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A comparative evaluation of HDFC Bank's financial stability in the context of AI adoption using the CAMELS model

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Abstract
By improving customer service, risk management, and operational efficiency, artificial intelligence (AI) is rapidly changing the banking industry. Leading this technical change is HDFC Bank, one of the biggest private sector banks in India. The CAMELS methodology, which assesses capital adequacy, asset quality, management effectiveness, earnings, liquidity, and sensitivity to market risk, is used in this study to compare HDFC Bank's financial performance before and after the financial institution adopted AI. The study is based on secondary data that spans a decade, encompassing five years prior to the adoption of AI (FY 2012–2016), one year following adoption (2017), and five years following adoption (FY 2018–2022). Financial ratios were examined under each CAMELS parameter, and the significance of the observed changes was tested using SPSS's paired sample t-test. Results show that after AI deployment, financial metrics generally improved, especially in areas like capital adequacy, profits, and management effectiveness. The fact that the benefits are not statistically significant, according to hypothesis testing, suggests that AI has not yet been completely incorporated into all aspects of banking. According to the study's findings, HDFC Bank needs to engage in staff upskilling, embrace a more thorough AI strategy, and extend its use throughout core processes in order to fully realize AI's promise. The financial impact of AI in Indian banking is better understood thanks to this article, which also provides insights for future study and industry strategy.

Keywords: Financial performance, asset quality, artificial intelligence, capital adequacy, liquidity, sensitivity and management earnings

Introduction
In the rapidly evolving landscape of the global banking sector, technological innovation has emerged as a key driver of competitive advantage and operational efficiency. Among these innovations, Artificial Intelligence (AI) stands out as a transformative force reshaping traditional banking practices. Banks are increasingly adopting AI to enhance customer experiences, optimize risk management, improve decision-making, and streamline internal processes. In this context, HDFC Bank one of India's leading private sector banks has taken significant strides in integrating AI technologies into its operations.

This study aims to evaluate HDFC Bank's financial performance before and after the adoption of AI, using the CAMELS model as the analytical framework. The CAMELS model comprising Capital Adequacy, Asset Quality, Management Efficiency, Earnings, Liquidity, and Sensitivity to Market Risk provides a comprehensive method for assessing a bank's overall financial health and stability.

By examining key financial indicators within this model, the research seeks to determine whether AI adoption has contributed to measurable improvements in HDFC Bank's performance. The evaluation not only highlights the financial outcomes of AI integration but also provides insights into how technology can influence banking efficiency and sustainability in an increasingly digital economy.

AI In banking sector
Artificial Intelligence, commonly referred to as AI, stands as a potent catalyst driving transformative changes across various industries. One industry that is undergoing an enormous AI driven evolution is banking. The world is ruled by technological development and one of the fastest evolving technologies in the world is artificial intelligence. One of

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such industries that are adopting artificial intelligence for various applications include the banking sector. The future of banking is artificial intelligence because it employs complex data analysis to fight fraud and enhance adherence to regulations. Declaring that artificial intelligence (AI) would replace human labor is unrealistic because AI is a type of computer that assists humans by decreasing the need for physical calculations. Nearly 80% of banks agree that artificial intelligence (AI) may have a major positive impact on the banking sector, per a new Business Insider study. Furthermore, another McKinsey analysis emphasizes the tremendous development potential of artificial intelligence (AI) in the banking and financial sector, estimating its worth at $1 trillion.

Leveraging ai in banking sector
Adopting Artificial Intelligence (AI) can give banking organizations a revolutionary edge. AI brings about digitization and gives banks the opportunity to compete with FinTech companies. The National Business Research Institute and Narrative Science together conducted a survey that found that 32% of financial service providers have already adopted AI technologies like speech recognition and predictive analytics. AI will have a significant impact on banking in the future since it will make it possible to employ advanced data analytics to stop fraud and enhance compliance. Because AI algorithms reduce the time needed for tasks that formerly took hours or days, anti-money laundering activities can be finished more quickly. AI also makes it possible for banks to efficiently process massive volumes of data and extract valuable information at previously unheard-of speeds. The success of implementing AI is increased by utilizing these benefits at the expense.

Areas of Application

Source: https://appinventiv.com
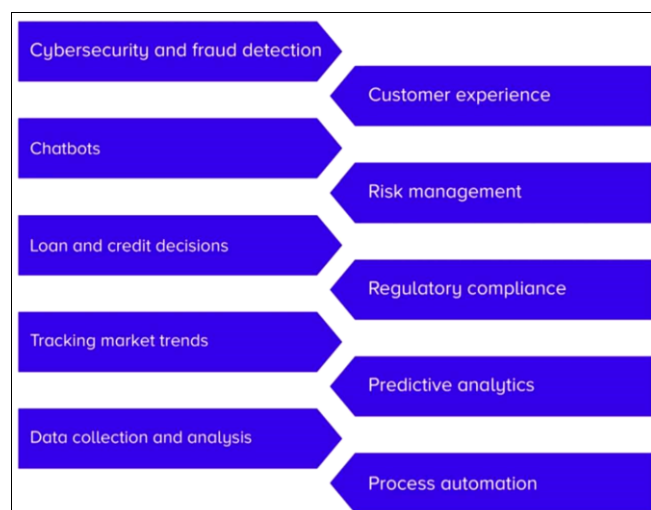
Fig 1: Application of AI in Banking Sector

1. Cyber security and Fraud Detection
Banks can detect fraudulent activity, monitor system vulnerabilities, reduce risks, and enhance the general security of online banking with the aid of AI and machine learning. Artificial intelligence's ongoing monitoring capabilities in the financial services industry allow banks to react to possible cyber attacks before they have an impact on internal systems, clients, or staff.

2. Chat bots
Conversational bots are among the best examples of artificial intelligence in banking. They work around the clock once deployed, in contrast to those who have regular work hours. Additionally, they keep learning about the usage patterns of a particular client. It helps them comprehend the needs of the user more effectively. Banks may guarantee that their customers can reach them at any time by including chat bots into their banking applications.

3. Loan and Credit Decisions
When evaluating a customer's credibility and ability to repay a loan, the bank can greatly benefit from artificial intelligence. An AI-based loan and credit system can evaluate the creditworthiness of customers with minimal credit history by examining their patterns and behavior. The technology also warns banks about specific behaviors that may increase the risk of a default.

4. Tracking Market Trends
Advanced machine learning techniques support the process of determining the state of the market and recommending investments. AI banking systems can also identify potential risks and suggest when it is best to purchase stocks. Because of its high data processing capacity, this state-of-theart technology speeds up decision-making and makes trading convenient for banks and their customers.

5. Data Collection and Analysis
Every day, banks deal with vast amounts of data. These data can be difficult to record, store, and retrieve. The enormous volume of information generated makes it difficult for employees to gather and record. Accurately recording and organizing such a vast amount of data becomes impossible. AI can quickly sift and store these data without requiring a lot of time or resources by employing its data mining techniques.

6. Customer Experience
To further enhance user ease and the customer experience, artificial intelligence is being integrated into banking and finance services. AI technology expedites and reduces errors in the Know Your Customer (KYC) data recording process. In addition, financial offers and the timely introduction of new products are made.

7. Risk Management
Global events including natural disasters, currency fluctuations, and political upheaval have a big influence on the banking and financial sectors. In these unpredictable times, it is essential to exercise extra prudence while making business decisions. By giving you a fairly clear view of what lies ahead, generative AI services for banking offer insights that assist you in staying organized and making timely decisions.

8. Regulatory Compliance;
Banks in India falls under the purview of the Banking Regulations Act and the RBI Norms. Complying and adhering to these regulations are pivotal for successful operation of business. AI using its Machine Learning tools makes these compliances process easy by thoroughly studying the provisions and updating the changes.

9. Predictive Analytics

Two of the most common uses of AI in the banking industry include general-purpose semantic and natural language applications, as well as predictive analytics with a wide range of applications. AI can identify connections and patterns in the data that conventional technologies were previously unable to identify. These trends may indicate untapped opportunities for sales or cross-selling, or they may even indicate operational data signs that have a direct impact on revenue.

10. Process Automation

Robotic process automation (RPA) algorithms automate repetitive, time-consuming activities, increasing operational accuracy and efficiency while lowering costs. Additionally, this enables users to concentrate on more intricate procedures that call for human intervention. Currently, banking organizations are effectively using RPA to improve efficiency and transaction speed.

Camels framework

The CAMELS rating system is a globally recognized supervisory instrument that was created in the United States to assess the degree of risk posed by banks and other financial institutions based on their financial statements. Capital adequacy, asset quality, management, profits, liquidity, and sensitivity are among the criteria that are utilized to make decisions. The regulatory authorities of a nation use the CAMELS rating system as a tool to rate the performance of the different financial institutions in the economy and identify their strengths and weaknesses.

In 1979, this idea was first used in the United States as a CAMEL rating under the Uniform Financial Institutions Rating System (UFIRS). In 1995, the Federal Reserve and the OCC changed it to incorporate the sixth component, "sensitivity." The word "CAMELS" is formed by the initials of all six constituents.

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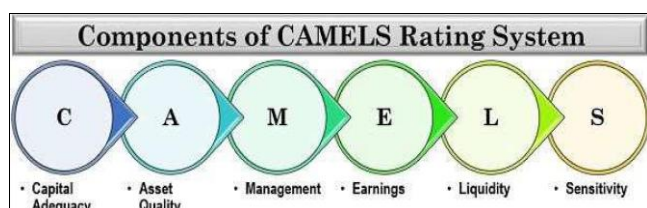
Fig 2: Components of CAMELS Framework

CAMELS in India

With a focus on boosting bank productivity and profitability, the Indian government's Narsaimham Committee implemented a number of banking and financial reforms. Two supervisory rating schemes for Indian commercial banks and foreign banks doing business in India were introduced by the Padmanabhan Working Group in India.

Even after taking into consideration a large amount of publicly accessible information regarding the performance and condition of banks, the CAMEL system remains useful. The CAMEL approach is a failure prediction model that banks can utilize. The ranking of the bank is evaluated using both quantitative and qualitative data.

Because of its usefulness, regulators frequently employ the CAMELS model. This model is ideal for evaluating the effectiveness of the bank. Banks are frequently the only significant source of funding and serve as the keepers of economic savings because financial markets are frequently underdeveloped in developing nations. The total strength of the bank will be determined by the strength of CAMEL's factors. The quality of the component highlights each product's internal strength and its ability to protect itself from market dangers. Therefore, a bank's steady financial stability protects both its creditors and the economy as a whole.

Literature review

Bansal, R., & Mohanty, A. (2013) [1] The study evaluates the financial performance of five Indian commercial banks using the CAMEL model, which assesses Capital adequacy, Asset quality, Management, Earnings, and Liquidity. The analyzed studies confirm that the CAMEL model is adequate at capturing overall bank performance by allocating weights to different parameters. The findings suggest that Kotak Mahindra Bank excels in asset and management quality, ICICI Bank in capital adequacy and liquidity, and AXIS Bank needs to improve its debt-equity ratio and investment strategies.

Kaur, J., Kaur, H. V., & Vineet, H. (2016) [2] Authors focused on evaluating the financial performance of Indian public sector banks using the CAMEL model. The study is based on secondary data from the last ten financial years, analyzing the top ten public sector banks. Bank of Baroda and PNB are regarded as the most stable banks based on the Camel rating; Indian Bank and IDBI banks, Canara Bank & SBI are regarded as average; Union Bank, Bank of India, Syndicate Bank & CBI are seen as below average, and are closely observed to guarantee their sustainability.

Rastogi, S., & Singh, M. V. (2017) [3] The researchers have attempted a longitudinal study on performance analysis of public and private sector banks using CAMELS model in continuation to their earlier study conducted in the year 2011. Their present study after a gap of five years has confirmed that there has been an improvement in performance of public sector banks on some of the parameters like management quality and liquidity. The researchers have concluded that the public sector banks have considerably shown efficiency in their financial performance in par with private sector banks.

Paul, J. (2017) [4] The paper discusses the effect of mergers on the financial performance of selected Commercial banks. It employs CAMEL ratios to analyse the pre-merger and postmerger Performance of banks in India from 2000-2012, focusing on capital adequacy, asset quality, management efficiency, earnings quality, and liquidity. The research findings reveal that Significant improvements were observed in capital adequacy and asset quality post-merger, while management efficiency and earnings quality did not show expected gains.

Thakur, J. (2021) [5]. The banks are looking more and more at cutting edge technology like analytics and block chains to build an active defense against cybercrimes. This paper discusses the adoption and implementation of AI in the Indian banking sector, highlighting its evolution and current applications. It examines the stages of AI development, types of AI, and the impact of AI on banking functions like personalized services and risk management. The document includes numerous references to support its content, ranging from academic journals to industry reports. The study has

concluded that AI is vested with both opportunities as well as challenges, successful implementation of AI depends on how the banks leverages both.

Salunkhe, R. T. (2019) [6] Research is based on exploratory research. The study is based on primary as well as secondary data. It examines the role of AI in enhancing customer experience, particularly through Robotic Process Automation (RPA) in retail banking. The study addresses issues like security and data threat while highlighting the advantages of AI in client interface, analytics, customization, and backend procedures. In order to overcome these challenges and fully realize AI's potential in the banking industry, the study highlights the necessity of raising awareness and making the most use of AI applications in the banking sector.

Rajendran, P., & Sudha, B. (2019) [7] The study evaluates HDFC Bank's financial performance over five years (2015-2019) using ratio analysis. It Analyzed key ratios which included current ratio, cash position ratio, fixed assets ratio, debt-equity ratio, and proprietary ratio. HDFC Bank has demonstrated remarkable resilience in its financial metrics despite industry challenges. The conclusion of the document states that HDFC Bank's financial performance is strong during the study period.

Thowfeek, M. H., Samsudeen, S. N., & Sanjeetha, M. B. F. (2020) [8] The researchers have discussed the impact of Artificial Intelligence (AI) in the banking sector, highlighting its potential to transform commercial use due to technological advances and data accessibility. Using interviews with AI specialists, it examines the factors that are driving and impeding the use of AI in banking, emphasizing the necessity of AI-oriented role models and process capabilities. The report suggests that banks must adapt to AI to maintain competitiveness and leverage customer and transaction data effectively.

Singh, K. (2020) [9] Author discusses the significant impact of Artificial Intelligence (AI) in the banking sector, highlighting its applications in customer service, engagement, fraud management, and more. It mentions that 37% of organizations have implemented AI, with a projected increase in AI market revenue to $97.9 billion by 2023. Several Indian banks like SBI, ICICI, and HDFC are adopting AI for various functions, including customer servicec hat bots and fraud detection systems this document provides a comprehensive overview of the current state and future prospects of AI in the banking industry, particularly in India. It concludes by saying that A user-friendly AI ecosystem is expected to create value for the banking industry.

Shetty, S. K., Spulbar, C., Birau, R., & Filip, R. D. (2022) [10] This research paper discusses the implementation of Artificial Intelligence (AI) in the banking sector, focusing on its impact on customers and bankers in India. Primary data collection has been adopted by collecting data from 170 customers and 30 bankers, further statistical analysis has been performed using chi-square, correlation, and regression. A series of survey questions aimed at bankers regarding the impact of AI in the banking sector, has been covered. The findings of the paper Highlights the benefits of AI in banking, such as improved safety in transactions, better customer experience, and reduced workload for bankers and states challenges faced by banks in implementing AI, including the high cost and the need for technical expertise.

Baker, H., Kaddumi, T. A., Nassar, M. D., & Muqattash, R. S. (2023) [11] The study examines how financial technologies (FinTech) adopted by banks can enhance their financial performance. The key findings of the report shows that FinTech positively affects total deposit and net profits, suggesting banks should adopt inclusive FinTech strategies for sustainable development. The study advocates for banks to embrace FinTech to improve flexibility, lower costs, and promote financial inclusion.

GAP Analysis
Prior research has mostly assessed AI's effects on non-financial metrics like employee efficiency and consumer happiness. Research on the financial impact of AI deployment in the banking industry is lacking. In order to bridge this gap, this study analyses the financial performance of HDFC Bank using the CAMELS framework, comparing pre- and post-AI Adoption periods.

Statement of problem
HDFC Bank is largest private sector bank and is a pioneer in AI adaption in India.AI implementation is a costly affair and rewards the businesses in long run by enhancing the operational efficiency and attributing to the cost savings. This study analyses the effect of AI implementation in the financial performance of the company. To assess the impact of AI adoption on HDFC Bank's financial performance, comparing pre- and post-AI implementation periods, using the CAMELS approach and analysing key financial parameters.

Research objectives
i. To analyse the impact on financial performance pre and post adaption of AI using CAMELS approach. ii. To compare the pre and post AI adoption effect on financial performance of HDFC Bank. iii. To study the application of artificial intelligence in the banking sector. iv. To understand how AI improves the business results of banking industry.

Scope of study
The research focuses on examining the impact of artificial intelligence (AI) applications on the financial performance of HDFC Bank using the CAMELS framework1. It compares financial parameters from Five years before and five years after AI adoption, with 2017 as a cooling period. The study aims to assess improvements in key financial ratios, such as Tier 1 Capital Ratio, Business per Employee, and Profit per Employee, among others, to determine the effectiveness of AI in enhancing the bank's performance. This study focuses only on the financial impact and will not delve into the non-financial impacts such as operational efficiency, customer satisfaction etc.

Methodology
The processes and procedures used to locate and analyze data pertaining to a specific research topic are known as research methodology. In order to achieve their objectives, researchers plan their study using the selected research instruments. All of the essential components of research are included, including the overall framework within which the study is conducted, data collection methods, data analysis methods, and research design.

Research design
CAMELS Framework ratios has been calculated year wise for a total of 10 year (5 years preperiod and 5 years post-period). The averages calculated for both the period has been compared by paired t test at 95% confidence level on the basis of assumption that no major change in the bank has taken place during this event which has impacted bank's performance apart from adoption of latest technologies.

Data collection
The study relies entirely on the secondary data which has been collected primarily from the HDFC Banks audited annual reports, RBI reports and from the Money control website. Other information with regard to the company's profile and management has been procured from the bank's website.

Hypothesis
Ho: There is no significant difference in HDFC Bank's financial performance pre and post Artificial intelligence adaption as per CAMELS approach.
H1: There is a significant difference in HDFC Bank's financial performance pre and post Artificial intelligence adoption as per CAMELS approach.
A paired sample for means T test at 95% confidence level has been performed to test the hypothesis using SPSS.

Research technique
This study adopts the CAMELS Framework model to analyse the effect of Artificial Intelligence on the financial performance of HDFC Bank. In banking supervision, the acronym CAMELS is used to evaluate the overall soundness and financial health of financial institutions, especially banks. Every letter in CAMELS stands for a distinct evaluation component these components can be used collectively to evaluate the financial performance of the bank pre and post AI adaption

Period of study
According to HDFC Banks reports, the bank has adopted Artificial Intelligence tools in the financial year 2016-17. This year was seen as year in which major investments were made by the company in AI infrastructure. The study considers 10 financial years comprising of:
- **Pre-AI Adoption:** The study considers five years before AI adaption, from FY 2012-2016.
- **Cooling Period:** 2017 is considered a cooling period for implementation of AI technology.
- **Post-AI Adoption:** The study examines five years after AI adaption, from FY 2018-2022. This periodisation aids in comparing the financial performance of the bank before and after the integration of AI technologies effectively.

Data analysis:
This segment of the study deals with a ratio analysis for the selected period on the basis of CAMELS framework. Mean of ratios are calculated for the pre and post period to analyse and interpret their trend. This study adopts the CAMELS Framework model to analyse the effect of Artificial intelligence on the financial performance of HDFC Bank. In banking supervision, the acronym CAMELS is used to evaluate the overall soundness and financial health of financial institutions, especially banks. Every letter in CAMELS stands for a distinct evaluation component these components can be used collectively to evaluate the financial performance of the bank pre and post AI adaption.

Capital adequacy ratios

	Capital adequacy ratios				
Years	**Capital Adequacy Ratio (%)**	**Tier-1 Capital Ratio (%)**	**Debt Equity Ratio (x)**	**Total Advances to total Assets (%)**	**Total Shareholders Fund to total Assets (%)**
2011-12	16.52	11.6	10.29	57.83	8.86
2012-13	16.8	11.08	10.05	59.88	9.05
2013-14	16.07	11.77	10.31	61.64	8.84
2014-15	16.79	13.66	8.52	61.9	10.5
2015-16	15.53	13.22	8.75	65.54	10.25
Pre-period average	16.34	12.27	9.59	61.36	9.5
2017-18	14.82	13.25	9.01	61.88	9.99
2018-19	17.11	15.78	7.34	65.84	11.99
2019-20	18.52	17.23	7.95	64.93	11.17
2020-21	18.79	17.56	7.57	64.85	11.66
2021-22	18.9	17.87	7.62	66.17	11.61
Post-period average	17.63	16.34	7.9	64.73	11.28

Capital adequacy ratio
Pre-AI adaptation with a CAR of 16.34%: This shows that the bank had a CAR of 16.34% before implementing AI. It claims that, in relation to its risk-weighted assets, the bank's capital was quite sound. In general, a CAR that is higher than the bare minimum required by regulations indicates that the bank is financially solid and serves as a buffer against future losses.

Post-AI adaptation with a CAR of 17.63%: The banks CAR post AI adaption has improved to 17.63% from 16.34% which indicates that the bank has either increased its capital base or has reduced its risk-weighted average assets. This increase in percentage indicates that there has been an increase in banks financial position and its ability to meet future obligation.

Total shareholders fund to total assets

Years	Capital Adequacy Ratio (%)	TIER-1 capital ratio(%)	Debt Equity Ratio(X)	Total Advances to Total Assets (%)	Total Shareholders Fund to total assets (%)
Preperiodaver					
Age	16.34	12.27	9.59	61.36	9.5
Postperiodave					
Rage	17.63	16.34	7.9	64.73	11.28

Asset quality ratio

Asset quality ratio				
Years	Gross NPA to Total advances (%)	Net NPA To Total advances (%)	Total Investment to Total asset (%)	Net interest Margin (X)
2011-12	1.02	0.20	28.85	3.63
2012-13	0.97	0.20	27.88	3.94
2013-14	0.98	0.27	24.60	3.75
2014-15	0.93	0.25	28.19	3.89
2015-16	0.94	0.28	23.12	3.83
Pre-period average	0.97	0.24	26.53	3.81
2017-18	1.30	0.40	22.76	3.76
2018-19	1.36	0.39	23.35	3.87
2019-20	1.26	0.36	25.60	3.67
2020-21	1.32	0.40	25.40	3.71
2021-22	1.17	0.32	22.02	3.48
Post-period average	1.28	0.37	23.83	3.70

Management quality ratio

Management quality ratio				
Years	Business per Employee (₹in crores)	Profit per Employee (₹in crores)	Return on assets (%)	Return on equity (%)
2011-12	6.69	0.08	1.53	17.27
2012-13	7.76	0.10	1.68	18.57
2013-14	9.83	0.12	1.72	19.50
2014-15	10.70	0.13	1.73	16.47
2015-16	11.55	0.14	1.73	16.92
Pre-period average	9.31	0.11	1.68	17.75
2017-18	16.39	0.19	1.64	16.45
2018-19	17.77	0.21	1.69	14.13
2019-20	18.31	0.22	1.72	15.36
2020-21	20.55	0.26	1.78	15.27
2021-22	20.68	0.26	1.79	15.39
Post-period average	18.74	0.23	1.72	15.32

Earnings quality ratio

Earnings quality ratio					
Years	Earnings per share	Net profit Margin (%)	Return on capital employed (%)	Dividend per share	CASA (%)	Cost to income (%)
2011-12	22.11	18.93	2.97	2.20	45.39	48.97
2012-13	28.49	19.18	3.12	2.75	43.43	49.58
2013-14	35.47	20.61	3.18	3.43	44.81	45.61
2014-15	42.15	21.07	3.11	4.00	44.03	44.56
2015-16	48.84	20.41	3.17	4.75	43.24	44.28
Pre-period average	35.41	20.04	3.11	3.43	44.18	46.60
2017-18	67.76	21.79	3.20	6.50	43.49	41.02
2018-19	78.65	21.29	3.34	7.50	43.37	39.65
2019-20	48.01	22.86	3.33	6.50	44.23	38.64
2020-21	56.58	25.74	3.42	6.50	47.11	36.32
2021-22	66.80	28.93	3.22	15.50	49.16	36.88
Post-period average	63.56	24.12	3.30	8.50	45.47	38.50

Net profit margin

Years	Earnings per share	Net profit margin (%)	ROCE (%)	Dividend per share	CASA (%)	Cost to income (%)
Pre-period average	35.41	20.04	3.11	3.43	44.18	46.60
Post-period average	63.56	24.12	3.30	8.50	45.47	38.50

Sensitivity ratio

Years	Price earning ratio (x)	Demand deposit to total deposit (%)	Price to book value (X)	Price to sales (x)
2011-12	21.98	29.99	4.08	4.47
2012-13	21.95	29.78	4.1	4.23
2013-14	21.11	28.08	4.13	4.37
2014-15	24.26	27.71	4.13	5.29
2015-16	21.93	27.06	3.73	4.5
Pre-period average	22.25	28.52	4.03	4.57
2017-18	28.37	28.37	4.62	6.12
2018-19	29.48	26.94	4.23	6.37
2019-20	17.95	15.18	2.76	4.12
2020-21	26.4	15.89	4.04	6.81
2021-22	22.01	32.82	3.4	6.38
Post-period average	24.84	23.84	3.81	5.96

Pairedt-test

A hypothesis analysis of the difference between population means for a set of randomly selected samples with nearly normally distributed variability is provided by the paired t-test. Tests are frequently conducted with as many similar subjects as possible or in a before-and-after scenario. The paired t-test determines whether there is no difference between the two observations. When you have two samples and observations from one sample can be paired with observations from the other sample, you may use the paired t-test to compare two population means. This could happen in the following situations: • Before-and-after observations of the same participants.

A comparison of two distinct approaches to assessment or two distinct treatments, applied to the same study participants.

Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair1	Pre-AI adaption	24.4106	17	23.30508	5.65231
	Post-AI adaption	24.9959	17	23.89999	5.79660

Paired Sample Test

		Paired Differences								
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper		t	df	Sig. (2- tailed)
Pair 1	Pre AI Adaption Post AI Adaption	-0.58529	3.47345	0.84244	-2.37118	1.20059		-0.695	16	0.497

The statistical paired t-test analysis of the study compares the financial performance of HDFC Bank before and after the adaption of artificial intelligence. This is the average value of the dataset. For both pre and post AI adaptation, the mean values are 24.4106 and 24.9959, respectively. The mean financial performance slightly increased from 24.41 (pre-AI) to 24.99 (post-AI). The standard deviations are 23.30508 (pre) and 23.89999 (post). Both pre-AI and post-AI standard deviations are quite high, indicating significant variability in the data. The mean difference is -0.58529, with a 95% confidence interval ranging from -2.37118 to 1.20059. This value (0.497) indicates whether the difference between pre and post adaptation is statistically significant. A value above 0.05 suggests that the difference is not statistically significant. Since the p-value(0.497) is greater than the significance level (typically 0.05), the null hypothesis (H0) can be accepted. Therefore, there is no significant difference in financial performance before and after AI adaptation for HDFC Bank.

Findings

The analysis of HDFC Bank's financial performance before and after AI adoption across the CAMELS parameters reveals mixed outcomes. Capital adequacy has shown improvement, particularly in the Tier 1 capital ratio, suggesting enhanced client confidence and greater reliance on the bank's AI-driven services. However, asset quality has declined, with increases in Gross and Net NPA ratios and reductions in investmentto-asset and net interest margin ratios, indicating limited positive impact of AI in managing asset performance. Management quality has significantly improved, evidenced by increased business and profit per employee, although a decline in return on equity suggests rising equity costs or long-term strategic investments. On the other hand, earnings quality has strengthened post-AI adoption, with substantial improvements in earnings per share, net profit margin, and return on capital employed, as well as a better CASA ratio, reflecting more efficient resource utilization and cost-effective funding.

Conclusion

Although there has been a noticeable improvement in key financial ratios following the adoption of AI, hypothesis testing indicates that the relationship between AI implementation and HDFC Bank's financial performance is not yet statistically significant. This may be attributed to the limited scope of AI integration, suggesting that the bank has not yet harnessed AI to its full potential. To unlock the true value of AI, HDFC Bank should adopt a comprehensive, multi-pronged strategy focused on expanding AI applications across core and support operations. Investing in workforce upskilling is equally essential to ensure employees are equipped to leverage AI tools effectively. Moreover, establishing a robust data governance framework

coupled with ethical AI practices will be critical to maintaining data privacy, regulatory compliance, and customer trust. By embracing a holistic and responsible AI strategy, HDFC Bank can position itself for enhanced growth, operational efficiency, and long-term competitive advantage in an increasingly digital financial ecosystem.

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