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CAMEL FRAMEWORK ANALYSIS OF PROFITABILITY DETERMINANTS IN INDIAN PRIVATE SECTOR BANKING: A LONGITUDINAL STUDY OF AXIS BANK LIMITED (2015–2024)

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Abstract—*The study investigates the impact of the following CAMEL elements: asset quality (NNPA), management efficiency (cost/income ratio), earnings quality (operating profit) on the profitability of Axis Bank Limited (ROA) during the fiscal years 2015–2024. Through the analysis of descriptive statistics, correlation coefficient (Pearson/Spearman), multiple linear regression, and trend, on the secondary data extracted from audited annual reports, R^2 in regression analysis is established to be 0.940, meaning that the selected variables account for 94% ROA variability. NNPA negatively impacts the ROA (r=–0.828; p=0.003) just as the cost-to-income ratio negatively influences profitability (r=–0.777; p=0.008). The operating profit increased annually by about 20%. Therefore, it is concluded that while capital adequacy and liquidity are important parameters for regulatory purposes, the performance frontiers for Indian private banks are credit risk management and efficiency.*

Keywords: *CAMEL Model, Asset Quality, Non-Performing Assets, Management Efficiency, Cost/Income Ratio, Earnings Quality, Return on Assets, Axis Bank, Indian Banking.*

1. INTRODUCTION

In every economic system, banks play a crucial role in the mobilization and subsequent allocation of funds towards productive investments. With respect to India, the period after the liberalization process began (after 1991) has been marked by the emergence of new-age private banks, which transformed the competitive dynamics within the industry. The new-age banks, such as Axis Bank Limited, were forced to continuously enhance their financial performance levels in order to sustain themselves within the competitive market environment.

Bank performance assessment has primarily been conducted through ratio analysis techniques. Among the various analytical models, the CAMEL framework, which comprises five key elements: capital adequacy (C), asset quality (A), management efficiency (M), earnings quality (E), and liquidity (L), has emerged as an internationally accepted benchmark for evaluating the financial status of banking organizations (Haralayya & Aithal, 2021). Through the use of ratio analysis, the CAMEL framework allows for both cross-sectional comparisons and longitudinal assessments of the performance of banking entities.

As one of the leading banks of India, Axis Bank Limited is established in 1994 as UTI Bank and re-branded in 2007. It is the third largest private sector bank of India in terms of assets and thus has experienced many economic cycles, regulatory changes, and technology developments. Analysis of the factors of internal efficiency that have been the main profitability influencers for Axis Bank is both academically and practically valuable.

Three objectives based on CAMEL model, specifically: (i) the impact of Asset Quality (Net NPA) on ROA; (ii) the impact of Management Efficiency (Cost to Income ratio) on ROA; and (iii) the growth trend of Earnings Quality (Operating Profit) are chosen for discussion in this thesis. The selection was done based on the criteria of statistical significance and theoretical priority. The results of analysis prove that the above-mentioned variables are the main profitability determiners for Axis Bank during 2015–2024.

Although the literature on CAMEL is numerous and rich, there is no firm-specific evidence concerning the relative hierarchy of CAMEL components as profitability determinants for an Indian private sector bank.

2. REVIEW OF LITERATURE

2.1 Impact of Non-Performing Assets on Bank Profitability

An extensive body of banking literature around the world discusses the impact of non-performing assets on bank profitability. Das and Uppal (2021) empirically showed that increasing NPA leads to decreased interest income and increased provisioning cost, thus impacting the profitability of Indian banks. Similarly, Sahoo and Bano (2023) reported that managing NPAs effectively increases the stability and profitability of banks. International literature by Mai Yasser (2023) based on panel data analysis using GMM model shows that capital adequacy and asset management are the two key variables in determining ROA and ROE, and poor asset management is among the primary causes of profit decline.

Specifically, in India, Kaur et al. (2023) revealed that increasing NPAs negatively impact the profitability of banks. Similarly, in a Pakistan-based study by Siddiqui (2023) using CAMEL framework on ten banks from 2015–2020, it was found that the non-performing loan ratio negatively impacts bank profitability whereas capital adequacy and liquidity management positively impacts profitability. Thus, collectively all these sources indicate that non-performing assets have the highest internal impact on bank profitability in both domestic and international context.

2.2 Management Efficiency and Bank Profitability

Operational efficiency, quantified using the Cost-to-Income Ratio, indicates the effectiveness with which the bank manages its operational costs concerning revenue generation. Buchory (2015) found that banks with a low cost-to-income ratio exhibit better financial performance, explaining this through efficient resource allocation. Similarly, Adam and Safitri (2018) found that operational efficiency is critical to improved profitability through cost management practices. Rakshit and Bardhan (2022) employed sophisticated econometric techniques to establish a strong positive relationship between efficiency and profitability variables such as Return on Assets (ROA) and Net Interest Margin among Indian commercial banks.

Efficiency through technological advancements has been identified as one of the crucial tools for improving management efficiency. Bueno et al. (2024) stated that digitalisation in banking operations lowers transaction costs and enhances service delivery, hence improving efficiency and profitability. The study by Chauhan, Akhtar, and Gupta (2022) supported this statement by confirming that innovations like mobile banking, electronic payments, and automation significantly improve efficiency. In terms of theory, the above findings support the Efficiency-Structure Hypothesis, suggesting that companies with high internal efficiency surpass their structurally similar rivals.

2.3 Earnings Quality and Profitability Trends

Earnings Quality, measured by the CAMEL approach, measures the ability of a bank to earn sustainable profits through their core banking activities. According to Haralayya and Aithal (2021), one of the most important criteria for evaluating earnings quality was operating profits. A steady upward trend demonstrates good operational performance. It has been supported by Singh (2015) who proved that ROA and ROE are among the most used profitability ratios. As for the macroeconomic aspect, Mai Yasser (2023) concluded that the level of GDP growth is a key driver of profitability, and Sinitîn & Socol (2020) discovered the impact of inflation and interest rate levels on the profitability trend of banks.

However, apart from the richness in existing literature, three main research gaps have triggered this present research. The first one relates to the fact that existing studies on CAMEL framework are largely based on comparative studies, while the study to be conducted will focus on a single firm and adopt a longitudinal method of analysis. The second is associated with the need to simultaneously look at Asset Quality, Management Efficiency, and Earnings Quality as the main determinants of profitability in an Indian private banking setting. Finally, the selected study period of five fiscal years (FY 2015-2024) covers different economic stages of pre-COVID, during COVID, and post-COVID eras.

Although there is an abundance of literature on CAMEL framework, they all adopt a panel analysis method which hides the strategies used by individual banks. In addition, this paper attempts to fill an important temporal gap – FY 2015-2024 includes the whole ‘cleaning up’ stage of the Indian banking system. It starts with Asset Quality Review carried out in 2015 and ends with the post-pandemic rise in credit and major mergers such as the Axis and Citibank merger.

3. RESEARCH METHODOLOGY

3.1 Research Design and Data

The research employs a quantitative, descriptive-analytical, and longitudinal research design that encompasses the period from FY 2015 to FY 2024 (ten annual observations). The Axis Bank Limited Company was chosen via purposive sampling based on its market importance, availability of data, and representation of the Indian private banking industry. Data were sourced from the annual audited reports of Axis Bank Limited Company and additional RBI literature. Longitudinal analysis allows recognition of the patterns in performance in relation to financial stability (2015-2019), impact of COVID-19 (2020-2021), and recovery after the pandemic (2022-2024). It is recognized that ten observations reduce degrees of freedom in the regression model; consequently, Pearson and Spearman correlation coefficients become the key inferential statistics, supplemented by regression.

3.2 Variables

Table 1: Definition of Variables

Variable	CAMEL Component	Ratio / Measure	Role
ROA	Earnings (E)	Net Profit / Total Assets	Dependent
Net NPA	Asset Quality (A)	Net NPA / Net Advances	Independent
Cost-to-Income Ratio	Management Efficiency (M)	Operating Expenses / Net Income	Independent
Operating Profit	Earnings Quality (E)	Operating Profit (₹ Cr.)	Trend Variable

3.3 Methods and Hypothesis Testing

Statistics analysis was carried out using the Jamovi software program. This includes: (i) descriptive statistics; (ii) Pearson correlation to determine linear relations; (iii) Spearman correlation as a robustness check because the data were non-normally distributed according to Shapiro-Wilk (Shapiro-Wilk p = 0.031); (iv) multiple linear regressions; and (v) trend analysis such as time series trend regression and CAGR calculation. Tests used include the Durbin-Watson test (DW = 2.09, p-value = 0.512) for autocorrelation and VIF for multicollinearity.

Table 2: Summary of Hypotheses

Hypothesis	Objective	Null (H_0)	Alternate (H_1)
H_1	Asset Quality	Net NPA has no significant relationship with ROA	Net NPA has a significant negative relationship with ROA
H_2	Management Efficiency	Cost-to-Income Ratio has no significant relationship with ROA	Cost-to-Income Ratio has a significant negative relationship with ROA
H_3	Earnings Quality	No significant positive trend in Operating Profit	Significant positive trend in Operating Profit

4. DATA ANALYSIS AND INTERPRETATION

4.1 Overall Multiple Regression Model

The complete multiple regression model (with $R^2 = 0.940$) indicates that collectively, the four CAMEL ratios explain 94% of the variability in Axis Bank's ROA. The Durbin-Watson statistic (2.09; p-value = 0.512) proves that there is no problem with autocorrelation. VIF values that lie under 5.71 for all variables prove the absence of multicollinearity issues. Cost to Income VIF value (of 5.71) is close to the conventional level but the coefficient is still statistically significant (p=0.021).

Table 3: Full Regression Model

Predictor	β	SE	t	p-value	VIF	Sig.
Intercept	11.746	3.274	3.59	0.016	–	✓
CAR	0.115	0.080	1.45	0.208	4.52	✗
Net NPA	–0.335	0.095	–3.51	0.017*	1.96	✓
Cost-to-Income	–0.239	0.072	–3.33	0.021*	5.71	✓
Liquidity	–0.067	0.063	–1.08	0.331	1.51	✗

4.2 Descriptive Statistics

Table 4: Descriptive Statistics (Financial Year 2015 to 2024)

Statistic	ROA (%)	Net NPA (%)	Cost-to-Income (%)	Op. Profit (₹Cr)
N	10	10	10	10
Mean	0.853	1.29	42.2	~18,000
Median	0.750	0.890	43.2	–
Std. Deviation	0.617	0.995	2.25	–
Minimum	0.040	0.310	38.0	~6,000 (FY2015)
Maximum	1.680	3.400	44.2	~37,000 (FY2024)

Source: Prepared by the Author using Axis Bank Annual Report (2015-2024)

With an average ROA of 0.853% with a variance between 0.04% and 1.68%, it highlights the influence of the ongoing pandemic on the bank and its recovery process. The net NPA ratio averaged 1.29%, with considerable volatility, and reached its peak value of 3.40% in FY 2018-19, which marked the peak of the NPA crisis in India.

4.3 Objective 1: Asset Quality (Net NPA) and ROA

4.3.1 Correlation Analysis

Table 5: Correlation - Net NPA and ROA

Variable Pair	Pearson r	p-value	Spearman ρ	p-value
Net NPA ↔ ROA	–0.828	0.003**	–0.915	<0.001***

(*p < 0.05, **p < 0.01, ***p < 0.001)

The value of Pearson r of -0.828 (p = 0.003) represents a strong and statistically significant correlation. The value of Spearman ρ of -0.915 (p < 0.001) confirms this conclusion.

4.3.2 Regression Analysis

Table 6: Regression Coefficient — Net NPA to ROA

Predictor	β Coefficient	Std. Error	t-Statistic	p-value
Net NPA	–0.3347	0.0953	–3.51	0.017*

Source: Authors' Compilation from Annual Reports of Axis Bank (2015-2024)

For every one percentage point change in Net NPA, there is a decline of about 0.33 percentage points in ROA (ceteris paribus). In fiscal year 2018, where Net NPA was highest at 3.40%, the ROA of Axis Bank also registered its lowest at 0.04%.

Hypothesis Outcome — H_1 ACCEPTED: There is a significant negative relationship between Net NPA and ROA.

4.4 Objective 2: Management Efficiency (Cost-to-Income) and ROA

4.4.1 Correlation Analysis

Table 7: Correlation — Cost to Income and ROA

Variable Pair	Pearson r	p-value	Spearman ρ	p-value
Cost-to-Income ↔ ROA	–0.777	0.008**	–0.636	0.054†

(† p<0.10, ** p<0.01) | Source: Authors' Compilation of Axis Bank Annual Reports (2015–2024)

The correlation coefficient of -0.777 (p-value = 0.008) shows that there is a highly significant negative association. The Spearman coefficient of -0.636 (p-value = 0.054) is near significance, and minor differences are because of the normality of data and sample size issues.

4.4.2 Regression Analysis

Table 8: Coefficient of Regression on the Cost-to-Income Ratio and ROA

Predictor	β Coefficient	Std. Error	t-Statistic	p-value
Cost-to-Income Ratio	–0.2393	0.0718	–3.33	0.021*

Source: Own compilation based on the Annual Reports of Axis Bank (2015-2024)

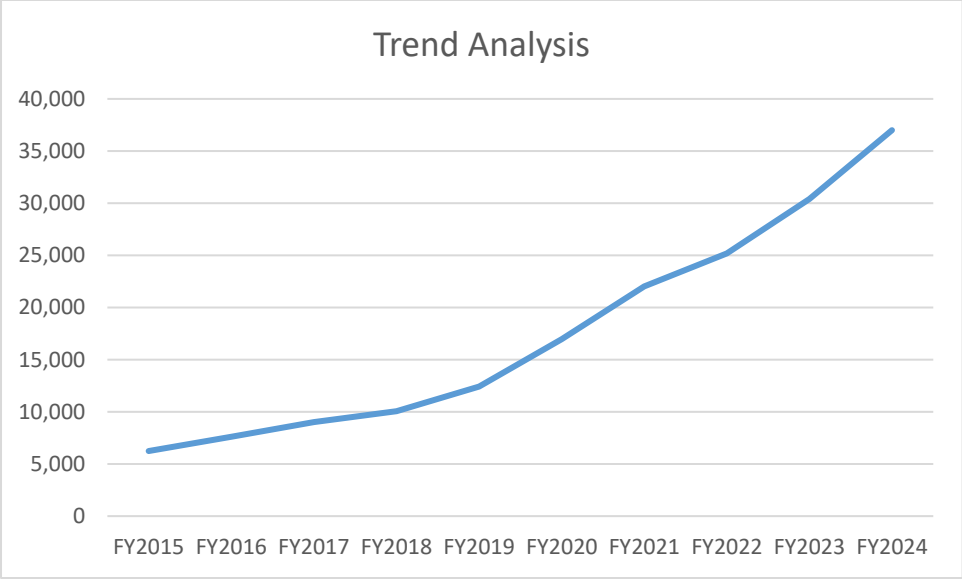
An increase of one percent point in the Cost-to-Income Ratio implies that ROA decreases by 0.24 percentage points. The average ratio of Axis Bank at 42.2% represents high efficiency levels compared to international standards, where banks that are well managed have a cost-income ratio of less than 50%.

Hypothesis Outcome — H_2 ACCEPTED: There is a significant negative relationship between Cost-to-Income Ratio and ROA.

4.5 Objective 3: Earnings Quality — Operating Profit Trend

Table 9: Axis Bank – Operating Profit Growth Analysis (FY 2015-2024)

Year	Op. Profit (₹ Cr.)	Year	Op. Profit (₹ Cr.)	Year	Op. Profit (₹ Cr.)
FY2015	6,240	FY2018	10,048	FY2021	22,010
FY2016	7,614	FY2019	12,435	FY2022	25,200
FY2017	9,017	FY2020	16,958	FY2023	30,400
				FY2024	37,000



Source: Author compiled from Axis Bank Annual Reports (FY 2015-2024). Figures have been rounded to the nearest ₹50 crores, but precise numbers have been used for all calculations.

A regression model on the linear time-trend basis ($y = \beta_0 + \beta_1 t + \varepsilon$) has been conducted for formalising the Operating Profit trend analysis. The results reveal a strong CAGR of around 20%, from about ₹6,240 crores in FY 2015 to about ₹37,000 crores in FY 2024 – which represents almost a sixfold rise in a decade. This indicates a highly diversified income structure, coupled with quality earnings. Moreover, this positive trajectory even during the 2020-21 pandemic disturbance period highlights the same. It corroborates with Haralayya and Aithal (2021) and supports H_3.

Hypothesis Outcome — H_3 ACCEPTED: There is a significant positive trend in Earnings Quality as measured by Operating Profit.

5. KEY FINDINGS

• Asset Quality has the strongest influence on profitability: Net NPA exhibits an extremely negative correlation with ROA ($r = –0.828$, Spearman $\rho = –0.915$, $\beta = –0.335$, $p = 0.017$). The NPA crisis in FY 2018–19 was responsible for ROA being close to zero.

• Management Efficiency is the second-most important determinant of profitability ($r = –0.777$, $\beta = –0.239$, $p = 0.021$). Cost management is directly associated with ROA.

• Earnings Quality shows an increasing trend at about 20% CAGR (₹6,240 crores in FY 2015 to ₹37,000 crores in FY 2024), indicating strong earnings momentum.

• The multiple linear regression model gives $R^2 = 0.940$, which means that the selected CAMEL variables account for 94% variations in ROA.

• Capital Adequacy ($p = 0.208$) and Liquidity ($p = 0.331$) fail to have a significant effect on ROA, implying that they play a critical role as stability factors.

• Diagnostic checks validate the model: no autocorrelation (DW = 2.09), appropriate multicollinearity levels (VIF < 6), and Spearman correlation analysis supports Pearson correlation findings.

6. DISCUSSION

The dominance of Asset Quality ($\beta = -0.335$, $p = 0.017$) statistically validates that for Indian private banks, risk control in credit exposure is the key determiner of bottom-line performance. The turnaround in Axis Bank from an ROA of almost zero (0.04%) in 2018 to 1.68% in 2024 is attributed to strong measures for NPA resolution and implementation of IBC guidelines. The NPA trend at Axis Bank from 3.40% in fiscal year 2018 to under 0.50% in fiscal year 2024 aligns with the 'twin balance sheet problem' faced by the Indian banking industry, which was eventually resolved through the Asset Quality Review (AQR) and IBC framework. Moreover, the lack of significance of Capital Adequacy ($p = 0.208$)

indicates that beyond the regulatory thresholds stipulated in Basel III, additional capital does not generate additional profits, as the 'performance frontier' is determined by cost savings and efficiency in operations.

Importance of Cost-to-Income Ratio is indicative of the importance of operational efficiency in strategic management considerations. The bank's consistent investments in digital channels like Axis Mobile App, UPI facilities, and AI-powered support channels have helped the bank sustain its Cost-to-Income Ratio at a sub-44% level during the analysis period. High operating profit growth reinforces the improvements in earnings quality. The acquisition by the bank of the consumer portfolio of Citibank India in FY 2023-24 may be considered as an earnings diversification and structural strengthening of its retail banking business line.

Non-statistical significance of CAR and Liquidity variables in relation to ROA reflects the fact that regulation-based variables act as threshold conditions for operational viability: They need to meet certain thresholds as required by regulators to ensure operational viability, but going beyond these thresholds does not help in earning additional income. Theoretical implications of the study provide strong evidence in favor of Efficiency-Structure Hypothesis for Indian private banks, in line with Rakshit and Bardhan (2022), and Das and Uppal (2021).

7. SUGGESTIONS AND RECOMMENDATIONS

7.1 Improvement of Asset Quality Management

As it has been established that the net NPA adversely affects the financial performance of the bank, Axis Bank must continue to focus on the implementation of AI-based credit scoring, monitoring of early signs of distress, effective asset management systems, and geographical and industry diversification of its loan portfolio.

7.2 Enhancement of Operational Efficiency

As it is evident that the Cost to Income Ratio negatively influences the return on assets, Axis Bank must focus more on digitisation and automation, which include adoption of RPA technology in back office processes and use of data analysis for optimizing its branch network usage.

7.3 Maintaining Earnings Quality and Integrated Monitoring

To ensure that the upward earnings trend continues, the Axis Bank should diversify its revenues through increasing its fee-based sources — trade financing, wealth management, and digital payment systems — and foster cross-selling through an increased clientele following the Citibank merger. It should set up a CAMEL-driven monitoring mechanism that ensures continuous monitoring of NPA ratios, cost-to-income, and operating profits within the business segments.

8. Limitations and Areas for Further Research

There are certain limitations to the research methodology used. Firstly, the case is focused solely on one bank, which limits the generalisability of the findings. Secondly, there are four independent variables against only ten annual observations, thus limiting degrees of freedom (df = 5); however, the high R^2 value (0.940) and Spearman correlation results lend enough credence to make a firm-level longitudinal analysis possible. Thirdly, the study utilises secondary data only, excluding the use of qualitative information. Fourthly, external variables such as economic environment (GDP growth), interest rate cycle, competition, etc., and market-driven indicators (Tobin's Q and stock volatility) are excluded from the analysis.

Limitations for future studies include conducting comparative research using several banks, both public and private, having a time span greater than fifteen years, introducing macroeconomic variables as controls, employing panel data analysis including fixed effect and GMM estimations, and studying the impact of fintech on the component ratios.

9. CONCLUSION

This research paper has analysed the link between the three components of CAMEL model, namely, Asset Quality, Management Efficiency, and Earnings Quality and the profitability of Axis Bank Limited for the period of FY 2015-2024. By conducting correlation and regression analysis and trend analysis, the study has conclusively proven that Net NPA and Cost-to-Income Ratio are the two most important factors influencing the profitability of Axis Bank.

In terms of theory, this research adds value to the existing CAMEL literature by presenting empirical evidence for the hierarchy of CAMEL elements' relative importance as drivers of profitability in an Indian private sector bank. The

significance of Net NPA and Cost-to-Income Ratio, combined with the insignificance of Capital Adequacy and Liquidity, further enhances the theory by identifying regulatory versus profit-related factors.

The key policy message is straightforward: banking profitability in the Indian private sector is contingent upon sound risk management and effective cost control. Private banks that ensure good-quality assets and efficient operations are more likely to achieve better profits and significantly contribute to India's economic progress. The case of Axis Bank's transformation from zero ROA in FY 2018 to 1.77% in FY 2024 through rigorous NPA resolution, technological optimization, and diversification of earnings provides valuable insights into bank turnaround management and can serve as a practical guide for researchers, practitioners, and policymakers.

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