

## Clarifications

### Examiner1 comments

Issue 1: The implicit assumption of the author is that risk is undesirable and anything that might increase risk is to be avoided.

Modification: (page 29): Fifth, higher deposit share is associated with lower earnings volatility of an average bank. The deposit structure of a bank should be monitored. Reserve Bank of India (2009c) notes that retail deposits may be volatile at individual customer level, but at bank level and banking industry level, “it provides solid foundation for banks to fund” their long-term assets like infrastructure and similar projects. However, deposit share is an important driver of bank riskiness which affects financial and economic stability. Sixth, there is strong evidence for ‘concentration-fragility’ view. Thus, bank supervisors may use concentration measure for better bank supervision.

Issue 2: Hedging, especially derivative, is not discussed.

Modification: (page 32): Risk can be managed by hedging, but appropriate bank-wise data on hedging or derivatives use/ market making are not available. This is a limitation.

Issue 3: The relation between risk taking and profitability should be considered.

Modification: Since dependent variable is a function of profitability, we didn’t include profitability as a predictor. This is a limitation.

Issue 4: Statistical relations are not causal relations.

Modification: Causal relations may be appropriate, because GMM addresses endogeneity. I made changes as well. (page 21): Third, higher deposit share is associated with lower earnings volatility and, therefore, is associated with lower (higher) portfolio risk (risk-adjusted profit). However, higher deposit is associated with higher insolvency risk and higher leverage risk, because, in case of higher deposit share, the benefits from lower earnings volatility is more than offset by the substantially lower capitalization maintained by an average bank. (page 22): Fifth, size and risk has nonlinear relationship. Large banks have higher risk than small ones. But, expansion is associated with higher bank risk up to a certain threshold. Once bank size exceeds the threshold, bank size is negatively related to bank risk.

Issue 5: Failure to use “the”, “a” or “an” where these were needed. Many English language errors are there.

Modification: I made changes.

## **Examiner2 comments**

### Chapter 1

Risk is the focus of the study. In the three essays, risk is compared with (a) ownership (b) concentration & competition (c) size and diversification. What is the rationale for this separation? Why not risk is compared with all the five variables together (jointly) in one study or essay?

**Answer:** The model in the first essay has variables, including ownership, concentration, size and diversification. The analysis in the first essay suggest that the loan growth, non-interest income share, deposit share, size, market concentration, foreign bank presence and GDP growth affect bank risk taking. We select two factors—competition (or market concentration) and diversification (or non-interest income share)—in order to conduct deeper investigations. The second essay and the third essay refer to these two investigations.

### Essay 1: Ownership and risk taking

1. The chapter/essay is titled as ownership and risk taking. But there is confusion between the term risky and risk taking. Is risk equal to risk taking (e.g: “If this is the case, the public sector banks may be more risky than private banks”).

**Answer:** more risky  $\equiv$  greater risk taking.

2. The first risk measure (page 13) is superficial and contradictory in nature. There are several concerns on this risk measure:

(a) The numerator is equal to  $PAT/Assets + Equity/Assets$  or  $PAT+Equity/Assets$ . The equity at time ‘t’ includes PAT less dividend of time of time t and hence one part of PAT is double counted. A strong understanding of accounting is required before using accounting ratios.

(b) The denomination of the measure is SD of ROA. It is not clear how many cases ROA is negative and my expectation is negative ROA is rare for banks in India. I looked into ROA of 12 banks which are part of CNX Bank Index from 2000 onwards and I find only on three cases out of 175 cases, the value is negative. So a high SD does not mean the bank ROA will turn negative and hence lead to insolvency.

(c) The ROA measure used total assets which include borrowing (deposits and other borrowing) and equity. The return component includes interest spread and other income. The ROA for a bank will be generally very low (around 1.5%). An important component of risk is use of leverage and ROA ignores the leverage completely. ROE may be desirable over RoA if the purpose of the measure is risk assessment. The question is what is the rational for using ROA and particularly over ROE?

(d) Insolvency in banks is often on account of erosion of capital invested at wrong place and SD of ROA will not capture this part.

(e) SD of ROA is based on three years data. Is it acceptable to use SD based on three data points?

**Answer:** First, Under less restrictive assumptions of the distribution, an upper bound for the true value of the probability of insolvency risk is obtained (see Hannan and Henwick, 1988) as follows. We define insolvency as a state where loss exceeds equity. Then the probability of insolvency is  $P(E < -\pi)$ , E being the equity and  $\pi$  being the profits.

$P(E < -\pi) = P(R = \frac{\pi}{A} < \frac{-E}{A} = -c - t - a)$  , where A is total asset and c-t-a is capital-asset ratio

$$= P(R^* = \frac{R - \mu_R}{\sigma_R} < -\frac{c - t - a + \mu_R}{\sigma_R} = -z) ,$$

$$\text{where } \frac{\mu_R + c - t - a}{\sigma_R} = z, E(R) = \mu_R, V(R) = \sigma_R$$

$$= \frac{1}{2} - \frac{1}{2} P(-z < R^* < z), \text{ assuming that R has symmetric PDF form}$$

$$= \frac{1}{2} - \frac{1}{2} P(|R^*| < z)$$

$$\leq \frac{1}{2} - \frac{1}{2} [1 - \frac{1}{z^2}] , \text{ applying Chebyshev inequality to the term } P(|R^*| < z)$$

$$= \frac{1}{2z^2}$$

Thus we find an upper bound for the insolvency probability  $P(E < -\pi)$  and this upper bound is an inverse function of z score.

Second, if the organization exists primarily to serve the shareholders' objective, then ROE is relevant. After crisis, we learned that other stakeholders' objective/expectation should be considered and, therefore, ROA is relevant.

Third, our risk measure is widely used in banking literature. ZSCORE based on 3 data points is widely used in the literature.

3. The other two risk measures also based on erosion of equity through normal P&L activities and not erosion of capital invested.

**Answer:** These measures are used in the literature.

4. ZSCORE is increased over the year as per figure 2.1. Is it on account of increase in Equity/Assets or decline in risk? How banks in India increased their solvency?

Answer: Capitalization ↑, ROA ↑ and earnings volatility ↓ (after initial increases) over the years.

5. What is the mean value of ROA and Equity/Assets for each group of banks?

<b>Answer:</b>	ROA	Equity/Assets
Domestic private	0.0064	0.0619
Public sector	0.0043	0.0533
Foreign	0.0102	0.1923

6. Page 20: One of the main conclusions is foreign banks are different compared to other banks on risk. To quote “This means foreign banks are more risky than both public sector banks and domestic private banks...”. Are they risky or taking more risk? These two terms need not be same. A bank is called risky if the outcome of their business shows historically low profitability and high standard deviation. A bank is said to be taking more risk if one sees the portfolio of assets and report high ROA with SD of ROA. The ZSCORE is essentially return per SD or net worth per SD of ROA. It is very unlikely to measure how much risk banks are taking or taken in the past.

**Answer:** Foreign banks are more risky ≡ foreign banks take more risk.

7. Page 28: The conclusion that “loan growth as early warning signal...” is also superficial. As economy grows, banks will also grow. Though GDP growth variable is included, it may not completely control. I have an additional concern on this growth variable. The descriptive statistics (Table 2.2 page 34) shows the minimum growth rate value is -1 (or -100%). How is it possible to have a negative 100% growth in loan portfolio? It is possible only when the loan value is reduced to zero. This raises question on the quality of data used in the analysis.

**Answer:** First, The distance from average may be monitored for loan growth variable. Second, loan growth = -1 is observed for few foreign banks, including ING banks. The results are similar if banks with -1 are dropped.

8. Page 29: Considering all non-interest income together and drawing conclusion that they are risk creator is not convincing. There are several fee based services (like locker facility or banker to IPO or acting as a trustee) that banks offer and these activities do not create any risk to bank. Since these incomes are not stable, they might show up higher volatility. It doesn't mean that they are risky. Income earned through un-hedged derivative transactions and other treasury operations are risky.

\* A related question on quality of data used. The maximum noninterest income as per Table 2.2 is 201.04%. It means interest income for that sample data is negative at 50% of noninterest income. How is it possible to have a negative interest income? What does it mean?

**Answer:**  $OI/(NII+OI) = 2$  implies  $NII = 50\% * OI$ . It may be noted that  $NII = \text{interest earned} - \text{interest expended} \leq 0$ .

\* Similarly, the minimum deposit value is zero. How it is possible to have a zero value in deposit? Is it absolute value or ratio?

**Answer:** Few foreign banks have zero deposit. For example, Toronto Dominion Bank, Bank International Indonesia have zero deposit in some year. These are ratios.

\* How the liquidity is measured?

**Answer:**  $\text{Liquidity} = (\text{Cash in hand and balance with RBI} + \text{Money at call and short notice} + \text{Balances with banks} + \text{Government securities}) / (\text{deposit} + \text{borrowings} + \text{other liabilities})$

9. Another conclusion is presence of foreign bank increases the soundness of an average bank. The minimum and maximum value of the share of foreign bank asset is 6.52% and 8.49%. With this narrow range, what kind of conclusion one can make from this value?

**Answer:** Foreign banks have metro presence. The benefits are limited.

10. Overall, I find too much importance is given for statistical analysis and interpretation is purely based on such analysis. However, basic understanding of variables and their relationship are missing.

**Answer:**

Essay 2: Competition, concentration and risk taking

The essay examines the relationship between Net Worth per unit of SD of ROA (defined as solvency risk measure or ZSCORE) and concentration ratio and competition ratio. The

overall conclusion is competition affect profitability whereas concentration doesn't affect the risk. My observations and questions on this essay are as follows:

1. The measurement of concentration ratio is clear. I have few questions on competition measure:

(a)  $P_{it}$  is defined as price of total output. What is the total output? Is it equal to total income? Or is it equal to net interest income (interest received-interest paid)? Or is it equal to net interest income plus non-interest income?

**Answer:** total output =  $Q_{it}$  = Total Assets

(b)  $MC_{it}$  is defined as marginal cost. Marginal cost generally means incremental cost and I presume it holds good in this case also (though I am not able to see incremental component in the equations). The question is how can you deduct marginal cost from total output and measure competition ratio. The expectation is the first term should also be marginal one. That is marginal revenue less marginal cost divided by marginal revenue can be a measure of competition ratio. If  $MR=MC$ , the equation will turn to zero and it means perfect competition.

**Answer:**  $MC_{it} = \delta \text{Cost} / \delta Q$ .

(c) Though the  $LERNER_{it}$  ratio is derived through set of equations, it looks like a typical margin ratio. The question is how can this ratio be equal to 1 so that we can define the situation as monopoly (as mentioned in Page 60 last paragraph)? It is possible only when  $MC_{it}$  is equal to zero. Is it possible to have zero value in  $MC_{it}$ ?

**Answer:** Lerner=1 implies  $MC=0$ .

2. The concentration ratio is also a measure of competition. What is the reason for combining both measures of competition into one single equation? If the two measures are different, what is the difference?

**Answer:** Since Correlation ( $C5, LERNER$ ) = -0.2745, we can construct regression without multicollinearity. Two measures are different by their definitions.

3. One of the conclusions is greater competition leads to higher risk taking. The relationship between ZSCORE and LERNER and LERNER\_SQ is positive (Table 3.4 Column 1). Since there is no expectation on the sign apriori, the conclusion is based on empirical evidence. The figure 3-1 shows both ZSCORE and LERNER values have increased over the years. It means the competition declined over the years along with decline in insolvency risk. The question is why banks in India are taking less risk when the competition declines?

**Answer:** This can be explained by ‘charter value’ hypothesis. According to this hypothesis, lower competition increases profit margin and charter value. Higher charter value induces banks to take less risk. However, both ‘competition-fragility’ view and ‘concentration-fragility’ view are applicable for Indian case.

4. The second conclusion is higher concentration leads to more risk taking. Since higher concentration in a way implies lower competition, the conclusion implies lower the competition, higher the risk. The result contradicts the previous conclusion. How do you compare the two contradictory results?

**Answer:**

5. Suppose in 2020, if the LERNER increases further (keeping in line with the current uptrend) and C5 declines further (in line with the current down trend), what is your expectation on risk taking? Where are Indian banks are heading on risk taking? If can’t predict, what is the value of the whole analysis?

**Answer:** Prediction is difficult.

6. In the second part of the analysis, the essay observes competition reduces profitability if the competition level exceeds certain threshold (page 66). This is obvious conclusion and the study confirms the same. However, what is more relevant is finding the threshold level. The competition ratio range is -2.05 to 0.87 and yearly average is showing an increasing trend. At what level the study finds competition is started producing desired effect.

**Answer:** Greater competition reduces profitability if LERNER exceeds the threshold 0.3265.

7. The next finding is lower the C5, Equity/Assets increases. As per Fig 3.2, the C5 declined smoothly over the years. Is this increase observed across all banks or only for C5 banks? The reason for this question is why should a change in C5 affects all banks uniformly? What is the use of this finding? Can we say the central bank should allow more banks if the central bank wants to increase capitalization which in turn improves solvency of banks? If we go by this line of thinking, more banks lead to more competition which in turn forces banks to take more risk ( as per first conclusion) and hence reduces the solvency!!

**Answer:** This is because both ‘competition-fragility’ view and ‘concentration-fragility’ view are supported.

8. The last finding of this essay is competition increases volatility of earnings. Figure 3.1 shows competition increased over the years. Volatility is measure by taking into account three years data. It means the three years ROA shows more volatility over the years. How much volatility increased over the years? What is the policy implication of this finding?

**Answer:** The earnings volatility increases and then decreases over the years.

9. Like in Essay 1, the focus is on statistical analysis and reporting the same rather than generating big picture and coming out policy implications. The results are reported but not investigated. If the focus shifts to investigating the results, the value of this essay will improve substantially.

**Answer:**

Essay 3: Size, diversification and risk taking

This essay observes two different outcomes when banks are classified as small and large. Increase in non-interest income (measure of diversification) reduces earnings volatility for small banks and increases earnings volatility for large banks (page 92). Why non-interest income has two different effects? What is the significance of Rs. 5.58 billion?

**Answer:** The good side of diversification dominates the bad side of diversification for small banks, while the opposite is true for large banks. The good side refers to risk diversification benefits, but the bad side refers to complexity. The threshold for bank size is 6.19 billion 2005 Indian Rupees for ZSCORE.