Applied Journal of Economics, Law and Governance https://doi.org/10.57017/ajelg.v2.i1(3).01

Does Management Quality Matter in Generating Post-Merger Synergy in Acquiring Bank? A Case of Indian Banks

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Abstract:

Mergers and acquisitions are noteworthy corporate strategic measure that assists the merged entity in external growth and afford it competitive advantage. The study tries to evaluate methodically the consequence of merger of United Western Bank along with Industrial Development Bank of India in 2006 and subsequent merger of IDBI bank with LIC of India in 2019 on their financial performance in terms of different financial parameters for the period from 2004-05 to 2024-25 dividing the entire period into two phases. Most of the financial indicators of Industrial Development Bank of India (IDBI) after undergoing merger with United Western Bank (UWB) in 2006 and LIC of India in 2019 exhibit noteworthy progress in their outfitted performance during post-merger period.

Post-merger regression analysis suggests that impact of management quality, capital adequacy and sensitivity to interest rate risk on profitability (ROA) parameter have improved much in comparison with entire study period's regression analysis (both pre- and post-merger taken together) in both mergers. It can be inferred from the regression analysis that merger of these above two banks and subsequently with LIC has significant impact on earning capabilities of the Bidder Bank (IDBI) in terms of creating synergy through augmented managerial efficiency and subsequently by capital adequacy and non-interest income related sensitivity.

Keywords: merger; India; United Western Bank; IDBI Bank; LIC of India.

JEL classification:C12; G21; L25.

Introduction

Mergers and acquisitions are designed decisions to amplify the value to the shareholders as well as the firm. The embryonic predisposition towards mergers and acquisitions (M&As) world-wide, has been gone up in flames by growing competition. As an inorganic growth strategy, M&A are corridors to accomplish competence and to generate value. It is most comprehensively used strategy by firms to reinforce and uphold their position in the market place. M&As are considered as a comparatively speedy and competent way to spread out into new markets and integrate new technologies.

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Mergers and acquisitions have been proceeding in corporate as well as banking sector to eradicate financial, operation and managerial “Achille’s heel” as well as to enhance growth and development, to generate shareholders value, motivate strength of the organization with a view to tackle challenges in the facade of unbending competition in globalized environment. The key energetic strength for merger activity is ruthless competition among firms of the same industry which puts focus on economies of scale, cost efficiency, and profitability. The other factor behind bank mergers is the “too big to fail” principle followed by the authorities. There is a covet to reduce costs, reach global size, take benefit of economies of scale, increase investment in technology for strategic gains, desire to expand business into new areas and improve shareholder value.

Earlier, merging of one bank with another executed by regulator was intended at protecting the interest of investors of fragile banks. Many small and weak banks have been merged with other banks mainly to protect the interests of depositors. These may be classified as forced mergers. When a specific bank shows severe symptoms of sickness such as huge NPAs, erosion in net worth or substantial decline in capital adequacy ratio, RBI imposes moratorium under Section 45(1) of Banking Regulation Act, 1949 for a specific period on the activities of the sick bank. In this moratorium period, RBI identifies a strong bank and asks that bank to prepare a scheme of merger. Presently, market led mergers has gained momentum.

Mergers and acquisitions (M&As) have got prominence rooted by growing competition, globalization, liberalization and integration of national and international markets. One of the strategies to face the intense competition could be, to consolidate through the process of mergers and acquisitions in case of Indian financial sector organizations. India is gradually but steadily moving from a regime of large number of small banks to small number of large banks and ‘larger the bank, higher its competitiveness and better prospects of survival’ appears to be the tune for success. Most of the merger in Indian banking segment has so far taken place to restructure financially fragile banks with strong banks. However, this may have unfavourable influence upon the asset quality of the stronger banks. It is, expected that the strong banks should be merged with stronger banks to compete with foreign banks as well as to penetrate in the global financial market.

The event to get hold of the besieged United Western Bank (UWB) has lastly concluded with Industrial Development Bank of India (IDBI) led by the poor financial conditions of UWB owing to its inefficient management, The revival process was primarily initiated by RBI granting moratorium for 3 months and finally merging two companies. Finally, on September 13, 2006, the RBI proclaimed the merger of the Industrial Development Bank of India (IDBI) and United Western Bank (UWB) which ultimately came into effect from October 03, 2006. IDBI gained momentum from UWBL's enormous branch network as the merged entity had 411 branches as against 181 of IDBI alone.

In between October, 2006 to January, 2019, IDBI bank passed through turbulent phases. From May 7, 2008, by obtaining brand new Certificate of Incorporation from Registrar of Companies, the Bank's name was changed to IDBI Bank Limited for reflecting more precisely its extended business operation. Another merger of IDBI Home Finance Ltd. and IDBI Gilts, two wholly owned subsidiaries of IDBI, took place on April 08, 2011 with IDBI Bank Ltd.

Re-categorization of IDBI Bank Ltd. as a Private Sector Bank formalized with LIC of India acquiring 51% controlling stake in IDBI Bank on January 21, 2019. This emerged as a perfect solution to deal with the dual problem of divestments and fiscal shortage and at the same time exiting some loss-making PSU. The Government of India (GOI) is the single investor in both organizations, LIC and IDBI Bank Ltd. This is expected that LIC's possession of IDBI Bank was a realistic approach for salvaging the bank. It was founding a bank assurance firm, providing LIC of India an outstanding place in the banking sector (www.idbi.in). With the fair deal, IDBI bank obtained total capital of Rs. 21,624 crores from LIC. On the contrary, this merger bears mammoth implication with the gigantic approval of LIC policies with IDBI bank's 1.5 crore retail consumers approximately, about 18,000 staffs, and more than 1,800 retail outlets. Additionally, IDBI Bank Ltd. will expand its cash management service to LIC to enlarge current account balances and lesser funding costs. Conversely, LIC, with its 11 lakh agents and over 1 lakh staff, will exhibit IDBI. Furthermore, the accord suggests facilitating 900 IDBI branches to allow payments using NEFT, an instant money transfer system operated by the RBI (Jasrotia et al., 2022; Kakade, 2019).

1. Literature Review

Relatively a small number of studies have examined the diverse aspects of Merger and Acquisitions (M&As) on banking sector as well as on Indian financial services sector that have been delineated below.

Lin (2005), based on DEA approach, observed that there is a statistically significant negative correlation between cost inefficiency index and bank mergers, which indicate that banks engaged in mergers, tend to improve cost efficiency and further observed that bank mergers tend to upgrade the technical efficiency, allocative efficiency and cost efficiency of banks. DeLong (2003) scrutinized a distinguished number of bank mergers occurred during 1991-95, examined numerous facets of diversification strategies. The study established that the merger of partners got benefited from the market highlighting their topography and activities and earning capabilities. Simply of these aspects, focusing earning streams augments long-term performance.

Halkos & Salamouris (2004), using DEA approach for a time period,1997–1999, found a large variation in performance and shows that the increase in efficiency is accompanied with a reduction in small banks' number due to mergers and acquisitions. Mishra et al. (2005) observed the contribution of the acquired banks in merely non conglomerate types of mergers (i.e., banks with banks), and observed extremely statistically significant proof that non conglomerate types of mergers absolutely diminish the total as well as the unsystematic risk while having no statistically significant consequence on systematic risk.

Ottaviani & Squintani (2006) observed that in case of risk averse banks, the correlation between the shocks to the demand for loans and the shocks to the supply of deposits persuaded a strategic interdependence between two sides of market while characterizing diversification strategy as a motivation for banks mergers.

Kakani & Mehta (2006) stated that there were multiple reasons for Merger and Acquisitions in the Indian Banking Sector and still contains to capture the interest of a research and it simply because of after the strict control regulations had led to a wave of M&As in the said sector and concluded that M&A is an imperative for the state to create few large Banks.

Weiguo & Ming (2008) applied DEA approach for analysing commercial banks' efficiency, took into account 5 American banks and 4 Chinese banks and observed that merger and acquisition (M&A) has superior impact on banking efficiency of Chinese banks than that of American banks. Anand & Singh (2008) studied the influence of merger on five banks in the Indian Banking scenario and observed that the announcement of merger of Bank had positive and significant impact on shareholder's wealth.

Bhan (2009) concluded that the mergers during 1995-2006 in the post reform period's banking sector possessed considerable gains, which was justified by the EVA of the banks. Aharon et al. (2010), analysed the stock market bubble effect on Merger and Acquisitions and found that merger of banks through consolidation is the significant force of change that took place in the Indian Banking sector.

Liargovas & Repousis (2011) scrutinized the effect of mergers on the performance of the Greek Banks for the period, 1996-2009, using Event study methodology. The overall results pointed out that bank mergers had no impact on wealth generation and improvement of operating performance.

Dutta & Dawn (2012) pointed out that the post-merger periods were thriving and show a significant increase in revenue, total assets, profits, deposits as well as number of employees of the acquiring firms of the banking industry in India.

Naga & Tabassum (2013) has inferred that net profit ratio, return on equity, operating profit ratio, return on capital employed, and also debt equity ratio, there is noteworthy variation but there is no noteworthy divergence in gross profit margin.

Ramachandran (2012) made a comparison between pre-and post-merger operating presentation of merged entity in assistance with several financial parameters for a period from 1999-2000 to 2010-2011 in the context of M&A in Indian banking segment. The study had come to an inference that there were no greater changes in the profitability when pre & post-merger periods are compared.

Gupta (2015) estimated the influence of merger and acquisitions on the financial performance of the selected banks in India. Considering the merger of ICICI bank and Bank of Rajasthan, and second, the merger of HDFC bank and Centurion Bank of Punjab, the study revealed that there is a positive impact of mergers on the economic performance of the selected banks.

Mondal et al. (2017), made an attempt to critically analyse the influence of the Nedungadi Bank and Punjab National Bank merger on their operating performance through comparing their pre and post- merger performance by using different financial ratios and showed that majority of the financial ratios of sampled banks in India display a remarkable and significant improvement in their performance during the post -merger period as compared to the pre-merger period in terms of liquidity and leverage parameters, profitability and shareholder's health. Ray (2018), evaluated the merger impact of the Bank of Rajasthan and ICICI Bank on their operating as well as financial performances by comparing their pre- and post-merger period performances, and indicated that most of the financial ratios under the consideration, showed an impactful improvement during the post-merger time in view of operational efficiency, profitability and shareholder's wealth as compared to the pre-merger period.

Edward& Manoj (2019) examined performance of SBI after merger of State Bank of Indore with it for a period from 2012 to 2019 dividing April 2012 -March 2017 as pre-merger period and April 2017 - March 2019 as post-merger period. The empirical analysis judged April 2012 to March 2017 as pre-merger study period and April 2017 to March 2019 as post-merger period. The result suggests that there is no noticeable change in the liquidity and profitability and operational performance. But market reacted negatively after announcement of merger.

Shanmugavel & Ragavan (2020) studied the pre-merger and post-merger financial performances of 9 leading banks Merger deal from the 2004 to 2010 comparing five years pre- and post-merger data by using some major financial Ratios such as profitability, Liquidity and Capital adequacy Ratio to observe the effect of merger on financial presentation of select banks. The results reveal that overall merger performance over the major profitability ratios, liquidity ratio and capital adequacy ratio are enhanced during post-merger period than the pre-merger period. The quick ratio showed a statistically significant increase, indicating better cash management. The empirical outcome led to conclude that merger is a deliberate move for industry intensification, mainly in the context of cutthroat pressure and mechanization.

Sengar et al. (2021) investigated on post-merger financial analysis of two Indian banks and endowed with a model which demonstrates qualitative research methodology using SWOT Analysis for chosen banks for 4 years period. The result suggests that the mergers of banks are flourishing and advantageous for the new combined entity as well as to the stakeholders.

Reddy (2022) evaluates the financial reliability of select public and private sector banks of India applying the CAMELS approach which takes into consideration capital adequacy, asset quality, management efficiency, earnings, and liquidity over period of five years from 2016-2020. The study revealed that private sector banks usually outperformed, more competent and cost-effective than public sector banks in most of the CAMEL factors, demonstrating superior competence and profitability.

Tanted & Baghchandani (2023) examined the pre- and post- merger effects of ICICI bank and former Bank of Rajasthan Limited. Financial performance of banks using several ratios like EPS, P-E Ratio, Current Ratio, ROI, ROA, ROE, Debt- equity ratio have been analysed. The result suggests that merger had a significant impact on Return on equity (RoE) and share prices affecting the growth of merged entity as well as investors and shareholders.

Jose & Jegadeeshwaran (2024) strived to evaluate the performance of State Bank of India by CAMELS approach during the pre- and post-merger periods with five of its associates for a period from 2012-2022 using some key financial parameters like asset quality, earning quality, capital adequacy, liquidity, management quality, and sensitivity to market risk. The result showed that SBI's financial proficiency is gradually escalating during post-merger periods. Out of several indicators used in CAMELS analysis, liquidity and management quality are established to be noteworthy in the post-merger period. The analysis concluded that management should be careful enough with efficiently handling liquid assets.

Fahad. et al. (2025) explored the fiscal performance of 4 merging banks in Pakistan to make out noteworthy differences and impact on pre- and post-merger outcome for the period from 2005 to 2022 using paired sample t-tests and regression analysis. The analytical endeavour suggests that there were noteworthy optimistic differences in definite financial indicators such as return on assets, Total Loan to Total Deposit, Dividend per share, earning per share for one bank, net interest margin, capital adequacy ratio for two banks, non-performing loans to total loans were significant for 3 banks, while debt to equity, market price

per share were important for all banks. Dividend per share has significant outcome for only one bank. Regression results revealed that in post-merger capital adequacy ratio, earning per share has positive but dividend per share and market price per share has significance negative impact on return on assets.

However, there is slight published empirical literature on the overall influence of Merger and acquisition upon banks in India. Reviewing previous literature on this issue, it is apparently found that the earlier studies differed from one another in the selection of period, selection of banks, selection of indicators and selection of statistical tools and techniques. In contrast, the present study focuses its attention on the impact of Merger and acquisition on selected commercial banks and its subsequent merger of merged entity of IDBI bank with LIC of India, a statutory company formed by government of India during FY 2004-05 to 2024-25. This study is a preliminary attempt to fill this research gap.

The present research is motivated by the very dearth of empirical evidence on the impact of M&A in Indian bank's context and also try to compare whether this merger has impacted economic performance of IDBI bank after merging with United Western Bank Ltd in 2006 and subsequent big merger with LIC of India in 2019. Specifically, we will attempt to assess the post-merger performance of specific Indian bank (IDBI Bank) after undergoing merger with United Western Bank Ltd in 2006 and LIC of India in 2019 by using accounting approach (ratios) during the study period from 2004-05 to 2024-25 in terms of different parameters (CAMELS ratios) and to identify and explore the factors responsible for growth or declining performance in post-merger phase of selected banks.

2. Research Methodology

For attaining the results vis-à-vis to analyse the effect of merger on acquirer banks, pre- and post-merger economic analyses have been compared in terms of several suitable financial ratios. The pre-and post-merger financial performance have been achieved in terms of Return on Assets (RoA) or Earnings, Capital Adequacy ratio (CAR), Assets Quality (AQ), Management Quality (MQ), Liquidity ratio (LR), Sensitivity ratio (SR). The pre-merger (two years before) and post-merger (after two years) financial ratios have been compared for pair t-test depending upon the availability of database. The year of merger has been carefully taken as base year and indicated by 0 which has been excluded from the analysis. Keeping in mind the purpose of the study, we have considered the mean difference, standard deviation, independent pair t-test as tools of statistical evaluation of our study.

Collection of data

The present study on selected Indian commercial banks is founded mainly on secondary database. The secondary data have been collected primarily from the Department of Research and Statistics of the Indian Banking Association (IBA). Besides, data have also been collected from Reserve Bank of India (RBI), Annual Report of Public Sector Banks, Trend and Progress of Banking in India, Study Reports of various Committees set up by India Government, websites of various governments and non-government agencies etc.

Period of Study

Two major merger deals took place in the operational regime of IDBI bank-one in 2006 where UWB with IDBI Ltd merged and another in 2019 formalizing merger between IDBI bank and LIC of India. Consequently, based on available current data from 2004-05 to 2024-25, the

study analysed two mergers deal segregating period of study into two fragmented time span-2004-05 to 2015-16 and 2015-16 to 2024-25.

In case of merger of UWB with IDBI Ltd., IDBI, constituted as a development financial institution under Industrial Development Bank of India Act, 1964, was incorporated as a govt. company on September 27, 2004. For accomplishing the quicker inorganic expansion of the bank, IDBI Bank Ltd, a wholly owned subsidiary of IDBI Ltd, was merged with IDBI Ltd in 2005. Therefore, data in statistical book or annual report of the bank available from 2004-05 compels us to initiate the analysis of merger from 2004-05. The merger of UWB with IDBI Ltd. had taken place in the year 2006-07 (the date of merger October 3, 2006). The data for two years prior to merger (i.e., FY 2004-05 & 2005-06) and data for two years after the merger have been analysed for IDBI bank. Thus, a period of 12 years (2004-2005 to 2015-16) has been analysed first. On the other hand, for second phase merger of IDBI bank with LIC of India in 2019, we have collected data from 2016-17 to 2024-25 from annual report of IDBI bank (several issues) as well as from moneycontrol.com. In case of merger of IDBI bank with LIC of India, data for five years prior to merger (i.e., FY 2015-16to2019-20) and data for five years after the merger (i.e., FY 2020-21 to 2024-25) have been analysed for IDBI bank

Sample banks and financial institution undertaken

We have undertaken a specific case of M&As where weak private sector bank-namely United Western Bank Ltd (UWB) has been merged with the public sector bank namely- IDBI Ltd in 2006 and another big merger deal taken place between IDBI bank and LIC of India in 2019.

Research Hypothesis

The following hypotheses may be formulated for testing the significant difference between Pre-and Post-merger financial indicators, which have been depicted below:

H_0 (Null Hypothesis): There is no significance difference between the pre-and post-merger financial indicators like Return on Assets (RoA) or Earnings, Capital Adequacy ratio (CAR), Assets Quality (AQ), Management Quality (MQ), Liquidity ratio (LR), Sensitivity ratio (SR).

H_1 (Alternative Hypothesis): There is significance difference between the pre-and post-merger financial indicators like Return on Assets (RoA) or Earnings, Capital Adequacy ratio (CAR), Assets Quality (AQ), Management Quality (MQ), Liquidity ratio (LR), Sensitivity ratio (SR).

Description of variables

Six independent variables are Capital Adequacy ratio (CAR), Assets Quality (AQ), Management Quality (MQ), Liquidity ratio (LR), Sensitivity ratio (SR)into our analysis because these variables are free from multicollinearity and one dependent variable indicating Earnings/ profitability (ROA) is considered.

(I) Capital Adequacy Ratio (CAR) (Capital/Risk weighted assets)

In the adoption of risk management strategies by a bank, the ratio determines the cushion available to a bank against the credit risk, operational risk and market risk. Capital adequacy has emerged as one of the major indicators of the financial health of a banking entity. It is important for a bank to maintain depositors' confidence and preventing the bank from going bankrupt. Capital is seen as a cushion to protect depositors and promote the stability and efficiency of financial system around the world. Capital Adequacy reflects the overall financial condition of the banks and also the ability of management to meet the need

for additional capital. It also indicates whether the bank has enough capital to absorb unexpected losses. Capital Adequacy Ratio acts as an indicator of bank leverage. The banks are required to maintain the capital adequacy ratio (CAR) as specified by RBI from time to time. It is arrived at by dividing the total equity by total assets. The higher the CAR, the stronger is the bank.

(II)Assets Quality

It assesses the quality of banks assets that includes current and fixed investments and loans, real estate and the off- balance sheets transactions. Since major part of banks assets are form by loans and investments, assets quality also covers banks loan quality thereby it also reflects the quality of earnings of the institution comes from those loans and investments. In CAMELS model through assessing the assets quality factor, we examine basically the performance of an asset. Its assessment involves rating of investment risk factors and making balance of those issues against the bank's capital earnings thereby indicating the stability of banks with particular risk. It also reflects the efficiency of a bank investment's policies. Here it is measured by the total investments to total assets Ratio.

(III) Management Quality

It measures the ability of banks management team to identify and then react to the financial stress. It is basically depended on the bank's business strategy for next few years, it's financial performances like capital accumulation rate, growth rate and identifications of their major risks. It also depends on their internal control systems ability to track and identifying potential risks. Truly speaking, through understanding of a bank's management quality evaluators ensure the safe operations of the banks, their competence to the needed and appropriate interior and peripheral control systems and regulations. Here we measure it through NII/NP.

(IV) Earnings

It helps to evaluate bank's long-term viability or strengthens in terms of returns specifically that core long term earnings that help them to grow their operations and maintain their competitiveness. Under this head, evaluators specifically examine ROA, Net Interest Margin and future earnings projection under ruthless economic circumstances. Here we use ROA as a measurement of Earnings of banks. ROA basically identifies how efficiently banks use their assets to generate long term return for their investors.

(V) Liquidity

This parameter mainly examines interest rate risk as well as the liquidity risks. If the interest rate risk is outsized, then, the investment in banking sector and loan portfolio value will be unstable and hence, liquidity risk arises as the risk of not being able to meet the present or future cash flow needs without affecting day to day operations. Here we measure liquidity through Cash and Cash Equivalents/Total Assets ratio.

(VI) Sensitivity

It measures the banks sensitivity to market risks. It replicates the extent to which earnings are exaggerated by interest rates, commodity prices and exchange rates. Here we measure this through NII/ Total Assets.

3. Statistical Tests and Econometric Methodology

To ensure the robustness and validity of empirical findings, a comprehensive econometric framework was implemented, integrating distributional diagnostics, parametric and non-parametric inference, regression modelling, and time-series econometric techniques. The empirical strategy followed a structured sequence: (i) normality testing, (ii) mean comparison analysis, (iii) multivariate regression modelling, and (iv) post-estimation diagnostic and causality testing. These procedures were implemented sequentially, as described below.

3.1. Normality Testing and Mean Comparison Tests

Shapiro–Wilk (S-W) Normality Test

The Shapiro–Wilk (S–W) test was employed to examine the normality of data distribution. The null hypothesis of the test assumes that the sample is drawn from a normally distributed population. The test statistic S-W evaluates the null hypothesis that a sample $x_1,...x_n$ came from a normally distributed population.

Formally:

H_0: Data follow a normal distribution.

H_1: Data deviate from normality.

Variables satisfying the normality criterion were analysed using parametric techniques, whereas non-normally distributed variables were evaluated through non-parametric procedures. The test statistic(W) is computed as:

$$W = \frac{(\sum_{i=1}^{n} a_i x_{(i)})^2}{(\sum_{i=1}^{n} (x - \bar{x})^2}$$

where $x_{(i)}$ = the ordered sample values; a_i = constants derived from the expected values and variances of the order statistics of a normally distributed sample.

Paired Sample t Test

For normally distributed series, the paired sample t-test was applied to examine whether statistically significant changes in normal returns occurred before and after M&A announcements, following Bhaumik & Selarka (2008).

The hypotheses are formulated as:

H_0: There is no significant difference in normal return due to the occurrence of the event.

H_1: There is a significant difference in normal return due to the occurrence of the event.

The hypotheses can be expressed in two different ways that express the same above idea and are mathematically equivalent:

H_0: $\mu_1 = \mu_2$ ("the paired population means are equal");

H_1: $\mu_1 \neq \mu_2$ ("the paired population means are not equal").

where: μ_1 is the population mean of variable 1, and μ_2 is the population mean of variable 2.

Wilcoxon Signed-Ranks Test

For variables that did not satisfy the normality assumption, the Wilcoxon Signed-Rank test was employed as a non-parametric alternative to the paired t-test. This test assesses whether the median differences between paired observations significantly deviate from zero.

The test statistic *W* is calculated as the sum of signed ranks of the differences. This procedure allows reliable inference when the assumption of normality is violated.

$$W = \sum_{i=1}^{Nr} [\text{sgn}(x_{2,i} - x_{1,i}) \cdot R_i]$$

This distribution has an expected value of 0 and a variance of:

$$\frac{N_r(N_r+1)(2N_r+1)}{6}$$

Following ratio estimation for each merger, the Shapiro–Wilk test was first applied. Based on the normality results, paired t test at 95% confidence level was carried out for parameters following normal distribution and Wilcoxon Paired Sign-Rank test was conducted for factors not following normal distribution.

3.2. Econometric Modelling & Diagnostics

Multiple Regression Analysis (OLS Method)

Multiple regressions have been conducted using Ordinary Least Square (OLS) estimation method in SPSS to assess the influences of hypotheses or more clearly to test how the independent variables explain the Earnings on Assets (EA). Before running the regression, investigation into the multicollinearity issue was carried out using the pair wise correlation matrix.

First of all, bivariate (pair-wise) correlations among the independent variables were examined to find out the multicollinearity problem. The existence of correlation of about 0.90 or larger indicates that there is problem of multicollinearity. When independent variables are highly correlated in a multiple regression analysis, it is difficult to identify the unique contribution of each variable in predicting the dependent variable because the highly correlated variables are predicting the same variance in the dependent variable. Some statisticians say correlations above 0.70 indicate multicollinearity and others say that correlations above 0.90 indicate multicollinearity.

Multicollinearity is assessed by examining tolerance and the Variance Inflation Factor (VIF), which are two collinearity diagnostic factors that can help to identify multicollinearity. If a low tolerance value is accompanied by large standard errors and no significance, multicollinearity may be an issue. The variable's tolerance is indicated by $1\text{-}R^2$. A small tolerance value designates that the variable under contemplation is approximately a perfect linear combination of the independent variables already in the equation and that it should not be added to the regression equation. The variance inflation factor (VIF) measures the impact of collinearity among the variables in a regression model. The variance inflation factor (VIF) is 1/Tolerance, it is always greater than or equal to 1. There is no formal VIF value for determining presence of multicollinearity. A commonly given rule of thumb is that multicollinearity exists when tolerance is below 0.1 and values of VIF that exceed 10 are often regarded as indicating multicollinearity. When those R^2 and VIF values are high for any of the variables in regression model, multicollinearity is probably an issue.

In the study, we frame a regression equation by OLS method to assess the impact of various predictors on Earnings on Assets (EA) of the acquiring banks in our study namely IDBI bank, as under. We have taken following five independent variables, which are free from multicollinearity, into our regression analysis:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$

where: Y is return on assets (RoA) or Earnings; X_1 is capital adequacy ratio (CAR); X_2 is Assets quality (AQ); X_3 is management quality (MQ); X_4 is liquidity ratio (LR); X_5 is sensitivity ratio (SR); ε_t represents the "noise" or error term; α and β_i represent the slope and coefficient of regression.

The coefficient of regression, β indicates how a unit change in the independent variables, in our study, capital adequacy ratio (CAR), assets quality (AQ), management quality (MQ), liquidity ratio (LR), sensitivity ratio (SR)]. The error, ε_t is incorporated in the equation to cater for other factors that may influence Return on assets (RoA) or earnings. The validity or strength of the Ordinary Least Squares method depends on the accuracy of assumptions. In this study, the Gauss-Markov assumptions are used and they include that the dependent and independent variables are linearly co-related, the estimators (α, β) are unbiased with an expected value of zero i.e., $E(\varepsilon_t) = 0$, which implies that on average the errors cancel out each other. The procedure involves specifying the dependent and independent variables. However, it depends on the assumptions that the results of the methods can be adversely affected by outliers.

3.3. Post-Estimation Diagnostics

Autocorrelation Tests

In Ordinary Least Squares (OLS) regression, time series residuals are often found to be serially correlated with their own lagged values. Serial correlation means (a) OLS is no longer an efficient linear estimator, (b) standard errors are incorrect and generally overstated, and (c) OLS estimates are biased and inconsistent. This test is an alternative to the Q-Statistic for testing for serial correlation. It is available for residuals from OLS, and the original regression may include autoregressive (AR) terms.

Durbin- Watson Statistic

Durbin Watson Statistic is a number that tests for autocorrelation in the residuals from a statistical regression analysis. Durbin-Watson statistic is always between 0 and 4. A value of 2 means that there is no autocorrelation in the sample. Value approaching 0 indicate positive autocorrelation and values towards 4 indicate negative autocorrelation. The test statistic is calculated with the following formula:

$$\text{DW} = d = \frac{\sum_{t=2}^{T} (e_t - e_{t-1})^2}{\sum_{t=2}^{T} e_t^2},$$

where: $e_i = y_i - \hat{y}_i$ are the residuals, y_i and $\hat{y}_i$= the observed and predicted values respectively.
n= the number elements in the sample.

The hypotheses for the Durbin Watson test are:

H_0= no first order autocorrelation.

H_1= first order correlation exists.

Breusch-Godfrey Test

Unlike the Durbin-Watson Test, the Breusch-Godfrey test may be used to test for serial correlation beyond the first order, and is valid in the presence of lagged dependent variables. The null hypothesis of the Breusch-Godfrey test is that there is no serial correlation up to the specified number of lags. The Breusch-Godfrey test regresses the residuals on the original regressors and lagged residuals up to the specified lag order. In order to estimate autocorrelation by the Breusch-Godfrey test, by OLS technique, we first estimate and save residuals and then we conduct another regression (the auxiliary regression) and regress the current value of residual on all of the independent variables, and as many lagged residual terms.

The Breusch-Godfrey statistic is:

$(T\text{-}p) * R^2$,

where: *T* is number of observations, *p* is number of lagged residual terms. Therefore, the number of observations multiplied by R^2 is the Breusch-Godfrey test statistic.

H_0: this regression will explain very little (i.e., no autocorrelation). The statistic is distributed chi-squared, with *p* degrees of freedom.

Reject H_0 if the p-value of the Breusch-Godfrey statistic is less than 0.05.

Stationarity and Unit Root Testing

When dealing with time series data, a number of econometric issues can influence the estimation of parameters using OLS. Regressing a time series variable on another time series variable using the Ordinary Least Squares (OLS) estimation can obtain a very high R^2, although there is no meaningful relationship between the variables. This situation reflects the problem of spurious regression between totally unrelated variables generated by a non-stationary process.

Therefore, prior to testing and implementing the Granger Causality test, econometric methodology needs to examine the stationarity; for each individual time series, most macro-economic data are non-stationary, i.e., they tend to exhibit a deterministic and/or stochastic trend. Therefore, it is recommended that a stationarity (unit root) test be carried out to test for the order of integration. A series is said to be stationary if the mean and variance are time-invariant.

A non-stationary time series will have a time dependent mean or make sure that the variables are stationary, because if they are not, the standard assumptions for asymptotic analysis in the Granger test will not be valid. Therefore, a stochastic process that is said to be stationary simply implies that the mean [$(E(Y_t)$] and the variance [Var (Y_t)] of Y remain constant over time for all t, and the covariance [covar (Y_t, Ys)] and hence the correlation between any two values of Y taken from different time periods depends on the difference apart in time between the two values for all t≠s.

Granger Causality Analysis

Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger, 1969).

The standard Granger causality test (Granger, 1988) seeks to determine whether past values of a variable help to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Y_t add no information to explanation of movements of X_t beyond that provided by lagged values of X_t itself (Green, 2003).

We should take note of the fact that the Granger causality technique measures the information given by one variable in explaining the latest value of another variable. In addition, it also says that variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y. If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y. The null hypothesis (H_0) that we test in this case is that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X. In summary, one variable (X_t) is said to Granger cause another variable (Y_t) if the lagged values of X_t can predict Y_t and vice-versa.

4. Analysis of Research Results

Phase-1: Merger of United Western Bank with IDBI bank [Date of merged on 03.10.2006]

The following Table 1 shows the average of pre-merger financial indicators of United Western Bank and IDBI bank and average of post-merger financial indicators of Acquiring Bank-IDBI bank, mean differences, change in ratio and their growth pattern.

Table 1: Pre- and Post-Merger Financial Ratios for IDBI Bank (UWB Merger, 2006)

Financial parameters	Pre-and post-merger	Mean	Mean Diff	Change in ratios	Std. Deviation	Growth Rate (%)	Impact (+)P or (-)N
C: Capital Adequacy Ratio (CAR)	Pre-merger	5.17525	0.624	I*	0.0449	12.06%	I(P)
	Post-merger	5.79874			0.986		
A: Assets Quality (AQ)	Pre-merger	29.9972	-1.7828	D**	0.3391	-5.94%	D(N)
	Post-merger	28.2144			2.3606		
M: Management Quality (MQ)	Pre-merger	-43.6505	230.98	I*	0.079196	529.16 %	I(P)
	Post-merger	187.331			68.55334		
E: Return on Assets (ROA)	Pre-merger	-0.4675	1.1415	I*	0.053033	244.17 %	I(P)
	Post-merger	0.674			0.1097		
LR: Liquidity	Pre-merger	7.53725	-0.7688	D**	0.351079	-10.20%	D(N)
	Post-merger	6.7684			0.8230		
SR: Sensitivity	Pre-merger	1.2577	-0.1711	D**	0.152452	-13.60%	D(N)
	Post-merger	1.0866			0.519732		

Note: *I = increase; *D = decrease. I(P) indicate a positive increase in the mean from the pre- to post-merger period, while D(N) denotes a negative decrease in the mean over the same period.

Source: Author's own estimate

While considering the case of United Western Bank and IDBI bank merger, regarding capital adequacy ratio (CAR), assets quality (AQ), management quality (MQ), earnings or return on assets (ROA), liquidity ratio (LR), sensitivity ratio (SR), null hypotheses are rejected which lead us to conclude that there are significant differences between pre-and post-merger above mentioned financial indicators. Table 1 shows a growth rate of 12.06% (showing improvement in post-merger period) in capital adequacy ratio (CAR). Capital adequacy ratio (CAR), one of the major indicators of the financial health of bank, has noticeably enhanced

during post-merger period, which assure customer regarding protection of their investment in one hand and on the other, it ensures profitability of the merged bank.

Asset quality is also a significant determinant of the overall financial condition of a bank. For commercial banks, the main factor affecting largely asset quality is the worth of their loan portfolio and their credit administration program. Loans characteristically encompass a greater part of a bank's assets and hold the greatest amount of risk to their capital. Securities may also consist of a large part of the assets and also hold significant risks. So, the rating of asset quality of a bank reflects its accessible and possible credit risk connected with its loan and investment portfolios due to an increase in nonperforming loans so that credit risk increases, as well as off-balance sheet transactions. In Table1, asset quality decreases at the rate -5.94% after merger took place. This indicates higher non-performing loans which leads to the lower return on equity and return on asset.

Management efficiency is one of the banks specific factors that determine the financial performance. In post-merger period, managerial efficiency of IDBI Bank has enhanced by more than 5 times than pre-merger period ensuring the safe operations of the banks, their competence to the required and appropriate internal and external control systems and regulations. This is an indication that the capability of the management after merger with UWB bank to deploy its resources efficiently, income maximization, reducing operating costs has been noticeably and magnificently increased as a reflection synergic force.

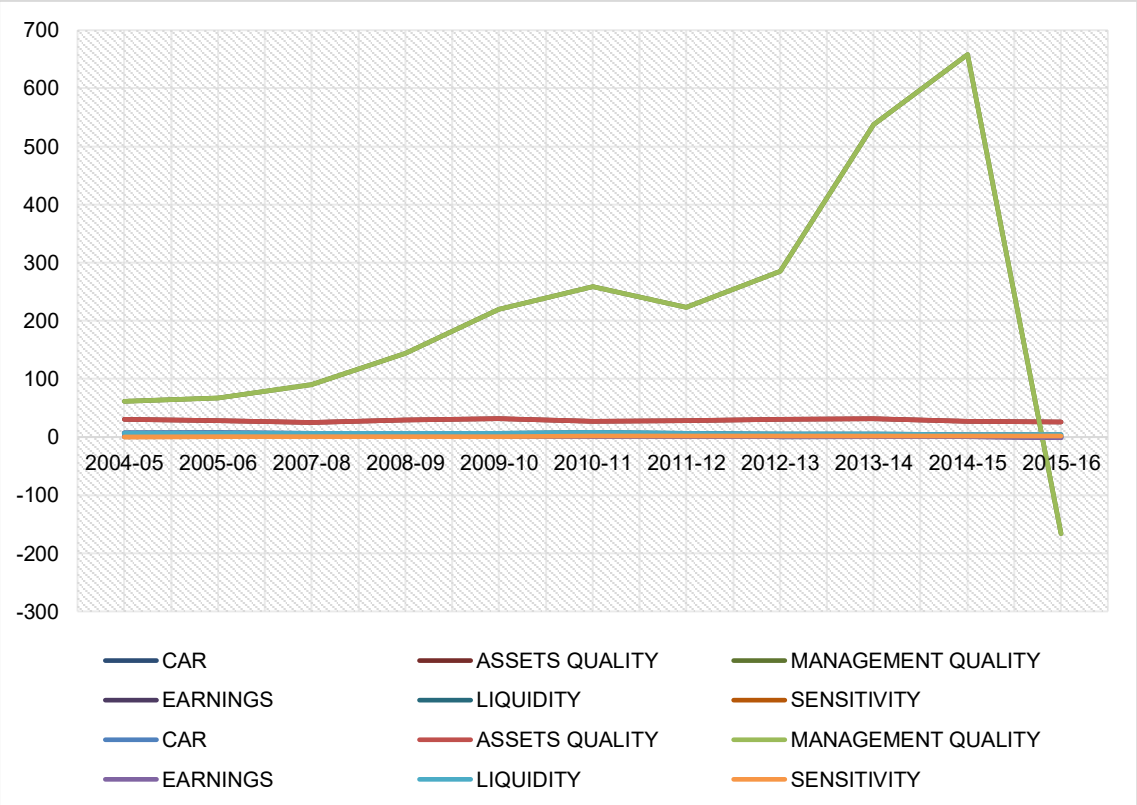
Return on Asset (ROA) indicating the barometer of measuring profitability of bank, indicates that it has increased at around 244% during post-merger period, which further indicates that it paves the way for enhancing the profitability of merged bank, probably due to enhanced managerial efficiency. After a merger, an increase in a bank's Return on Assets (ROA) is indicated by key financial and operational improvements that demonstrate the bank is generating higher profits from its combined asset base. The bank improves its operational efficiency by eliminating redundancies. This is typically reflected in a decrease in the cost-to-income ratio which have perhaps been made possible by closing overlapping branches and consolidating corporate offices, integrating and streamlining IT systems, reducing technology and maintenance costs, reducing redundant staff and other overhead costs.

The result in Table1 suggests regarding liquidity of merged entity of IDBI Bank that liquidity decreased at the rate of 10% nearly after merger indicting liquidity risk of not being able to meet the present or future cash flow needs without affecting day to day operations. This has another type of profound implications. A decrease in a bank's liquidity after a merger can be indicated by a decline in its high-quality liquid assets, an increase in the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) (as defined by Basel III regulations), or a higher cost of borrowing on the interbank market. A decrease in the bank's holdings of high-quality liquid assets, such as cash or government bonds, is a direct sign of lower liquidity. A rise in the amount of non-performing loans can tie up the bank's capital, reducing the liquid funds available for other purposes. An increase in the cost of borrowing from other banks indicates a higher demand for liquidity, which can be a sign of a liquidity shortage. Additionally, if decrease in liquidity ratio is accompanied with a rise in the credit-to-deposit ratio, especially if it outpaces growth in deposits, it might suggest that the bank is using more of its funds for lending, leaving less for immediate liquidity.

From the result, it suggests that sensitivity ratio decreased by nearly 14% during post merge period. A decrease in a bank's sensitivity ratio after a merger typically indicates a reduction in its exposure to market risks like interest rate, foreign exchange, or commodity price fluctuations. However, the specific implications depend on the cause of the decrease and the bank's overall strategy. The avenues through which it might happen in case of merged entity of IDBI Bank are by means of more diversified portfolio. A merger can create a larger, more diversified loan and investment portfolio, reducing the overall concentration of risk. If the merged entity holds a wider range of assets, the impact of a downturn in any single market is less pronounced. Another possible way that IDBI may adopt is Balance sheet restructuring.

The management of the newly merged bank may actively restructure the balance sheet to minimize exposure. This could involve reducing holdings of highly volatile assets or mitigating mismatches between interest-sensitive assets and liabilities. Moreover, to stabilize earnings, the bank may increase its investment in less volatile, high-quality securities, such as government bonds, which have lower risk and lower returns.

Figure 1: Graphical presentation of pre- and post-merger financial performance of UWB and IDBI Bank



Source: own estimate from tabulated data

Table 2: Classification and rating of CAMELS parameters

Capital Adequacy Ratio		
Sl no.	Particulars	Remarks
C	CAR= CAR= total equity / total assets	Good
Asset Quality		
Sl no.	Particulars	Remarks
A	AQ= total investments/ total assets	Poor
Management Quality		
Sl no.	Particulars	Remarks

M	MQ= NII/NP	Excellent
Earning Quality		
Sl no.	Particulars	Remarks
E	ROA= Net income/TA	Excellent
Liquidity		
Sl no.	Particulars	Remarks
L	LR=Cash and Cash Equivalents/Total Assets ratio	Poor
Sensitivity		
Sl no.	Particulars	Remarks
S	SR=NII/ Total Assets	Decreasing

Source: Author's own assessment

Table 2 suggests, based on merged entity of IDBI with UWB, that the parameter indicating capital adequacy ratio present positive trend towards their performance evaluation. With respect to asset quality, the parameter displays miserable declining trend. While considering Management efficiency, the respective ratio shows very strong positive performance that is beyond our general expectation. With respect to earning quality represented ROA, it has been found that financial parameter has presented excellent favourable picture within our expectation. With respect to liquidity and sensitivity analysis, the respective parameters are found to have declining trends during post-merger scenario.

Table 3: Shapiro-Wilk test of normality of merged entity of IDBI

Variables	Shapiro-Wilk		
	Statistic	Df	Sig.
CAR	.820	12	.016
AQ	.913	12	.232
MQ	.927	12	.346
E or ROA	.674	12	.000
LR	.861	12	.052
SR	.777	12	.005

Note: H_0: Data series are normal;H_1: Data series are not normal
Source: Author's own estimate

The Shapiro–Wilk testis a test of normality in frequentist statistics. This is a preferred test of normality when sample size is small (<50). The null-hypothesis of this test is that the population is normally distributed. Thus if the *p*-value is less than the chosen alpha level (0.05), then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. In other words, the data are not normal. On the contrary, if the *p*-value is greater than the chosen alpha level (0.05), then the null hypothesis that the data came from a normally distributed population cannot be rejected. In the study, data regarding asset quality (AQ), management quality (MQ) and liquidity (LR) are from normally distributed population. On the other hand, data relating to capital adequacy ratio (CAR), earnings (E) represented by ROA and sensitivity (SR) are from non-normal population.

Table 4: Paired samples statistics of United Western Bank Ltd and IDBI and merged entity of IDBI

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	AQ post	27.064	2	2.7789297	1.9650
	AQ pre	29.7095	2	1.5351288	1.0855
Pair 2	MQ post	117.1765	2	38.4475170	27.1865
	MQ Pre	64.4345	2	4.6633692	3.2975
Pair 3	LR post	6.6015	2	0.1421285	0.1005
	LR pre	6.5015	2	0.6314464	0.4465

Source: Authors' own estimate

In case of pre-and post-merger Asset Quality ratio, (AQ pre & AQ post), since the calculated value of t (0.867) for N = 2 (as in Table 5) is lower than the table value (12.7062 at $t_{0.05}$, df =1), we accept the null hypothesis. The results are not significant at 0.05 level of significance (p = 0.545).

Table5: Paired Samples t Test of United Western Bank Ltd and IDBI and merged entity of IDBI

Pair	Variables (Pre-Post)	Paired Differences					t	Df	Sig. (2 tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
1	AQ post - AQ pre	-2.6455	4.314	3.0505	-41.405	36.114	-0.867	1	0.545
2	MQ post - MQ Pre	52.742	33.784	23.889	-250.796	356.28	2.208	1	0.271
3	LR post - LR pre	.1000	0.48931	.3460	-4.296	4.496	0.289	1	0.821

Source: Authors' own estimate

Therefore, the results of the above Table5 show insignificant difference between pre-and post-M&A Asset Quality ratio, because the p-value is greater than 0.05. Therefore, after merger and acquisition taken place, there is no significant difference in the performance of the said IDBI bank in India as H_0 is accepted. This indicates that the means of the pre-and post-merger Asset Quality ratio values are not different significantly. On the other hand, in case of both pre-and post-merger Management Quality ratio(MQ pre & MQ post) and Liquidity ratio(LR pre & LR post), since the calculated value of t (2.208) and t(0.289) respectively for N=2 (as in Table 5) is lower than the table value (12.7062 at $t_{0.05}$, df =1),we can conclude that there exists insignificant difference between pre-and post-M&A management Quality and liquidity ratio, because the p-value is greater than 0.05 in both cases.

Even some ratios individually depicts that there is slight increase or decrease in the financial performance of banks, but paired samples *t* test shows in this study that there is no significant impact. From Table 5, for example, we observe that in pair 1, the post-merger asset quality ratio mean is smaller than that of the pre-merger period. We, therefore, conclude that it is more likely to have been due to some systematic and deliberate cause. If all other confounds are eliminated, this systematic cause must have been the event of merger.

Table 6: Hypothesis test summary

Null Hypothesis	Test	Sig.	Decision
The distribution of CAR pre & CAR post; EA pre & EA post; SR pre & SR post are the same	Related samples Frieman's Two-way Analysis of Variance by Ranks	0.103	Retain the null hypothesis

Note: Asymptotic significance is displayed. The significance level is 0.05.
Source: Authors' own estimate

In the above table, in all three cases, since the *p* value 0.103 is more than 0.05, we accept null hypothesis implying that there is no significant difference between premerger CAR and post-merger CAR; pre-merger EA and post-merger EA and also pre-merger SR and post-merger SR for merged entity of IDBI bank.

Table 7: Wilcoxon Test Ranks of merged entity of IDBI

Test Statistics[a]			
	CAR pre - CAR post	EA pre - EA post	SY pre - SY post
Z	-1.342[b]	-.447[c]	-1.342[c]
Asymp. Sig. (2-tailed)	.180	.655	.180

Note: [a]Wilcoxon Signed Ranks Test; [b]based on negative ranks; [c]based on positive ranks.
Source: Authors' own estimate

By applying the Wilcoxon signed rank test in Table 7, we can see that for all the 3 ratios, the significance level is more than 0.05 (0.18,0.655,0.18 respectively), therefore, the null hypothesis is accepted which indicates that there is no significant difference between the pre and the post-merger performance on the basis of CAR, EA, SR of the IDBI bank. However, if we compare the individual ratio, we have found that the post-merger CAR, post-merger EA performance has been better than the pre-merger period and reverse have happened in case of SR ratio.

Table 8 presents the pair wise correlation matrix for the variables used in our estimation. Prior to estimation, we examined the correlation among independent variables and we find that different independent variables are weakly correlated with each other. None of the pair wise coefficient of correlation was 0.90 or larger. From our analysis to test whether there exists multi collinearity, it is found that correlations among independent variables are moderate which do not exceed the general rule of thumb. Moreover, tolerance for these variables is moderately high which also are beyond the specified minimum ceiling (0.10) and VIFs do not exceed the specified rule of thumb of 10 (shown in regression analysis). This indicates that multicollinearity is not an issue of concern in this study.

Table 8: Correlation matrix among independent variables

		AQ	CAR	MQ	LR	SR
Pearson Correlation	AQ	1.000	-0.311	0.314	0.031	-0.095
	CAR	-0.311	1.000	-0.498	0.674	-0.632
	MQ	0.314	-0.498	1.000	-0.167	0.447
	LR	0.031	0.674	-0.167	1.000	-0.359
	SR	-0.095	-0.632	0.447	-0.359	1.000

Source: Authors' own estimate

The diagnostic tests are performed to the equation regarding problems such as autocorrelation and heteroskedasticity. Diagnostics are necessary to establish the power of the results in respect to robustness, biasness and efficiency of the estimates. We have conducted different diagnostic tests in order to see whether our results are free from problem of serial autocorrelation. The top part of the output presents the test statistics and associated probability values. The Obs*R-squared statistic is the Breusch-Godfrey LM test statistic for the null hypothesis of no serial correlation.

Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.599708	Prob. F(5,6)	0.7044
Obs*R-squared	3.998702	Prob. Chi-Square(5)	0.5496
Scaled explained SS	1.284474	Prob. Chi-Square(5)	0.9365

Source: Authors' own estimate from collected data

H_0: There is no heteroscedasticity i.e., variance for the errors is equal.

In math terms, that's: $H_0 = \sigma^2_1 = \sigma^2$.

H_1: There is heteroscedasticity i.e., variance for the errors is not equal.

In math terms, that's: $H_1 = \sigma^2_1 \neq \sigma^2$.

An important assumption of the classical linear regression model is that the disturbance (residual) term u_i is homoscedastic; that is, they all have the same variance. For the validity of this assumption, Breusch-Pagan-Godfrey Test are applied in the regression equation and the result is given in Table8.We can define heteroscedasticity as the condition in which the variance of error term or the residual term in a regression model varies. The Breusch-Pagan-Godfrey Test do not reject the null hypothesis of no heteroscedasticity because the p-value is larger than 0.05. (p>0.05). So, we fail to reject null hypothesis of no heteroscedasticity and the *F*-statistic and the LM test statistic both indicate that the residuals are not heteroscedastic and therefore variances for the errors are equal.

Table 9: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.888411	Prob. F(2,4)	0.4794
Obs*R-squared	3.690934	Prob. Chi-Square(2)	0.1580

Source: Authors' own estimate from collected data

As the calculated Breusch-Godfrey LM test statistic of 3.690934does not exceed the critical χ^2 (1) value (i.e., 3.84) in case of Merger of IDBI Bank and United Western Bank (Table 8), we cannot reject the hypothesis of no serial correlation up to lag order 1 at the 95% confidence level. The (effectively) high probability value (>0.05) corresponding to 'Obs*R-squared' strongly indicates the absence of serial correlation in the residuals. Therefore, the result from diagnostic checking shows that model does not suffer from autocorrelation.

To determine the stationarity property of the variables under our study, results from Table 10 revealed that the ADF values are smaller than the critical t-value at 5% level of significance for all variables at level [I(1)].

Table 10: Augmented Dickey Fuller (ADF) Test

Variables	CAR	AQ	MQ	EA	LR	SR
ADF test statistic	-3.308	-4.003	-6.742	-2.257	-4.432	-2.706
Test critical value t1% level	-1.982	-3.321	-3.259	-1.982	-3.213	-1.982
Prob	0.0039	0.0206	0.0006	0.0304	0.0083	0.0124
Decision (Stationary)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Author's own estimate

H_0: series has unit root;

H_1: series is trend stationary.

Based on these results, the null hypothesis that the series have unit roots at level can be rejected. Therefore, the results show that variable of our interest in each of the five cases of merger - capital adequacy ratio (CAR), assets quality (AQ), management quality (MQ), earnings or return on assets (EA or ROA), liquidity ratio (LR), sensitivity ratio (SR), attained stationary at first difference [I(1)] using augmented Dickey Fuller Test.

On the basis of the ADF result, we have tried to run cointegration test but failed to get any cointegrating relations among variables under consideration probably due to paucity of adequate long run time series data base, thus compelling researchers to run OLS technique.

We have taken following five independent variables capital adequacy ratio (CAR), assets quality (AQ), management quality (MQ), earnings or return on assets (ROA), liquidity ratio (LR), sensitivity ratio (SR), into our analysis because these variables are free from multicollinearity and also one dependent variable indicating profitability (ROA) is considered. From our analysis, to test whether there exists multicollinearity, it is found that correlations among independent variables are moderate which do not exceed the general rule of thumb. Moreover, tolerance for these variables is moderately high which also are beyond the specified minimum ceiling (0.10) and VIFs do not exceed the specified rule of thumb of10. This indicates that multicollinearity is not an issue of concern in this study (Result not shown).

Due to paucity of data, for proper understanding of impact of merger, we fail to conduct regression analysis in pre-merger and post- merger period separately. Instead, for better understanding of the impact of merger, we have conducted regression for entire period (taking both pre- and post-merger period) and separately for post-merger period.

Table11: Regression analysis of merged IDBI Bank (Post-merger period)

Coefficients [a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-2.787	2.016		-1.383	.261		
CAR	.089	.103	.438	.866	.450	.211	4.737
AQ	.061	.070	.239	.881	.443	.737	1.358
MQ	.002	.001	.625	2.332	.048	.754	1.327
LR	.170	.195	.358	.869	.449	.320	3.129
SR	-.184	.386	-.153	-.476	.667	.525	1.906

Note: [a] dependent variable: EA

Source: Author's own estimate using SPSS.

Table 11 shows the summary results for regression analysis (considering ROA as dependent variable) in the post-merger period. The parameter estimates reveal that out of 5 independent variables, only a single variable (MQ is found to have statistically significant impact on ROA at 5% level respectively.

Table 12: Regression analysis of IDBI Bank and UWB and merged IDBI Bank (both pre & post-merger period)

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-2.258	2.937		-.769	.471		
CAR	.108	.121	.517	.890	.408	.224	4.473
AQ	.023	.097	.085	.238	.820	.592	1.690
MQ	.001	.001	.320	.937	.385	.645	1.550
LR	.226	.234	.404	.966	.372	.431	2.318
SR	.089	.359	.104	.249	.812	.432	2.317

Note: [a] dependent variable: EA
Source: Author's own estimate using SPSS.

Table 12 shows the summary results for regression analysis (considering ROA as dependent variable) in both the pre- and post-merger period taken together. The parameter estimates in table reveal that out of five independent variables, no variable is found to have statistically significant negative impact on ROA at 10% and 5% level respectively.

Table13: Pairwise Granger causality test

Lags: 2	Obs.	F-Statistic	Probability	Decision
EA does not Granger Cause AQ	10#	0.79340	0.5020	Accept
AQ does not Granger Cause EA		0.32870	0.7343	Accept
EA does not Granger Cause CAR	10	1.75845	0.2641	Accept
CAR does not Granger Cause EA		0.80636	0.4971	Accept
LR does not Granger Cause EA	10	2.56333	0.1713	Accept
EA does not Granger Cause LY		0.14098	0.8718	Accept
MQ does not Granger Cause EA	10	7.22823	0.0335*	Reject
EA does not Granger Cause MQ		11.2829	0.0140**	Reject
SY does not Granger Cause EA	10	4.49222	0.0464*	Reject
EA does not Granger Cause SY		0.06872	0.9345	Accept

Note: # Observations after lag. *(**) Indicates significant causal relationship at 5% significance level.
Source: Author's own estimate

The results of pair wise granger causality between earning (EA) and different financial variables are contained in Table 13. We have found that causality between earnings (EA) and management quality (MQ) is bidirectional, no causality exists between earning (EA) and capital adequacy ratio (CAR), earning (EA) and liquidity (LR) in any direction. There exists unidirectional causality between synergy (SR) and earning (EA) which moves from sensitivity to earning (EA).

Phase-2: Merger of IDBI bank and LIC of India [Date of merger on 21.01 2019]

Table 14 represents the pre- and post-acquisition pattern of IDBI Bank Ltd which represents that share of public in the total shareholding is condensed from 26.02% in 2016-17 to 19.04% in terminal pre-acquisition period,2018-2019.

Table 14: Statement of shareholding pattern of IDBI Bank during pre- and post-acquisition period

Shareholding Pattern (%)/years	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
	Pre-Acquisition period					Post-Acquisition period				
(A) Promoter and promoter group [govt. of India]	80.16	73.98	73.98	80.96	46.46	47.11	45.48	45.48	45.48	45.48
(B) Public	19.84	26.02	26.02	19.04	2.54	1.89	5.29	5.29	5.29	5.29
Total (A+B)	100	100	100	100	100	100	100	100	100	100

Source: Annual report of IDBI (several issues)

This is a reflection of loss of public confidence in the said bank. This might probably be owing to gradual unwarranted loss and abrupt increase in NPA. Post-acquisition picture reflects regaining of public confidence with the increase in public shareholding from 1.89% in 2020-21 to 5.29% in 2024-25.

Table 15: CAMELS Analysis of IDBI Bank [Merger of IDBI bank with LIC of India]

Ratios/ years	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
	Pre-Acquisition period					Post-Acquisition period				
C: Capital Adequacy Ratio (CAR)	11.74	11.59	10.42	10.31	11.42	13.54	15.71	19.43	20.33	22.48
A: Assets Quality (AQ)	5.79	10.59	21.41	27.87	27.52	27.64	22.77	19.47	6.53	4.86
M: Management Quality (MQ)	27.24	41.66	46.17	69.67	95.79	96.62	47.81	49.59	48.47	40.67
E: Return on Assets (ROA)	1.69	1.52	1.43	2.29	1.48	1.68	2.61	2.73	2.89	2.92
LR: Liquidity	6.29	6.24	5.61	5.87	5.16	7.41	3.32	2.87	1.67	1.58
SR: Sensitivity	1.23	0.97	1.24	2.41	1.18	1.51	1.63	1.69	1.41	0.88

Source: Computed Annual reports of IDBI Bank [several issues]

Table 15 designates that, during the pre-acquisition and post-acquisition period, CAR of IDBI Bank is more than the benchmark level determined by RBI i.e. (9%). The higher CAR points out that the bank is capable of protecting value of investment of investors. Average CAR of pre-acquisition period is 11.24 and of post-acquisition period is 18.13 reflecting a positive growth of 61.29% (Table 16).

Table 16 indicates that, during post- acquisition period, asset quality of IDBI bank decreases from 18.71 in pre-acquisition period to 15.99 in post-acquisition period at the rate -14.54% after merger happened implying higher non-performing loans leading to the lower return on equity and return on asset. In post-merger period with LIC, managerial efficiency of IDBI Bank has enhanced slightly by0.39% from a pre-merger average of 56.348 to 56.568 in post-merger period ensuring the safe operations of the banks. The result in Table 15 indicates that Return on Asset (ROA) indicating profitability of bank has increased gradually and post-merger period shows 44.14% jump from pre-merger period. Liquidity of merged entity of IDBI Bank decreased at the rate of -33.86% nearly after merger indicting liquidity risk of not being able to meet the present or future cash flow needs without affecting day to day operations. The sensitivity ratio suggests that sensitivity ratio increased by nearly 10.57% during post merge period. An increase in a bank's sensitivity ratio after a merger typically indicates an enhancement in its exposure to market risks like interest rate, foreign exchange, or commodity price fluctuations. Figure 1 and Figure 2 corroborates the statistical presentation of the data.

Table 16: Mean and Standard Deviation of pre-merger ratios of combined IDBI bank [Date of merger on 21.01 2019]

Financial parameters	Pre-and post-merger	Mean	Mean Difference	Change in ratios	Std. Deviation	Growth Rate (%)	Impact (+)P or (-)N
C: Capital Adequacy Ratio (CAR)	Pre-merger	11.24	6.89	I*	0.6452	61.29%	I(P)
	Post-merger	18.13			3.638		
A: Assets Quality (AQ)	Pre-merger	18.71	-2.72	D**	9.911	-14.54%	D(N)
	Post-merger	15.99			10.093		
M: Management Quality (MQ)	Pre-merger	56.348	0.22	I*	26.752	0.39%	I(P)
	Post-merger	56.568			22.428		
E: Return on Assets (ROA)	Pre-merger	1.62	0.72	I*	0.443	44.14%	I(P)
	Post-merger	2.34			0.432		
LR: Liquidity	Pre-merger	5.70	-1.93	D**	0.439	-33.86%	D(N)
	Post-merger	3.77			2.340		
SR: Sensitivity	Pre-merger	1.23	0.13	I*	0.440	10.57%	I(P)
	Post-merger	1.35			0.237		

Note: *I = increase; *D = decrease. I(P) indicate a positive increase in the mean from the pre- to post-merger period, while D(N) denotes a negative decrease in the mean over the same period.

Source: Author's own estimate

While considering the merger of IDBI bank and LIC of India, regarding capital adequacy ratio (CAR), assets quality (AQ), management quality (MQ), earnings or return on assets (ROA), liquidity ratio (LR), sensitivity ratio (SR), null hypotheses are rejected which lead us to conclude that there are significant differences between pre-and post-merger above mentioned financial indicators.

Figure 2: Pre- and Post-Merger Financial Performance: LIC & IDBI Bank

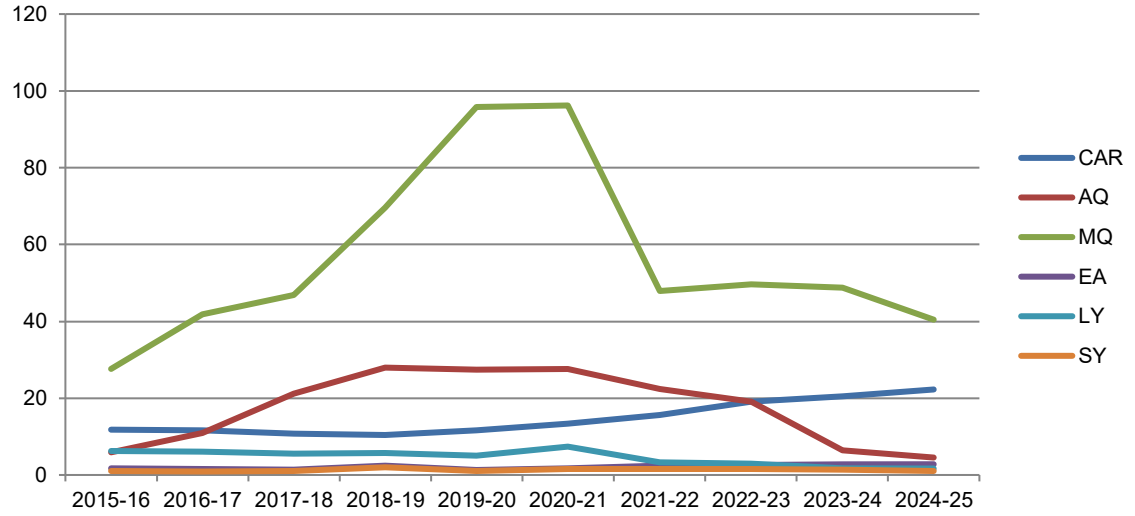


Table 17: Regression analysis of IDBI Bank and LICI and merged LICI (both pre & post-merger period)

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.395	.640		.617	.571		
CAR	.060	.030	.427	2.006	.115	.133	7.534
AQ	-.019	.013	-.302	-1.460	.218	.141	7.084
MQ	.001	.004	.024	.152	.887	.241	4.158
LR	-.095	.057	-.309	-1.650	.174	.171	5.836
SR	1.157	.192	.647	6.033	.004	.524	1.908

Note: [a] dependent variable: EA

Source: Author's own estimate using SPSS.

Table 17 shows the summary results for regression analysis (considering ROA as dependent variable) in both the pre- and post-merger period taken together. The parameter estimates in table reveal that out of five independent variables, capital adequacy ratio and sensitivity ratio are found to have statistically significant favourable impact on ROA at 5% level respectively.

Conclusion and Findings

Based on the overall interpretation of the selected merged entity of IDBI bank for our study period (2004-04 to 2024-25), the following findings can be obtained from the analysis of results from individual merged bank.

In case of merger between IDBI and UWB, the analysis suggests that the performance of banks has been improved in post-merger period in terms of some financial parameters and declining also in terms of a few parameters. Capital adequacy ratio present positive trend towards their performance evaluation. With respect to asset quality, the parameter displays miserable declining trend. While considering management efficiency, the respective ratio shows very strong positive performance that is beyond our general expectation. With respect to earning quality represented by ROA, it is explicitly observed that financial parameter has

presented excellent favourable picture within our expectation. With respect to liquidity and sensitivity analysis, the respective parameters are found to have declining trends during post-merger scenario. But unfortunately, we failed to find any statistically significant difference regarding impact of merger during post reform period in the light of analysis of financial ratios, probably due to systematic cause initiated by taking comparison only for two premerger and two post-merger years. But, numerical analysis of trend of economic performance in view of same ratio for long post-merger period suggests a vibrant impact of management quality on merger entity IDBI bank's profitability performance, which is also corroborated by regression results.

In case of merger between IDBI and LIC in 2019, the result suggests that capital adequacy ratio and specifically earnings ratio represented by return on assets seem to be more vibrant after IDBI bank being merged with LIC. This might be owing to improved operational efficiency of bank by closing overlapping branches and consolidating corporate offices, integrating and streamlining IT systems, reducing technology and maintenance costs. Enhanced capital adequacy ratio ensures protection of customers regarding their investment as well as ensures profitability of the bank. Increased bank's sensitivity ratio by nearly 10 percent after a merger typically indicates an increase in its exposure to market risks. Asset quality and liquidity decreased as well like previous merger highlighting higher non-performing loans and enhanced liquidity risk of not being able to meet the present or future cash flow needs without hampering day to day liquidity.

The regression result which assesses the influence of several financial parameters on profitability [considering only post-merger period] suggests that in case of merger between IDBI and UWB happened in 2006, only a single independent factor-Management Quality (MQ) is found to have statistically significant optimistic blow upon profitability or earnings of the bank (ROA). If both the pre-merger as well as post-merger period taken together, regression result reveals that no parameter is found to have statistically significant positive/negative impact on profitability (ROA), which supports our theoretical presumption. On the other hand, in case of merger between IDBI and UWB happened in 2019, capital adequacy and sensitivity ratio are found to have statistically significant positive effect on profitability which corroborate our empirical assessment. The reality is quite visible from merger of IDBI bank with LIC that high sensitivity indicated by non-interest income suggests that IDBI bank's profitability is more elastic to interest rate shock because bank can go on generating income from a variety of fee-based services. It clearly demonstrates lower sensitivity to interest rate changes in unpredictable interest rate surroundings.

The analytical snapshot critically provides us introspection that management quality of merged entity of IDBI bank might enhance by following more stylish and competent management practices and corporate governance standards across the combined entity, by proficiently managing non-performing assets (NPAs) credit market, and operational risks. It could be enhanced by the rationalization of branches and roles, optimal use of the personnel, and an increase in business and revenue per employee over time.

The preliminary post-merger phase may witness a transitory decline in profitability due to amalgamation costs and challenges, the superior management quality ultimately leads to a more competent, steady, and profitable banking entity through achieving cost efficiency via-a-vis revenue synergy. Merged banks can influence a better customer base and an extended branch network to cross-sell a wider arrangement of products and services, which increases

non-interest income and overall revenue streams. Additionally, the management's better ability to manage NPAs through more efficient revitalization measures and credit risk practices assists in reducing provisioning costs, which in turn boosts net profits.

These research endeavour put forward an introspection into the evaluation of performance in terms of profitability, and investor emotion as a result of merger or acquisition, assisting stakeholders to judge the efficacy of the premeditated progress. By investigating and evaluating these pre- and post-merger indicators, policy -makers can comprehend overall financial wellbeing and its effect on the banks' competitiveness and, above all, can steer potential tactical decisions in the vibrant banking sector of India.

Nevertheless, government as well as legislators should be more vigilant in advocating merger as a way to garner economies of scale and scope. In view of the present empirical findings, the future reforms in banking segment should be directed towards strengthening competitive and market-oriented policies. Therefore, in the longer period, managerial policies and strategies that are cost effective and prolific, efficient could elevate the administrative efficiency and economic performance of banks. The findings of the study recommended that banks should put a lot of focus on their own internal processes since management efficiency, had positive influence on their profitability policies.

Credit Authorship Contribution Statement:

Both authors contributed significantly to the research, reviewed the final manuscript, and approved it for submission. The corresponding author confirms that the contribution descriptions are accurate and agreed upon by both authors. Saha, S: data collection; econometric and statistical computation; visualization. Saha, S. was responsible for statistical data collection, computation, and preparation of graphs and visual representations. Ray, S.: writing, original draft; writing, review & editing; literature review. Ray, S. was responsible for conducting the review of literature and preparing the main written content of the manuscript and completion of final revisions as per hon'ble referees' recommendation and formal communication to the journal's editor.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclaimer

The authors are thankful to anonymous referees for making valuable comments in the earlier draft of the article. In spite of our sincere attempts in revising the article, if any pitfall remains, the responsibility solely lies on us.

Acknowledgment/Founding

N/A

Data Availability Statement

Data available on request: The data presented in this study are available on request from the corresponding author.

Ethical Approval Statement

All data were fully anonymised prior to analysis. Moreover, this study is based partially on the analysis of previously published literature and did not involve human participants, personal data, or animal subjects. Therefore, ethical approval was not required.

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How to cite this article

Saha, S., & Ray, S. (2026). Does Management Quality Matter in Generating Post-Merger Synergy in Acquiring Bank? A Case of Indian Banks**.** *Applied Journal of Economics, Law and Governance*, Volume II, Issue 1(3), 7-35. https://doi.org/10.57017/ajelg.v2.i1(3).01

Article's history:

Received 22nd of December, 2025; Revised 17th of January, 2026;
Accepted for publication 27th of January, 2026; Available online: 2nd of February, 2026
Published as article in Volume II, Issue 1(3), 2026

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