



FINANCIAL HEALTH OF INDIAN BANKING SECTOR – AN AUTOREGRESSIVE DISTRIBUTION LAG APPROACH

Sheikh Bilal

Lecturer, Department of Management, Jazan University, Saudi Arabia
sbilal@jazanu.edu.sa

Syed Mohammad Faisal, PhD 

Assistant Professor, Department of Management, Jazan University, Saudi Arabia
dfaisal@jazanu.edu.sa

Ahmad Khalid Khan, PhD

Assistant Professor, Department of Management, Jazan University, Saudi Arabia
akkhan@jazanu.edu.sa

Abstract

The primary objective of this study will be to assess the financial health of the Punjab National Bank from India. As a result, the CAMELS system of measurement applied—Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity—are crucial performance indicators for the overall financial health of Punjab National Bank. The study uses secondary data from 2007 to 2021 in the financial services industry. PNB, an Indian public sector bank, was chosen because of its role in the industry. The autoregressive distributed lag (ARDL) regression method is used to figure out how the quality of an asset is related to other things. The results often illustrated the interdependencies among the components and the varying degrees of prosperity they enjoyed. In all procedures, including capital adequacy, asset quality, management, profits, liquidity, and sensitivity, the top management, chief executives, regulators, and government officials of banks may benefit from the research's conclusions. Numerous earlier studies on Indian financial institutions have employed the CAMELS approach for doing financial health checks, but this study is the first to focus explicitly on the topic. The CAMELS

analysis has led to a lot of new information, and this effort adds to that. Using a multidimensional approach, this study is a new way to determine how the Punjab National Bank's finances are doing now. This provides a comprehensive framework for understanding the CAMELS approach to financial ratios.

Keywords: CAMELS, Financial Ratio, Financial Health, Auto Regressive Distributed Lag, Indian Banking Sector

INTRODUCTION

All financial experts agree that a bank's capacity to continue operating is influenced by factors other than how much money it generates. It would help if one kept this in mind since it is significant. In the past few years, there has been much research into how well bank money works and how reliable it is (Kirimi, Kariuki, & Ocharo, 2022). Throughout history, many economists, policymakers, academicians, and bankers have studied how well banks do financially. The bank's financial health assessment uses a variety of metrics, including the Capital Adequacy Ratio (CAR), Non-Performing Loans (NPL), Return on Assets (ROA), Net interest margin (NIM), and Loan to Deposit Ratio (LDR), as well as z-score, PESTLE Analysis (Political, Economic, Sociological, Technological, Legal, and Environmental), PARTS model (to assess project creditworthiness) and others. However, here it has been used the CAMELS method of research in this study.

The most important things that affect a country's economic success are the growth of both domestic and international trade and the industrialization and modernization of agricultural methods (Quoc Trung, 2021). How an economy grows may also be significantly influenced by many other things. A healthy and prosperous economy capable of effectively competing on the global market might be the basis for a stable financial system. When seen from the vantage point of the whole global economy, it is impossible to stress how important a responsible financial sector is to the overall economic prosperity of a country (Yesmine et al., 2022). The modern economic system is held together by its most vital cog, which is the banking sector. It is impossible to stress how important this industry is to the economy. A bank is one of the oldest financial institutions in business today.

They are essential for many economic activities, like lending and investing money in banks and other financial institutions. A healthy economic system operates the way that gas does in a car. It is done by making it easier for people to access money, which is then put into high-return ventures, making the economy more productive (Keffala, 2021). This target is within reach as a direct consequence of the development of a robust banking system that doubles as a

fuel injection system at the same time. Statistics gathered from a variety of real-world sources all point to the same conclusion, which is that countries that have banking systems that are more advanced grow at a faster rate than those that have financial systems that are less modern (Shen, Wu, Chen, & Wang, 2020). Numerous studies have pointed to a connection between the economy's growth and the financial sector's development. These studies have also shown the relevance of the financial industry to the growth of an economy. According to a second assessment, resources are being reallocated away from traditional fields that are seeing slow development and towards firms that are generating profits (Misra & Aspal, 2012).

The business world of finance is at the forefront of this transformation. As a consequence of this, it motivates others to start businesses in places that are experiencing fast population growth and significant public interest. From what has been talked about, it's clear that a country's ability to make money is directly related to its financial system. It is an essential point that needs to be stressed more. It is correct, given that the ability to make money is contingent upon the monetary system (Luu, Doan, & Anh, 2021). As a result, conducting an in-depth investigation of the efficiency with which banks carry out their functions and how well they do economically is essential. It is one of the most critical jobs carried out by the monetary and financial systems (Trabelsi & Trad, 2017). The CAMELS model is broken down into its parts: capital sufficiency, management quality, earnings, liquidity, and sensitivity. CAMELS is an acronym often used to refer to capital adequacy, asset quality, management quality, earnings, and sensitivity. The individual letters and words that make up the acronym are listed below. Politicians and bank regulators have been pushing for CAMELS to be used as a rating model. to monitor and assess the bank's operations and financial health. The Center for Advanced Methods in Economic and Legal Studies conceived (CAMELS) (Afroj, 2022). The components that make up the acronym CAMELS are as follows: capital adequacy, management of assets, earnings, liquidity, and capitalization.

In 1979, the Federal Financial Institution Examination Council authorized the CAMELS rating system as an effective internal supervisory tool to detect and evaluate financial institutions. As a result of this authorization, the CAMELS grading system was finally put into practice in 1979. After this change was made, there was a noticeable spike in the number of people using the system. This piece of legislation was given the council's first approval in the first time (USA) (Lee & Lee, 2019). The CAMELS ratio is used by those responsible for maintaining order in the banking industry to keep a close eye on the performance of each financial institution. It is done to ensure that the financial system is as consistent as practically possible. This page provides information on the Punjab National Bank, a global financial institution that offers a diverse range of banking products and services and is headquartered in

India. Its main office may be found in India (PNB) (Papadimitri, Staikouras, Travlos, & Tsoumas, 2019) The corporation's headquarters may be located in New Delhi, India, which also happens to be the continent's capital. The bank opened its doors to clients and began doing business in 1894. As of March 2017, the bank had 6,937 branches and 10,681 automated teller machines (ATMs), serving more than 80 million customers. The Punjab National Bank is answerable to the policies and regulations set out by the central government of India. The government exerts its influence on the organization by controlling it (Petropoulos, Siakoulis, Stavroulakis, & Vlachogiannakis, 2020). The Banking Regulation Act of 1949 and the Reserve Bank of India Act of 1934 are the two pieces of legislation responsible for creating their respective rules. The first of these laws was enacted in 1934, and the second did the same in 1949 (Dang & Vong, 2020).

The Indian Companies Act stipulated that the Punjab National Bank had to be legally founded by May 19, 1894, to be recognized as a legitimate company in the eyes of the law. Initially, the organization's administrative headquarters were situated in the Anarkali Bazaar in Pakistan. When the founding board was being put together, Indians from different parts of the country offered their knowledge. Even though they all lived in different parts of the country, they were all devoted followers of the numerous religious traditions they adhered to, regardless of their religion. They all agree that the country needs a national bank to help it grow economically (Greiner, Kohlbeck, & Smith, 2022).

During the first few years of the bank's existence, Lala Lajpat Rai, the bank's founder, played a significant role in the day-to-day running of the business. The Punjab National Bank was started with the help of many influential people, such as Lala Lalchand, Kali Prosanna Roy, E. C. Jessawala, Prabhu Dayal, Bakshi Jaisha Ram, and Lala Dholan Dass. There is a widespread misconception that Lala Harkishan Lal and Dyal Singh Majithia were responsible for establishing the country. On May 23, 1894, the board of directors met for the first time to take care of important business. The doors of Lahore's first bank were initially opened to the public on April 12, 1895. On this particular day, the city had good cause to rejoice. The Punjab National Bank (PNB) is important because it was the first bank in India to be set up with money from Indian investors.

It is also essential because it has been running since it started. In addition, it was the first bank in India to accept deposits from customers outside the country. As a direct response to the mistake, the bank changed its name to "First Indian Bank." The Oudh Commercial Bank is the first organization in the history of the world to be headed by the people of India. It was an entirely novel item that had never before been put up for sale. In the year 1881, everything got started in Faizabad, and it ended there in 1958.) The Punjab National Bank (PNB), which had been given permission to do so, was in charge of the accounts of several influential national

leaders, such as Mahatma Gandhi, Lal Bahadur Shastri, Jawaharlal Nehru, and Indira Gandhi. PNB was successful in achieving this goal. The PNB is now looking at the statement made by the Jalianwala Bagh Committee.

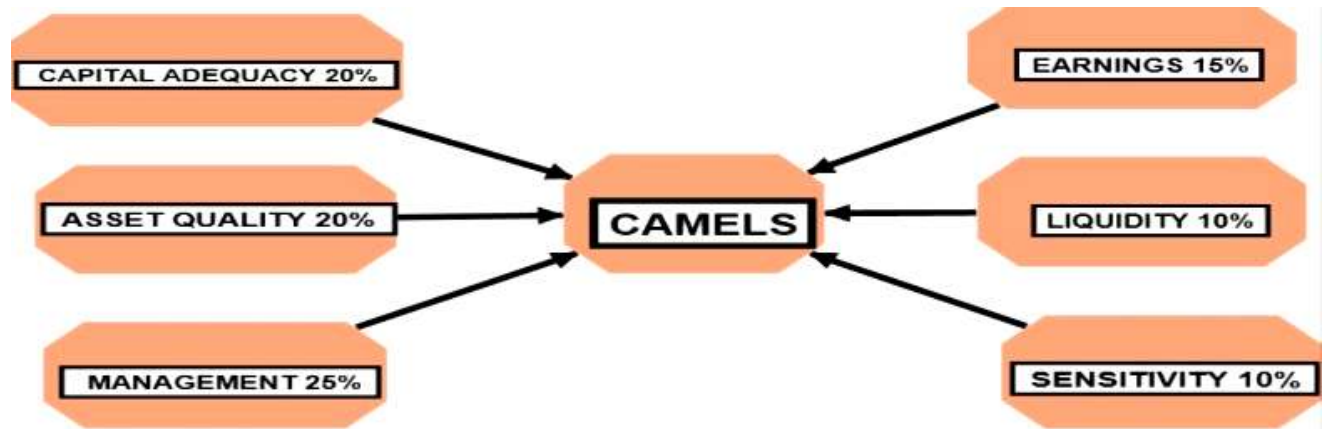


Figure 1: CAMELS Analysis Model

As shown in Figure 1 and detailed above, each component was given a proportional weight when determining the bank's financial soundness.

Capital Adequacy 20%: The procurement capital and its source play a substantial part in ruling out the CAMELS analysis of the bank.

Asset Quality 20%: An asset here refers to the loans given by these banks shown in the balance sheet, which are arbitrated by their quality.

Management 25%: Managing of menace at every step, since the inception of planning, organizing, staffing, and controlling comprises CAMELS Analysis.

Earnings 15%: The supervisory level analyzes the budding, sustainability, movement, and eminence for earning.

Liquidity 10%: The movement and obtainability of liquid cash and near-cash also affects the analysis.

Sensitivity 10%: The component is the bank's sensitivity in the direction of the market risk.

In addition, banks are ranked on a scale from one to five points. (This is what we mean when we talk about point 1, which is "Strong.") The best financial institutions have scores between 1.0 and 1.4. Finances, operations, and management are in great shape. "Critical" point 5 describes the severe inadequacy of the analysis between 4.5 and 5. The financial situation at these banks is volatile, and they need to be carefully watched, or there is a big chance they will fail. This is one of the few studies where a single bank's financial health is checked through an

application of ARDL, where independent variables are used as predictors to project their impact on Asset Quality, which is the dependent variable. And the structure of the study is planned as follows: Section 1 will review the literature, and Section 2 will be the research methodology. Section 3 will discuss the results and discussion, and, last but not least, Section 4 will present the conclusion, followed by all cited literature in the form of references.

REVIEW OF LITERATURE

Everyone now believes that a bank's ability to stay financially viable depends on factors other than profitability. Much research has been conducted to evaluate banks' operational and financial stability. This section covers some of the most critical previous research required for the present inquiry. (Haralayya & Aithal, 2021) evaluated the creation, and intermediation methods are the three most essential ideas in banking writing. Banks' approaches to the first two tactics reveal the disparities between them. The generation model is based on the idea that banks will spend time and money to give customers account and credit services. Sharing knowledge and informing others of the findings are examples of outputs. According to the second hypothesis, banks' primary duty is facilitating communication between investors and savers. These methods need to consider how the financial and monetary systems work together. On the other hand, the intermediation model says that banks should help savers and investors connect. According to this rule, the amount of money leaving the account should match the amount anticipated to remain there. All deposits, loans, borrowings, investments, and other financial obligations fall under this category. The third tactic expands on the first by including additional banking-related elements. It has been shown that the intermediation strategy is the best way to get information from all levels of financial intermediaries, but the creation strategy is the best way to get information from a single bank branch. Obtaining data on the volume of transactions and reports may be time-consuming. The financial literature pertinent to the concept of "intermediation" supports it. Numerous articles have been published regarding how the banking system's outputs and inputs result in advantages, disadvantages, and respect for customers. The mediation process yielded all additional ideas and techniques. Whatever choice you make, you must spend your money in some way. (Shaddady & Moore, 2019) explored by using panel data for 2,210 banks in 47 European countries from 2000 to 2016, do a thorough study of how different financial laws and supervision affect the stability of banks. A rating system called CAMELS is used to assess quantile regressions. Statistics show a positive correlation between bank stability and a greater degree of capital regulation. Conversely, tighter regulations, deposit protection, and extensive oversight lead to less stable institutions. These consequences may be seen more clearly in institutions with greater levels of stability. Also,

commercial banks, smaller banks, and banks in countries that are still developing are more likely to be hurt by regulatory shocks.

(Dincer, Gencer, Orhan, & Sahinbas, 2011) investigated after the financial crisis that hit Turkey from November 2000 to February 2001, there were changes made to the country's structure, especially in the banking sector. It attempted to deal with problems with setting rules for banks and how the financial sector regulates the banking industry. The banking sector's reactions have developed into a significant subject of study as a direct consequence of the global economic crisis of 2008. This is in addition to how the banking sector performed while it was expanding. CAMELS ratios are one of the best ways to measure how well the banking industry is doing. They look at important factors that show how well the industry is doing. This is true even though several studies examine how effectively the banking industry performs. (De Jonghe, 2010) looks at how banks specialize and spread their financial operations and how well they can handle a crisis in the banking sector. Extreme value analysis is used as the first stage in our procedure to get market-based estimates of the systemic risk exposures provided by banks. "Tail beta" is a way to measure the systemic risk of the banking industry. It determines how likely a bank's stock price will drop if the banking index falls. The next step is to determine how this risk measure is affected by the relationship between interest income and other types of income that don't come from interest. Different kinds of non-traditional banking activities may be to blame for the wide range of risks that banks face. People believe that actions taken by banks that don't generate interest will increase their "tail beta." Also, smaller and better-capitalized financial institutions are better able to handle significant events. These connections are stronger during difficult economic times than during prosperous ones. It has been shown that giving different financial tasks to the same organization does not stabilize the banking system. This finding may shed light on why financial oligopolies trade at a discount.

(Saeed, Shahid, & Tirmizi, 2020) studied to find out how the CAMELS Ratio affects how well the banking industry works. In this study, the performance of the banking sectors in Pakistan and Sri Lanka was compared in terms of efficiency and empirical significance using the panel regression model using the CAMELS ratio (Capital Adequacy (CA), Asset Quality (AQ), Management Soundness (MS), Earnings, Liquidity (LR), and Sensitivity to Market Risk (SR)). These ratios include Liquidity (LQ), Asset Quality (AQ), and Capital Adequacy (CA). All Pakistani and Sri Lankan banks opened between 2008, and 2016 have given their data. Using the Hausman Test on GLS, time-fixed, and random-fixed effect model estimates, it was found that the random-effects model is better than the fixed-effect model. The empirical results also show that every part dramatically affects how well the banking systems of both countries work. These variables include CA, AQ, LR, MS, Return on Equity (ROE), Return on Assets (ROA)

(Earnings), and Return on Assets (ROA) (Earnings). SR is not as significant but is positively correlated with efficiency. The empirical analyses also show a positive link between SR and how well the banking sectors in both countries work. On the other hand, these findings support what previous studies have discovered. (Derviz & Podpiera, 2008) examined the variables that affected the Czech Republic's capital-assets-management-earnings-liquidity-sensitivity-to-market-risk (CAMELS) and long-term Standard & Poors (S&P) bank ratings between 1998 and 2001 when the country's three biggest banks—which together accounted for about 60% of the sector's total assets—were sold to new owners and had time to adjust. The three largest banks comprised over 60% of the Czech banking sector (2002–2005). Using the same set of explanation criteria used by the Czech National Bank-hired banking sector regulators and related to the CAMELS rating's inputs, the best predictors of how well they will do are found. Both ratings may agree that this is over. While utilize a standard panel data framework to analyze the CAMELS rating, it employs an ordered-response logit model to study the long-term S&P rating. Several things can be explained by our study, such as leverage, funding spread, the ratio of total loans to total assets, value-at-risk for tangible assets, and adequate capital. (Moudud-UI-Huq, 2017) intended to use the composite rating method to look at and evaluate the financial performance of Bangladesh's banking sector in 2013 and 2014. To achieve this objective, 10 of the 38 private commercial banks (PCBs) were selected. CAMEL has thoroughly examined the state of the banks' finances and reported its conclusions. According to these figures, most banks scored 2.14, which is a good grade for the group. One PCB, Eastern Bank Ltd., received the rating "Strong," while the other seven received "Satisfactory." The composite scores for AB Bank Ltd. and City Bank Ltd. are both in the center of the spectrum. This means that most PCBs in Bangladesh have been running at a level that most people think is good for a long time. Most of the time, a bank's operational success depends on how well its management can come up with strategic plans and make sure they are carried out correctly. Like it has been this year, maintaining the quality of assets will probably be the most challenging challenge in 2014. 2013 was an average year for the Bangladeshi banking industry in terms of how it was run, how much money it made, and how stable it was. Finally, it is recommended that banks focus more on the caliber of their assets, their employed purposes, and the efficacy of their management grids.

(Babar & Zeb, 2011) assessed the financial sector of an economy is essential to its overall growth and success. The banking business, which is in charge of receiving savings from economic units with surpluses in the form of deposits and distributing money to monetary units with deficits in the form of advances, is the foundation of the financial sector. The banking industry supports other industries and the economy during economic downturns or crises. But

when banks are the leading cause of a financial problem or the center of an economic recession, like they were during the current historic financial crisis, which lasted from 2007 to 2009, it makes it harder for the economy to get back on its feet. As a result, it is crucial to monitor the performance of the banks closed and ensure that they adhere to the regulations set out by the regulatory bodies. The level of internal management, the law, and the level of external rating agencies, are used to judge how well a bank is doing. Rating systems are used by regulators and supervisors to evaluate how well a bank is doing and if it is following the law. This is done to ensure that the bank continues to go in the proper direction. The bank's management is the only person aware of these ratings and is held in the tightest of secrecy. External organizations that rate credit do audits and assessments of financial institutions like banks before they give their ratings to the public and investors. The results of these two assessments of the state of the institutions must agree. Investors and management will get precise information as a result. Many financial institutions went out of business in the last few years as a result of the failure of both their internal rating systems and external credit rating agencies. CAMELS is a new way for the State Bank of Pakistan to keep an eye on and regulate businesses. The six most crucial aspects of the bank are examined to determine how effectively it is performing. A company's capital, assets, management, profitability, cash flow, and degree of market risk vulnerability make it up. The total rating, which also varied from 1 to 5, was based on these ratings on a scale of 1 to 5. The PACRA is the top credit rating company in Pakistan. Most of the banks and companies in the nation get ratings from it. As part of our study, are comparing the CAMELS rating system with the PACRA rating agency and gathered data for this project from seventeen commercial banks that are part of Pakistan's financial system. The outcomes from the sample banks are different. This can indicate that banks have been failing over the last three or four years, or it might suggest that Pakistan's financial system is in danger. The situation is not favorable in any case. (Absar, Amran, & Nejati, 2014) intended to find out what kinds of human capital reporting are optional and how much of that information is in the annual reports of 27 of the 30 Bangladeshi banks listed on the Dhaka Stock Exchange. Using the subject, form, quantity, and location methods of content analysis, the research shows that all banks have HC in their yearly words, with "staff training and development" being the most common problem. For the first time, our inquiry has shown that five Bangladeshi banks have specific sections in their annual reports where they discuss HC. This study's findings indicate that 93% of sample banks quantitatively report HC. This research on HC reporting could help banks in Bangladesh and other developing countries improve the HC reporting in their annual reports by telling them what to focus on. (Njoku, 2011) gauged CAMEL (Capital Adequacy, Management Quality, Earnings, and Liquidity) tool is used by bank regulators as part of their off-

site monitoring to figure out how strong a bank's finances are. The purpose of this research is to compare the CAMEL tool to the structure of the financial health of Nigerian banks. In previous research, factor analysis was used to describe the design of a bank in terms of its presence on the market, macroeconomic situation, ability to attract deposits, prudential practices, quality of profits, market power, and capital assurance.

According to (Njoku and Inanga, 2008b), the CAMEL model employs subjectivity to choose which factors to use and how much weight to give each one, in contrast to the anatomic model founded on facts. Comparing the properties of the two models provides some crucial information. Because of this, the authors of this study used discriminant analysis to find important univariate descriptors. By comparing descriptions of body parts to the CAMELS model, the research helps discover the problems that affect a bank's financial health. Because of this, the study has to discuss actual variables that don't fit the CAMELS framework. (Nour, Al-Taweel, & Rashwan, 2021) premeditated to find out how capital risks affect the use of CAMELS standards in financial institutions listed on the Palestine Stock Exchange (PSE). The banks' financial reports on the Palestine Stock Exchange between 2007 and 2019 were used as a research tool. The words were analyzed using both deductive and inductive techniques. There is a moral hazard at the level of indication (0.05) of capital risk on capital sufficiency and profits (capital) (returns) for banks listed on the Palestine Stock Exchange. Capital risk's effect on an asset, management, liquidity, and market risk sensitivity is morally irrelevant (0.05). For banks that are listed on the Palestine Stock Exchange, it is recommended that they study the essential parts of the CAMELS model by looking at their capital, the quality of their assets, the quality of their management, their earnings, the quality of their liquidity, and how vulnerable they are to market risk. Capital risk will decrease as a result.

(Islam & Chowdhury, 2016) provided much attention has been paid to more voluntary reporting of data like environmental, social, and corporate governance information. Almost all data businesses are obliged to publish their financial data. This is true since it is required by law to provide financial information. All organizations that are part of the Global Reporting Initiative (GRI) use a reporting standard called G4. Its objective is to provide thorough reporting guidelines and standards. In this paper, the G4 principles are used to look at the sustainability disclosure systems that are already in place in the Bangladeshi banking sector. The 2014 annual reports of the 30 listed banks were content analyzed to assess disclosures. The results show that banks are more willing to share general information (66%) than technical information (17%). The public can access just 36% of the G4's strategy to ensure sustainable growth. It's a small number. The banking industry may adopt G4 and change how it reports fitting with GRI. (Wanke, Azad, & Barros, 2016) examined Malaysia's dual banking system's effectiveness using

the Dynamic Slacks Based Model (DSBM). The objective is to calculate how much Malaysian banks might produce from 2009 to 2013 while reducing input costs. To be more precise, DSBM is the first phase of a two-part procedure that evaluates how well conventional and Islamic banks operate in Malaysia and looks like the CAMEL rating systems. In the second step of the process, the results of the DSBM are combined with MCMC methods used to create generalized linear mixed models (GLMM). This is done to make a model for judging the performance of banks that can accurately predict what will happen in the future. Compared to conventional banks, Islamic financial institutions seem far more inefficient and lazier. When the group of Malaysian Islamic banks is used as the study's main point of comparison, foreign banks are less effective than their domestic counterparts. This shows that there are cultural and legal barriers. The findings are crucial for forming public policy.

(Chiaramonte, Croci, & Poli, 2015) calculated Z-score, often used as a proxy for a bank's health, was examined between 2001 and 2011 for a group of European banks from 12 different nations. To be more precise, do a horse race analysis between the Z-score and the CAMELS-related factors also use probit and supplemental log-log models (2008–2011) to show that the Z-ability score is at least as good as the CAMELS variables at finding distress episodes over the whole period and during the crisis years. Fewer data is also required. This has always been the case, even during difficult times. In conclusion, big and commercial banks tend to have more complex business structures, which makes the Z-score more relevant in these situations. (Adam, Soliman, & Mahtab, 2021) reviewed that it is hard to compare the results of empirical research because there are different ways to measure enterprise risk management (ERM). Enterprise risk management is a broad concept, so companies that adopt and use it may get extra benefits. The best framework for analyzing ERM should be comprehensive enough to include all possible signals, outputs, and effects that come from the features of a firm. Second, because of how banks work and the risks they take, this research makes an ERM model for the banking industry that is unique to it offer a thorough process and different ways to develop ERM measures for the banking sector, considering both ERM components and sector needs. It used the ERM model for the banking industry and the CAMELS model for bank performance to determine a complete way to measure ERM. With these two models, the banking industry has a full set of OLS for analyzing ERM measures. We approach bank risk management differently than previous generations have. Our approach gives bank CEOs, risk managers, board members, central bankers, and anyone else in charge of ensuring the financial system is stable a complete framework for managing risk.

(Wanke et al., 2016) scrutinized Malaysia's dual banking system's effectiveness using the Dynamic Slacks Based Model (DSBM). The objective is to calculate how much Malaysian

banks might produce from 2009 to 2013 while reducing input costs. To be more precise, DSBM is the first phase of a two-part procedure that evaluates how well conventional and Islamic banks operate in Malaysia and looks like the CAMEL rating systems. In the second step of the process, the results of the DSBM are combined with MCMC methods used to create generalized linear mixed models (GLMM). This is done to make a model for judging the performance of banks that can accurately predict what will happen in the future. Compared to conventional banks, Islamic financial institutions seem far more inefficient and lazier. When the group of Malaysian Islamic banks is used as the study's main point of comparison, foreign banks are less effective than their domestic counterparts. This shows that there are cultural and legal barriers. The findings are crucial for forming public policy. (Rashid & Jabeen, 2016) considered to look at the macroeconomic, financial, and bank-specific factors in Pakistan that affect both conventional and Islamic banks. To do this, we used the ratios given by CAMELS to figure out the financial performance index (FPI) and then applied them to the good determinants. Our study is based on an unbalanced annual panel data collection from 2006 to 2012. The GLS regression analysis shows that conventional banks' efficiency, liquidity, and spending levels are significant in figuring out how well they do. On the other hand, how well Islamic banks work, how much money they make, and how much of the market they control play a significant role in their success. Also show that the effects of GDP and interest rates on lending hurt commercial and investment banks' ability to make money. The study's empirical results show that bank managers could focus on lowering overhead and operational costs to improve performance. This is true since the FPI was harmed by both of these issues. Our study shows that banks need to change their operational efficiency, financial risk management requirements, and general management practices to improve their performance.

(Naqvi, Rizvi, Uqaili, & Chaudhry, 2018) inspected Islamic banks are increasingly challenging conventional banks since they act as intermediaries. Capital markets and non-banking financial firms have constantly threatened traditional banks. The disintermediation and reintermediation of conventional banks have been the subject of academic study. Reintermediation via Islamic banks has yet to be considered. On the other hand, this study looks at reintermediation "within" the banking industry as a possible way to bridge the gap. It is the first study comparing Islamic and conventional banks in financial market reintermediation. (Kaur, 2010) measured the globalization of the market, which has made the competition even fiercer, is partly to blame for the changes in the Indian banking sector. The several commercial banks that are now operating in India are rated in this article. There are three major types of banks in India: public sector banks, private sector banks, and other nations. 28 banks from the public sector, 26 banks from the private sector, and 28 banks from outside the public sector

were examined for research on profitability. The CAMEL analysis approach was used to evaluate the candidates. By including two ratios in the final composite index, the qualities of Capital Adequacy, Asset Quality, Management Quality, Earning Quality, and Liquidity were all assessed. Andhra Bank and State Bank of Patiala are tied for first place among the finest public sector banks. HDFC Bank is ranked as the second-best private sector bank, while Jammu & Kashmir Bank is regarded as the best private sector bank. The bank that does the most business on the global market is Antwerp Bank. In a close second position is J.P. Morgan Chase Bank.

(Denis & Sheth, 2012) determined service-sector businesses have a big problem because their levels of skill and effectiveness are sometimes different. Many different people and businesses are worried about this issue, such as bankers, insurance brokers, innkeepers, and courier services, to name a few. Indian banks have seen a fast expansion in regulation, technology innovation, and competition during the last ten years, just like other banks throughout the globe. The detrimental impacts of competition have directly impacted the revenue generated by banks. Examining the efficiency of India's commercial banks is crucial for understanding their ability to survive and thrive in the country's current economic climate. The CAMEL Model provides the foundation for the author's examination of banks' performance. According to the data, Axis Bank, HDFC, and Punjab National Bank's overall growth rates were perfect. (Babu & Kumar, 2017) CAMEL approach was made to judge the efficiency of financial institutions based on different factors. Regulators utilize local and remote surveillance to determine a bank's financial stability. The CAMEL grading system promotes openness, expansion, and transformation for financial institutions. This approach makes it easy to understand the institution's benefits, drawbacks, and potential threats. The author of this research looked at how productive public and private sector banks were based on their market capitalization rates. To maintain uniformity, the ten chosen banks (five from the public sector and five from the private sector) are split into two groups. A ratio from each category of the CAMEL grading system—capital adequacy, asset quality, management efficiency, earning capacity, and liquidity—can be chosen to assess a bank's efficiency. The quality of the assets, their earning potential, and how simple it is to sell them are items to consider.

RESEARCH METHODOLOGY

The study used secondary data in the banking sector and one of Indian banks, amongst numerous public sector banks, PNB has been taken purposely for study after pretest financial analysis as per financial results and requirements for this study. From its

financials required for CAMELS study 15 years data from 2007 to 2021 has been taken. Selection of time span was totally based on convenience of data availability. All these secondary data was obtained from reliable sources on web which is freely available for investors and researchers for further study and analysis so there was no conflict of interest in data collection. The entire analysis closely inspired to conduct multiple regression and thus Auto Regressive Distributed Lag (ARDL) was used. Before conducting ARDL some required diagnostic tests such as normality test in which Jarque-Bera test and for stationary of dependent variable Augmented Dicky Fuller (ADF) test was conducted. With an availability of many research to ARDL for investigation, Eviews 10 has been taken as a vigorous research contrivance of time series data for CAMELS study.

Research objective was framed on the basis of selected variables from **CAMELS** ratios as mentioned below capital, asset quality, management, earning ability, liquidity and sensitivity. Asset quality which is devised by (Ledhem & Mekidiche, 2020) has been taken as dependent variable and for diagnostic as well as main investigation for multiple regressions (Yildirim & Ildokuz, 2020) and rest of the variables were taken as independent variables.

RESULTS AND DISCUSSION

The following are the observations from 2007–2021 in Table 1, where all the dependent and independent variables were pretested for diagnostic data. Their normality was tested by applying the Jarque-Bera test at a significance level of 5% and found to be significantly normally distributed, thus accepting the null hypothesis (H_0). As was already said, most data are normally distributed, but in the case of asset quality ($p = 0.49149$), a slight deviation ($p = 0.05$) is enough to reach the threshold. However, such variation was the least significant and considered a secure fit for a normally distributed population. All independent were found unconditionally significant for normally distributed data before applying the stationary and multi-regression tests by using ARDL in CAMELS analysis of the data set of financial ratios. Furthermore, a dependent variable on asset quality was enforced for another diagnostic test. For stationary data, as shown in Fig. 2 and table 2, the Augmented Dicky Fuller(ADF) test was required. Because the initial results were insignificant ($p = 0.5613$) and the data was not found to be stationary, it was converted into a series of stationary data at the first difference by forming another variable, $DY = \text{asset quality} - \text{asset quality} (-1)$. Fig 3 and Table 3 further tested the ADF test for dependent variable asset quality and found a stationary ($p = 0.0118$) at the first difference after data diagnosis.

Table 1: Descriptive Statistics of Economic Variables

Ratios	ASSET QUALITY	CAPITAL ADEQUACY	EARNING ABILITY	LIQUIDITY	MANAGEMENT	SENSITIVITY
Mean	17.48163	15.98187	0.085053	0.086914	78.31664	0.031381
Median	17.32222	15.80931	0.088417	0.082363	78.43025	0.03145
Std. Dev.	1.909569	1.921774	0.012708	0.043325	35.08056	0.005613
Jarque-Bera	1.681023	1.698503	1.394907	1.065422	0.922553	1.173763
Probability	0.49149	0.507735	0.517851	0.587011	0.630478	0.556059
Observations	15	15	15	15	15	15

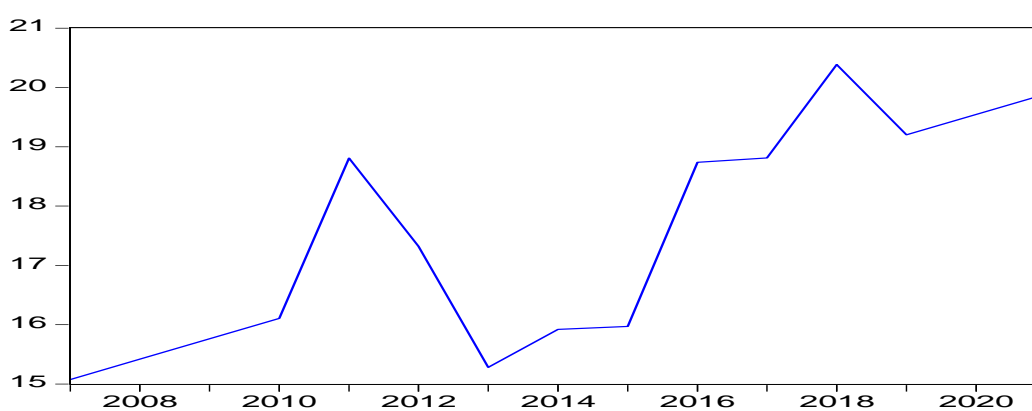


Figure 2: Asset Quality

Table-2: Unit Root Investigation of Asset Quality

Ho: \ **ASSETQUALITY has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

Augmented Dickey-Fuller		
test statistic		
	t-Statistic	Prob.*
	-1.37997	0.5613
Test critical values	1% level	-4.004425
	5% level	-3.098896
	10% level	-2.690439

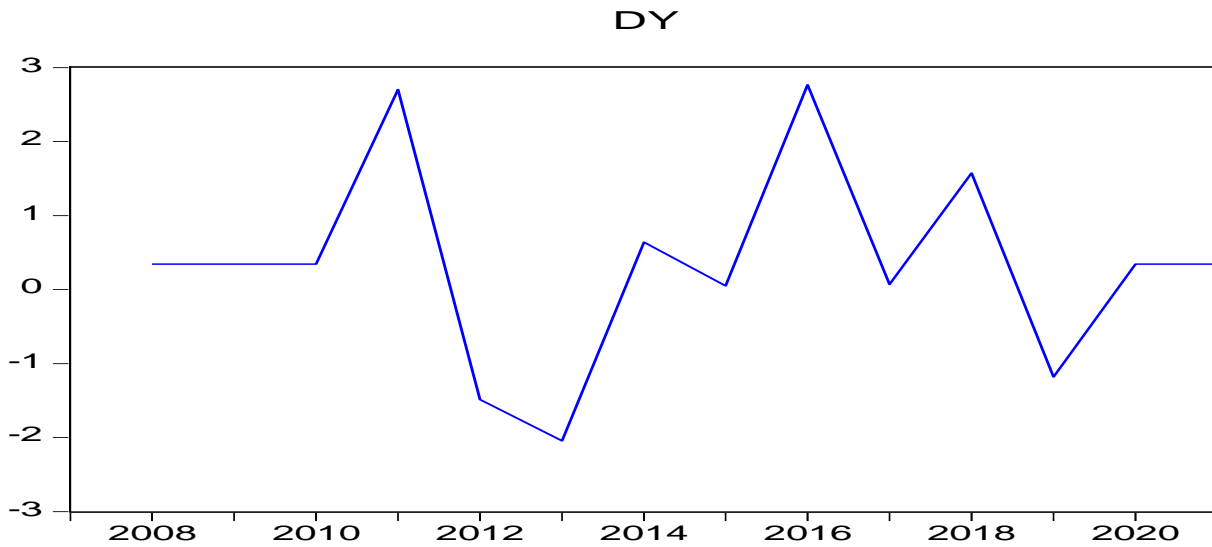


Figure 3: Unit Root Graph

Table 3: Lag Length, p-value

Ho:\ DY has a unit root		t-Statistic	Prob.*
Exogenous: Constant			
Lag Length:	0		
(Automatic based on SIC, MAXLAG=2)			
Augmented Dickey-Fuller test statistic		-3.961904	0.0118
Test critical values	1% level	-4.05791	
	5% level	-3.11991	
	10% level	-2.701103	

Table 4: Least Square Model

Dependent Variable: ASSETQUALITY				
Method: Least Squares				
Sample: 2007 2021				
Included observations: 2007-2021				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITALADEQUACY	1.029906	0.00168	613.1643	0
EARNINGABILITY	-0.260538	0.466312	-0.55872	0.59
LIQUIDITY	0.185107	0.226885	0.815862	0.4356
MANAGEMENT	-0.000251	0.000169	-1.488966	0.1707
SENSITIVITY	16.88311	0.488153	34.58569	0
C	0.517725	0.073577	7.036504	0.0001

The regression model as depicted in table 4 is implied with Auto Regressive Distributed Lag (ARDL) method where asset quality was taken as dependent variable and other variables such as capital, earning ability, liquidity, management quality and sensitivity have been taken as independent variables. The output of regression followed the following mathematical model as mentioned below.

$$Y = C + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \dots + \text{error term}$$

Where Y is a dependent variable, $\alpha_1, \alpha_2, \dots$ are the coefficients and x_1, x_2, \dots are independent variables (predictors).

On the basis of this model the effects of independent variables on dependent variable were explained as follows:

$$Y = 0.517725 + 1.029906 \text{CAPITAL} - 0.260538 \text{EARNINGABILITY} + \text{LIQUIDITY} - 0.000251 \text{MANAGEMENTQUALITY} + 16.88311 \text{SENSITIVITY}$$

It has been found in the equation that earning ability and management quality have negative relationship on asset quality. This result has been justified by their p-values too as they fail to predict about the dependent variable asset quality, $p > 0.05$ in case of earning ability $p = 0.5900$ and also management quality $p = 0.1707$. Also, from the table it was indicated that capital adequacy and sensitivity were two independent variables whose p values found less than 0.05 and thus affected significantly the dependent variable asset quality whereas earning ($p = 0.5900$), liquidity ($p = 0.4356$) and management quality ($p = 0.1707$) were found insignificant predictors of asset quality. Apart from individual analysis it was required to analyze their overall prediction on asset quality as mentioned in table below.

Table 5: R- Squared

R-squared	0.999999	Mean dependent var	17.48163
Adjusted R-squared	0.999998	S.D. dependent var	1.909569

As depicted in table 5, R- squared (0.999999) that could predict 99.99% of the variation in the asset quality was explained by capital adequacy, earning ability, liquidity, management quality and sensitivity. Only 0.01% of the variation was explained by other independent variable not countable for this study.

Table 6: Durbin Watson Test

F-statistic	1221415	Durbin-Watson stat	1.157971
Prob (F-statistic)	0.000000		

Based on table 6, F-statistic (1221415) with the p-value 0 indicated that the independent variables have significant effect on dependent variable. Also, from the Durbin-Watson stat (1.157971) preferably <2 indicated no serial autocorrelation found amongst dependent and independent variables.

CONCLUSION

In this research, CAMELS was the study that predicted and demonstrated the ARDL model and interrelation amongst dependent variable asset quality with other predictors acted as an independent variable such as capital adequacy, management, earnings, liquidity and sensitivity. The Punjab National Bank (PNB) financial ratios in the form of CAMELS indicated sufficient evidence and strong supportive predictors in the assessment of asset quality as mentioned in the above table in the form of R^2 i.e., 99.9%. But when analyzed individually there were only two independent variables capital and sensitivity found that predicted asset quality significantly in the time span of selected 2007-2021. Other independent variables individually did not affect asset quality significantly as their p-values found more than 0.05 i. e. insignificant. The variation was found unexpected in this CAMELS study of PNB since pandemic period was also the part of this study and thus expected because of these predictors did not support asset quality individually and found insignificant. Also, it was pre tested in the study that if sensitivity ratio was not included in this study, then results were found favorable and significant individually but would have been violation from the main theme and the objective of the research CAMELS analysis of the PNB in the context of their relationship among one another. Apart from their individual p values it was found that collectively the model was significant and met the expected results. This study gave insights about financials of one bank hence no comparative study was possible since research objective was to test the model fit and role and significance of predictors towards dependent variable asset quality. It was also analyzed that the panel data of various banks from Indian banking sector could have been purposeful for better understanding of CAMELS analysis and thus left the scope of further study for researchers.

Based on the findings of the study that demonstrated the collective significance of the model and met the expected results in assessing the role and significance of predictors towards the dependent variable, asset quality, as well as considering the unique focus on one bank's financial data without a comparative study, here are some implications and recommendations:

IMPLICATIONS:

Model Validity: The study's ability to demonstrate the connotation of the model and its fit for analyzing asset quality in the context of one bank's financial data implies that the model chosen

is appropriate for such an analysis. This proposes that the model can potentially be applied to other banks or financial institutions, provided the data is available.

Single Bank Insights: The study provides valued comprehensions into the financials of a specific bank. This could be useful for the bank itself, its management, and stakeholders in understanding its asset quality, which is a precarious aspect of financial stability.

CAMELS Analysis: The mention of CAMELS analysis implies that the model and predictors are relevant for evaluating the overall health of a financial institution, and not just limited to asset quality. This can be significant for regulatory authorities and investors.

RECOMMENDATIONS

Further Comparative Studies: While the research objective was to test the model fit on a single bank's data, it is recommended that future studies explore comparative analyses. Comparing the asset quality and predictor significance of multiple banks or financial institutions within the Indian banking sector can deliver a broader perspective on how different organizations perform in similar conditions.

Broaden the Scope: The study mentions that the panel data of various banks from the Indian banking sector could be purposeful for a better understanding of CAMELS analysis. Therefore, researchers are encouraged to demeanor more vital studies that include a diverse set of banks. This can facilitate a comprehensive assessment of the strengths and weaknesses in the sector.

Policy Implications: If the findings suggest certain predictors meaningfully impact asset quality, policymakers can use this information to design better regulatory measures and interventions to sustain a healthy banking sector. For example, if certain financial indicators consistently lead to better asset quality, banks can be encouraged to focus on these characteristics.

REFERENCES

- Absar, M. M. N., Amran, A., & Nejati, M. (2014). Human capital reporting: Evidences from the banking sector of Bangladesh. *International Journal of Learning and Intellectual Capital*, 11(3), 244-258.
- Adam, M., Soliman, A. M., & Mahtab, N. (2021). Measuring Enterprise Risk Management implementation: A multifaceted approach for the banking sector. *The Quarterly Review of Economics and Finance*.
- Afroj, F. (2022). Financial strength of banking sector in Bangladesh: a CAMEL framework analysis. *Asian Journal of Economics and Banking*.
- Babar, H. Z., & Zeb, G. (2011). CAMELS rating system for banking industry in Pakistan: Does CAMELS system provide similar rating as PACRA system in assessing the performance of banks in Pakistan? In.
- Babu, M. R., & Kumar, M. A. (2017). Adequacy of camels rating system in measuring the efficiency of banking industry: a retrospect. *International Journal of Research in Arts and Sciences*, 3(3-8), 3-6.
- Chiaromonte, L., Croci, E., & Poli, F. (2015). Should we trust the Z-score? Evidence from the European Banking Industry. *Global Finance Journal*, 28, 111-131.

- Dang, D., & Vong, J. (2020). Revisiting bank profitability, performance and stability in Asia Pacific (2012-2018) using the EAGLES framework. *International Journal of Electronic Finance*, 10(1-2), 116-130.
- De Jonghe, O. (2010). Back to the basics in banking? A micro-analysis of banking system stability. *Journal of financial intermediation*, 19(3), 387-417.
- Denis, L., & Sheth, Y. (2012). Present Scenario of Indian Banking Industry: an appraisal through Camel analysis. *Journal of Humanities, Social Science & Management*, 3, 5-14.
- Derviz, A., & Podpiera, J. (2008). Predicting bank CAMELS and S&P ratings: the case of the Czech Republic. *Emerging Markets Finance and Trade*, 44(1), 117-130.
- Dincer, H., Gencer, G., Orhan, N., & Sahinbas, K. (2011). A performance evaluation of the Turkish banking sector after the global crisis via CAMELS ratios. *Procedia-Social and Behavioral Sciences*, 24, 1530-1545.
- Greiner, A. J., Kohlbeck, M. J., & Smith, T. J. (2022). Auditor pricing of abnormal income from sales of available for sale securities: evidence from the banking industry. *Accounting and Business Research*, 1-35.
- Haralayya, D., & Aithal, P. (2021). Study on Model and Camel Analysis of Banking. *Iconic Research And Engineering Journals (IRE)*, 4(11), 244-259.
- Islam, M. N., & Chowdhury, M. A. F. (2016). Corporate sustainability reporting in the banking sector of Bangladesh: an appraisal of the G4 of the Global Reporting Initiative. *International Journal of Green Economics*, 10(3-4), 252-278.
- Kaur, H. V. (2010). Analysis of banks in India—A CAMEL approach. *Global Business Review*, 11(2), 257-280.
- Keffala, M. R. (2021). How using derivative instruments and purposes affects performance of Islamic banks? Evidence from CAMELS approach. *Global Finance Journal*, 50, 100520.
- Khan, M., & Faisal, D. S. M. (2019). A study for similarities between Islamic practices vis-a-vis accounting practices. *Asian Journal of Science and Technology*, 10(04), 9592-9597.
- Khan, A. K., Al Aboud, J. A., & Faisal, S. M. (2018). An empirical study of technological innovations in the field of accounting-boon or bane. *Business & Management Studies*, 4(1), 51-58.
- Khan, A. K., Faisal, S. M., & Aboud, O. A. A. (2018). An Analysis of Optimal Inventory Accounting Models—Pros and Cons. *European Journal of Accounting, Auditing and Finance Research*, 6(3), 65-77.
- Khan, A. K., Al Aboud, O. A., & Faisal, S. M. (2018). Muamma (conundrum) of Riba (Interest and Usury) in Major Religions in General and Islam in Particular. *The International Journal of Social Sciences and Humanities Invention*, 5(2), 4438-4443.
- Kirimi, P. N., Kariuki, S. N., & Ocharo, K. N. (2022). Financial soundness and performance: evidence from commercial banks in Kenya. *African Journal of Economic and Management Studies*(ahead-of-print).
- Ledhem, M. A., & Mekidiche, M. (2020). Economic growth and financial performance of Islamic banks: a CAMELS approach. *Islamic Economic Studies*.
- Lee, C.-C., & Lee, C.-C. (2019). Oil price shocks and Chinese banking performance: Do country risks matter? *Energy Economics*, 77, 46-53.
- Luu, H. N., Doan, T. N., & Anh, P. T. H. (2021). Managerial ability and bank failure. *Applied Economics Letters*, 28(4), 305-309.
- Misra, D. S., & Aspal, P. (2012). *A camel model analysis of State Bank Group*. Paper presented at the Proceedings of 19th International Business Research Conference.
- Moudud-UI-Huq, S. (2017). Performance of banking industry in Bangladesh: insights of CAMEL rating. *International Journal of Financial Engineering*, 4(02n03), 1750006.
- Naqvi, B., Rizvi, S., Uqaili, H. A., & Chaudhry, S. (2018). What enables Islamic banks to contribute in global financial reintermediation? *Pacific-Basin Finance Journal*, 52, 5-25.
- Njoku, J. (2011). Anatomic assessment of CAMEL in Nigerian banking. *International Journal of Economics and Accounting*, 2(1), 76-99.
- Nour, A. N. I., Al-Taweel, E. M., & Rashwan, A. E. R. M. (2021). Impact of capital risk on the application of CAMELS standards in banks listed on the Palestine Stock Exchange. *International Journal of Electronic Banking*, 3(1), 63-82.
- Papadimitri, P., Staikouras, P., Travlos, N. G., & Tsoumas, C. (2019). Punished banks' acquisitions: Evidence from the US banking industry. *Journal of Corporate Finance*, 58, 744-764.
- Petropoulos, A., Siakoulis, V., Stavroulakis, E., & Vlachogiannakis, N. E. (2020). Predicting bank insolvencies using machine learning techniques. *International Journal of Forecasting*, 36(3), 1092-1113.

- Quoc Trung, N. K. (2021). Determinants of bank performance in Vietnamese commercial banks: an application of the camels model. *Cogent Business & Management*, 8(1), 1979443.
- Rashid, A., & Jabeen, S. (2016). Analyzing performance determinants: Conventional versus Islamic banks in Pakistan. *Borsa Istanbul Review*, 16(2), 92-107.
- Saeed, H., Shahid, A., & Tirmizi, S. M. A. (2020). An empirical investigation of banking sector performance of Pakistan and Sri Lanka by using CAMELS ratio of framework. *Journal of Sustainable Finance & Investment*, 10(3), 247-268.
- Salamai, A. A., Faisal, S. M., & Khan, A. K. (2022). The relationship between inflation and GDP with reference to oil based economy. *International Journal of Multidisciplinary Research and Growth Evaluation*.
- Shaddady, A., & Moore, T. (2019). Investigation of the effects of financial regulation and supervision on bank stability: The application of CAMELS-DEA to quantile regressions. *Journal of International Financial Markets, Institutions and Money*, 58, 96-116.
- Shen, C.-H., Wu, M.-W., Chen, T.-H., & Wang, J. (2020). How does shadow bank affect bank ranking in China? *Emerging Markets Finance and Trade*, 56(3), 641-658.
- Trabelsi, M. A., & Trad, N. (2017). Profitability and risk in interest-free banking industries: a dynamic panel data analysis. *International Journal of Islamic and Middle Eastern Finance and Management*.
- Wanke, P., Azad, M. A. K., & Barros, C. P. (2016). Financial distress and the Malaysian dual banking system: A dynamic slacks approach. *Journal of Banking & Finance*, 66, 1-18.
- Yesmine, T., Hossain, M. E., Khan, M. A., Mitra, S., Saha, S. M., & Amin, M. R. (2022). Benchmarking the banking sector of Bangladesh: a comprehensive analysis of performance and efficiency. *Asian Journal of Economics and Banking*.
- Yildirim, H. H., & Ildokuz, B. (2020). Determining the Relationship Between CAMLS Variables and Profitability: An Application on Banks in the BIST Bank Index. In *Contemporary Issues in Business Economics and Finance*: Emerald Publishing Limited.