ with the statement that CDR indicates the aggressive lending activity. Instead, CREDGR indicates the growth in lending activity and could be considered a better indicator of the aggressiveness of lending activity. CDR is significant and negatively associated with bad loans, as the results (in table 5A) correctly suggest that higher the CDR the lower tends to be the level of NPAs.

The explanatory variables OER and ROI exhibit theoretically expected relationships. OER has a direct and significant association with NPA levels. As the NPAs rise the operating costs associated with handling of these stressed assets also increase. Theoretically, as ROI increases there is an increase in cost of servicing the loans by the borrowers resulting in a positive impact on the NPAs leading to the rise in their levels (table 5A and 5B).

The proportion of rural and semi-urban bank branches (RUSUBRA) has been considered a determinant to examine whether the location of banks (i.e. in rural and semi-urban areas) matter in causing NPAs. As expected, RUSUBRA affects the NPA significantly in both specifications. RUSUBRA is found to be econometrically significant and positively associated with rise in NPA levels (table 5A and 5B) in tune with the perception of bankers in India.

It is better to extend the period of 1997-2009 to 1991-2014 if possible. As shown in Figure 2, there seems to be a time trend in NPAs during the period of 1997-2009. Moreover, the authors could benefit a lot from the analysis of a full period of 1991-2014 and three sub-periods of 1991-1996, 1997-2009, and 2009-2014, respectively. The comparisons between the three sub-periods would be very useful and interesting. People would be particularly interested in the NPAs and bank profitability after the global financial crisis happened in late 2008 (or early 2009). This advice also applies to the tables and figures in Part II.

Response: Appreciate the comment as I also thought on the same lines before embarking on this study. One of the significant constraints is the non-availability of data for the period before 1997 for the banking groups in India. Hence the study covered from 1997 - 2009. The choice of the period is dictated by several considerations. First, this study considers published data on the variables. Second, the year 1996-97 marks the rigorous regime of prudential norms because of the 'first generation' reforms programme initiated in 1991, and hence it is desirable to study the impact of various determinants and the behaviour of different banking sectors in terms of NPAs through the initiation of the reform process. Further, the said period covers the significant period of post-liberalization in Indian banking. The period chosen is up to March 2009 and not beyond, to avoid the sudden devastating effect of the global financial crisis, and is not before March 1997, as the effects of liberalization and various financial sector reforms were was well established by this year. However, I am interested in extending the current study for the period 2009-2014 in my next paper providing a link to this paper. I welcome the suggestion of the referee in this regard.

The paper uses two estimation methods, namely Panel Least Squares and GMM. For the panel least squares estimation, it seems that the authors did not control fixed effects or year effects. At least, it is better to add a regression that controls all group dummies if it is not appropriate to control fixed effects. For the GMM estimation, the referee is wondering if the method is appropriate here as there are no time lags of dependent variables in the regression equations.

Response: We estimate models 1a to 1f with panel least squares with cross-section weights (PCSE) standard errors & covariance. Model 2a to 2f are estimated with Panel Generalized Method Moments with cross-section weights (PCSE) standard errors & covariance and 2SLS instrument weighting matrix. The specifications are found to be econometrically appropriate and adequate in explaining the model. Regression that controls all group dummies is provided in the Simultaneous Equations-Three-stage least-squares regressions (table 7).

It is more meaningful to report the results of simultaneous equations as baseline results, not as the robustness tests. One reason is that the endogeneity problem does exist in the paper, as bank asset quality is one determinant of bank profitability. While in the robustness tests, the authors could add in a similar robustness test for the simultaneous equations as to other regressions.

Response: We have performed the Three-stage least-squares regressions for the simultaneous equations involving dependent variables GNPA – ROA and GNPA – ROE as robustness check of the specification. It would be unwarranted to report the results of simultaneous equations as baseline results.

Referee Report No. 2

While in principle the depth of the available data-set could represent a strength of the paper, there are studies in the literature already addressing the issue of loan performance and bank profitability in emerging countries and, specifically, in India (even if the issue of loan performance has been investigated in a different context and not "per se"). Therefore, the value added to the field seems to be limited. Moreover, results do not seem to be supported by convincing empirical analysis. Due to these reasons and, more generally, to the areas of concern which are highlighted below, the paper is not recommended for publication.

Response: We find only a few studies of citable significance that have dealt on the problems of NPAs, particularly in the context of developing economies. This is due perhaps to the lack of sufficient published, disaggregated information on the micro-management of NPAs and the nature and type of default. Though the Indian banking system has not experienced notable banking crises, unlike other banking systems in the world, the issues concerning NPAs have come up particularly in view of the comparatively high levels of NPAs of Indian commercial banks vis-à-vis that of the other countries. This kind of economy, which has not suffered banking crises but continues to face the problem of mounting NPAs, is indeed a motivation for undertaking an empirical examination conjoining the profitability analysis as well.

The findings of this study offer some useful policy implications. In contrast to the perception of some urban bankers that priority sector lending (PSL) causes NPAs, this study finds that PSL does not contribute significantly to NPAs. This supports the contention that branch expansion in rural and semi-urban areas for extending priority sector credit is a viable proposition, and there need not be aversion to this by policy makers or industry heads. Third, ownership of banks is an interesting issue that has been debated quite often. This study offers an analysis that also looks into the ownership dimension of these banking groups and establishes that private and foreign banks have advantages in terms of efficiencies in better credit management in containing NPAs, which indicates that bank privatization can lead to better management of default risk.

In view of the several original contributions of this study, we believe that this paper contributes significantly to the literature on bank asset quality and profitability in a comprehensive manner in the context of an emerging economy like that of India.

Specifically, the conclusions reported in the abstract on the independence between quality of bank loans and lending by rural branches (RUSUBRA) are apparently at odds with all the results presented by the author on this account. The coefficients estimated for RUSUBRA are always significantly positive in the loan quality regressions (see Tables 5a-5b and 7). Moreover, as banks more involved in priority sector lending are presumed to be endowed with a more diffused network of rural branches, the terms PSC (priority sector) and RUSUBRA are likely to entail a similar informative content. Hence, there is the suspect that the "priority sector" variable could turn out to affect positively loan performance, once RUSUBRA is taken out of the regressions. Therefore, (a) the apparent contradiction between the abstract and the empirical findings should be clarified, and (b) the effects played by priority sector lending on loan quality should be also tested in regressions which exclude the bank rural branches term.

Response: We would like to clarify that rural and semi urban branches (RUSUBRA) and priority sector credit (PSC) are altogether different variables. The comment that banks more involved in priority sector lending are presumed to be endowed with a more diffused network of rural branches, the terms PSC (priority sector) and RUSUBRA are likely to entail a similar informative content is unfounded. The priority sector lending definition is quite vast and does not necessarily confine only to rural areas. Our results indicate that priority sector credit is found to be significant and negatively associated with profitability suggesting that the higher the priority sector credit, the lower would be bank profitability. Our point in the abstract that Priority sector credit has been found to be not significant in affecting NPAs intends to convey that priority sector credit does not contribute to increase in NPAs contrary to the popular perception that these contribute to NPAs. Our empirical results too convey the same logic.

More generally, the empirical model does not allow for time persistence in the data, which is likely to shape the development over time of the outstanding amounts included in the loan quality (independent) variable and the covariates, and to bias the estimates if not properly accounted for. A dynamic panel data specification, allowing for lagged terms and estimated consistently using the Arellano and Bond (1991)'s GMM method, should be adopted to study the macroeconomic and bank-specific determinants of loan quality, as in Louizis, Vouldis and Metaxas (2012).

Response: We appreciate the suggestion. Initially, we too were interested in employing this method. However, Arellano - Bond GMM method could not be used as the time period employed is not quite large. We could not extend the time period in view of the non-availability of data for the banking groups in India for the period before 1997. As suggested by the referee we have gone through the Louizis (2012) paper

The author should include in the literature some recent papers on similar issues, comment the results which are at odds with previous works and explain which are the drivers of the differences in empirical findings. Among others, see Cole (2009) on the performance of agricultural credit in India; see Louizis, Vouldis and Metaxas (2012) and Klein (2013) on the macroeconomic and bank-specific determinants of loan quality; see Beck, Jakubik and Piloiu (2013) for macroeconomic determinants of loan quality across a large group of countries. The discussion on ownership of banks in India should mention Gormley (2010), Sanyal and Shankar (2011) and Bhaumik and Piesse (2008). Banerjee Cole an Duflo (2004) should be considered for a background on the Indian banking industry.

Response: We are thankful to the referee for this useful suggestion. We are happy to include the suggested papers in the literature review in the revision of this paper.

The description of the dataset used for the empirical analysis is vague (page 16). The author should clarify the coverage of the sample with respect to the universe of banks operating in India; furthermore, a clearer set of references should be provided with regard to the sources of information.

Response: We are thankful to the referee for this useful suggestion. We are happy to incorporate further details on the dataset in the revision of the paper.

To evaluate the different role played by macroeconomic and bank-specific factors on the development of asset quality and profitability, these two distinct types of determinants should be analyzed sequentially, as in Louizis, Vouldis and Metaxas (2012). In particular, a baseline model should include only macroeconomic indicators; further, the bank-specific variables, which are the focus of the paper, should be added to verify whether they contribute to the explanatory power of the model.

Response: We are thankful to the referee for this useful suggestion. We are happy to introduce the suggested approach in the revision of the paper.