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Financial Technology and Performance of Islamic Vs. Traditional Banks in Pakistan: By Non-Parametric Data Envelopment Analysis (DEA)

Azeem Akhtar Bhatti	Assistant Professor, Department of Commerce, Sindh University, Laar Campus Badin, Sindh, Pakistan.
Ali Raza	Bahria University, Karachi Campus, Karachi, Sindh, Pakistan.
Anila Devi	Assistant Professor, Department of Management Sciences, Benazir Bhutto Shaheed University, Lyari, Sindh, Pakistan.
Mansoor Ali Jamali	Mohammad Ali Jinnah University, Karachi, Sindh, Pakistan.
Maryam Khokhar	School of Economics and Management, Yanshan University, China.

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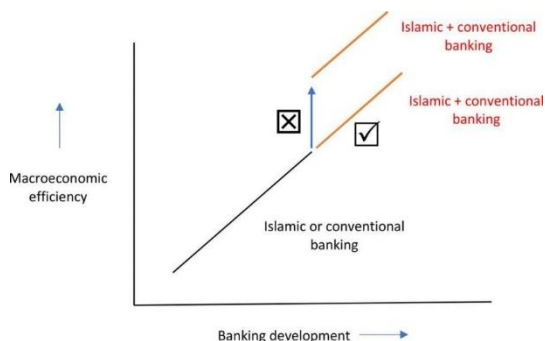
Corresponding Author:

Maryam Khokhar

Email: maryamkhokhar60@gmail.com

Abstract: A strong banking system is essential for driving economic growth and improving social welfare, particularly in developing nations such as Pakistan. This is because the banking sector serves as the backbone of the economy. Therefore, stability and performance in the banking system are paramount for sustained progress and prosperity. Pakistan's banking system has undergone significant changes due to comprehensive reforms that were implemented following the 1990 financial crisis at the local level. As a result, the system has undergone a fundamental transformation. The primary objective of our study is to present novel findings on the current government of the country's banking Sector. To evaluate the performance levels of banks in Pakistan, we conducted a non-parametric data envelopment analysis (DEA) that compared the performance of Islamic Vs. Traditional Banks. We calculated the shadow return on equity (SROE) by formulating a frontier cost function specification that is constrained by capitalization. Furthermore, we investigated the relationship between performance and shadow return on equity using a panel vector auto regression (PVAR) framework. Lastly, we examined the scale economies within the banking Sector in Pakistan, and our results have significant implications for regulatory decision-making and analysis.

Graphical Abstract



Introduction

A stable and efficient banking system is essential for promoting economic growth and social welfare, particularly in developing nations like Pakistan, where the banking sector serves as the backbone of the economy. Pakistan's banking system has undergone a significant revolution as a result of the comprehensive reforms that were introduced after the 1990 financial crisis at the

local level (Toymuxamedov et al. 2023). The year 1990 is considered a milestone for the banking sector in Pakistan. The banking sector is becoming more and more crucial to the growth and development of the financial system. The quality and performance of banking services not only impact the economic growth of a nation but also affects various aspects of people's daily lives. During the mid-1980s, public sector banks were the dominant entities in Pakistan's financial sector (Afif et al. 2023). At that time, although foreign banks outnumbered government-owned banks in Pakistan's financial sector, they were not in direct competition with the latter. During the 1990s, the Pakistani government allowed the establishment of local private banks and the privatization of national banks. The primary goal of these reforms was to restructure the banking sector and make the banks more efficient. The issue of nonperforming loans was a significant concern for the Sector, as the banks were struggling to recover these loans (Hailiang et al. 2023). The banks' inability to recover nonperforming loans resulted in damage to their lending capacity and overall performance. However, technological advancements have played a significant role in the transformational changes in Pakistan's banking Sector. During the mid-1980s, public sector banks were the dominant entities in Pakistan's financial sector. Numerous factors impeded Pakistan's economic growth during that period, including limitations on interest rates, elevated reserve requirements, and constraints on credit allocation.

However, after the reforms, the structure of Pakistan's banking system underwent a significant transformation. Generally, banking reform has had an optimistic impact on the increase in assets and mobilization of deposits. A recurring theme in numerous reviews of Pakistan's banking sector is the significant issue of non-performing loans. The banking sector is becoming increasingly vital in fostering the growth of the financial system. The competence and quality of banking services have a profound effect not just on a nation's economic

development but also on all facets of individuals' daily routines. In the mid-1980s, public sector banks were the main players in Pakistan's financial sector. In the mid-1980s, although foreign banks were more prevalent than government-owned banks, they did not directly compete with them, as the financial sector was primarily dominated by public sector banks. During the 1990s, the Pakistani government permitted the establishment of local private banks and the privatization of national banks (Hasan 2023). The main aim of these reforms was to restructure the banking sector and increase its compatibility. The inability of banks to recover nonperforming loans was a major concern for the banking Sector, which harmed their lending capacity and overall performance. However, technological advancements have played a significant role in the revolutionary changes witnessed in Pakistan's banking Sector. Public sector banks held a major stronghold over the financial sector until the 1990s (Khokhar, Zia, et al. 2022). The sluggish economic growth witnessed during that period resulted from a combination of factors, such as restrictions on interest rates, elevated reserve requirements, and constraints on credit allocation. The banking system underwent significant changes as a consequence of the reforms. In general, banking reform has had a positive impact on the growth of assets and the mobilization of deposits. Many reviews of Pakistani banking have identified the big quantity of non-performing loans as a prevalent issue.

The objective of our research is to provide new insights into the current government of the banking sector in Pakistan. To achieve this, we conduct an in-depth analysis of a comprehensive dataset to assess the levels of cost and profit performance among Pakistani banks between 2020 and 2023. To estimate the performance levels of banks in Pakistan and compare the performance of Islamic and traditional banks, we employ a non-parametric data envelopment analysis (DEA) methodology. We estimate the shadow return on equity (SROE) by developing a

frontier cost function specification that considers a capitalization constraint. Moreover, we examined the connection between performance levels and shadow return on equity using a panel vector auto regression (PVAR) framework. Moreover, our investigation focuses on scale economies within the banking Sector of Pakistan. These findings may provide useful perspectives for regulatory evaluation and decision-making. The main goal of our research is to provide new insights into the present government of Pakistan's banking sector. Initially, we evaluate the levels of both cost and profit performance among Pakistani banks from 2020 to 2023, utilizing a comprehensive dataset. Our study utilized non-parametric data envelopment analysis (DEA) to estimate the performance levels of Pakistani banks and compared the performance of Islamic banks versus traditional banks. To calculate the shadow return on equity (SROE), we developed a specification of the frontier cost function that considers a capitalization constraint. Furthermore, we investigated the correlation between performance and shadow return on equity using a panel vector auto regression (PVAR) framework. Lastly, we explore scale economies within the banking industry of Pakistan, and the outcomes of our analysis may offer significant value for regulatory assessment and decision-making.

Literature Review

The FDIC (Federal Deposit Insurance Corporation) defines bank defeat as the shutdown of a bank by a central or government banking controlling support. In general, a bank is shuttered when it becomes unable to fulfil its responsibilities to investors and other backers. The Bank of International Settlements (2002) has noted that inefficient banks are at greater risk of defeat than their efficient counterparts (Khokhar et al. n.d.). As a result, analyzing a bank's performance and liquidity can be useful indicators for predicting the likelihood of its defeat. (Yudaruddin 2023) Has argued that enhancing the performance of banks can help

mitigate disappointments within the economic system. Comparing various banking models, such as Islamic banks with mini and big traditional commercial banks, can provide insights into potential methods for reducing the incidence of bank defeats during times of financial turbulence. Analyzing the factors that contributed to ups and downs in performance among banks during the financial crises that occurred between 2020 and 2023 could be beneficial in helping bank leaders enhance their institutions' performance and foster a more stable economy (Irshad et al. 2019). Making this information accessible to the Sector could be an important step in this process. The FDIC (Federal Deposit Insurance Corporation) defines a bank defeat as the closure of a bank by a federal or government banking regulatory agency (Hazzi, Ihsan, and Kilani 2013). A bank is commonly closed when it becomes incapable of fulfilling its commitments to depositors and other stakeholders (HOU et al. 2021). Bank performance and liquidity analyses are good measures for predicting bank defeat because inefficient banks are more likely to fail than efficient banks (Bank of International Settlements, 2002). (Yudaruddin 2023) argues that boosting bank performance could mitigate defeats in the financial system. Comparing various banking models, such as Islamic banks with mini and big traditional commercial banks, may provide insights into potential methods for mitigating bank defeats during periods of financial turbulence. By gaining a more comprehensive understanding of the factors that drove performance ups and downs in banks during the financial crises that occurred between 2020 and 2023, and disseminating this information to bank leaders, it could be possible to enhance the performance of banks and foster a more stable economy (Zeb Khaskhelly et al. 2022).

Between 2010 and 2020, the banking Sector's defeats resulted in a \$900 billion bailout paid for by taxpayers. This amount is much greater than the \$250 billion cost of the savings and loan financial crisis that occurred in 1989. The

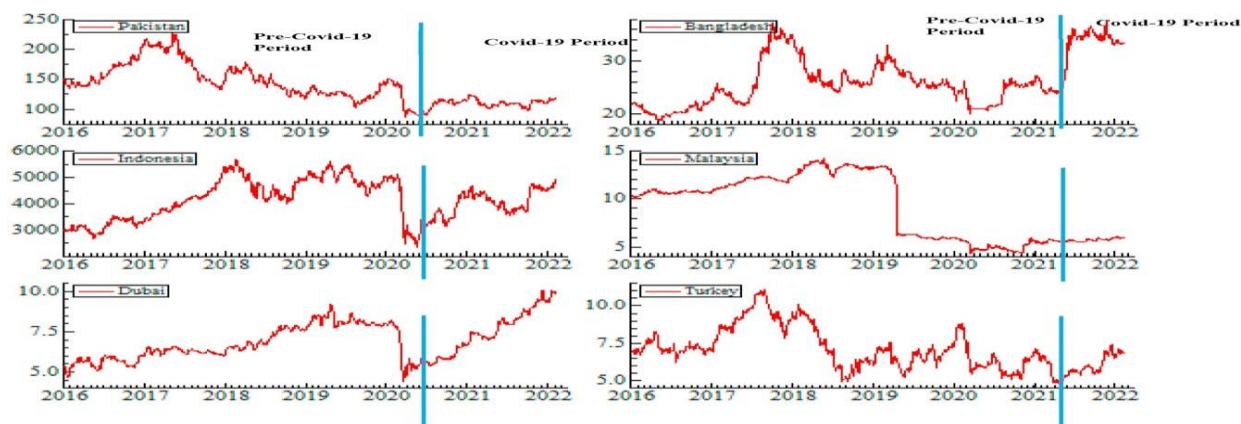
financial stability of Pakistan's banking system is threatened by inefficient or underperforming banks, which may lead to a financial crisis. Between 2020 and 2023, 168 banks in Pakistan with assets worth \$834.1 billion and deposits totalling \$432.8 billion failed, resulting in a \$150.2 billion cost to the Government Bank of Pakistan (SBP), according to a 2020 SBP report. Islamic banks, which follow Sharia law, saw an increase in their assets during the same period and did not experience any bank defeats. This presents a specific challenge for businesses in Pakistan (Khaskhelly et al. 2023). The banking system's financial stability in Pakistan is at risk due to the presence of weak or inefficient banks, which could lead to a financial crisis. Specifically, between 2020 and 2023, 168 banks in Pakistan with assets of \$547.1 billion and deposits of \$432.8 billion failed, costing the Government Bank of Pakistan (SBP) \$52.2 billion, according to an SBP report from 2009. This presents a significant business challenge. Furthermore, the cost of bank defeats is a concern, as taxpayers had to pay \$800 billion in bailout money between 2020 and 2023. This is significantly higher than the cost of the savings and loan financial difficulties in 1990, which was \$125 billion. Islamic banks, operating under Sharia law, did not experience any bank defeats during this time period and saw an increase in assets.

The aim of this non-experimental quantitative study is to evaluate and compare the

performance of Islamic and commercial banks during the 2020–2023 recession period, using 2006 as a baseline. The study takes asset size into account and aims to identify changes in bank performance (dependent variable) according to asset size and bank classification (independent variable) (Hou et al. 2021). To determine whether there is a statistically significant change in the performance of Islamic banks, mini-commercial banks (less than \$100 million in assets), and big commercial banks (over \$1 billion in assets), a t-test was used. In this study, samples were randomly drawn from each type of bank, 10 samples were from Islamic banks, 10 samples were from mini commercial banks and 4 samples were from big commercial banks (Khaskhelly et al. 2023). As suggested by Babbie (2007), random sampling was used in this study to ensure that each bank has an equal chance of being selected. To determine the appropriate sample size, the sample size formula of Creswell (2009) was used, with a minimum sample size of 10 for Islamic banks, 10 for mini commercial banks and 4 for big commercial banks as Figure 1 shows the raw data of conventional banks. The study uses data envelopment analysis (DEA) to measure the change in performance in the sample from 2020 to 2022, with 2023 as the base year. Efficiencies for 2020, 2021, and 2022 are compared to base-year efficiencies to determine the amount of change.

Figure 1

Raw data of conventional banks



The study utilizes data envelopment analysis (DEA), with input variables being labor costs, fixed assets, and total deposits, and output variables being total loans and total investments. Fewer bank defeats may lead to more stable economies in the communities in which banks operate, providing social benefits. The objective of this non-experimental quantitative study is to assess the change in performance of Islamic and commercial banks during the 2020-2023 recession, compared to 2006, which is used as a baseline. The study takes asset size into account and aims to analyze how bank performance (dependent variable) varies according to asset size and bank classification (independent variable). We gathered financial information from both Islamic and commercial banks' audited financial government in order to evaluate and compare the performance of each type of banking system. (i.e. Islamic banks, mini profitable banks and big profitable banks) in recession years from 2006 to 2020 to 2023 (Ahmed et al. 2022).

To identify significant variations in performance among Islamic banks, mini-commercial banks, and big commercial banks, the researchers employed t-tests. The study included six Islamic banks, fifteen mini commercial banks with assets of less than US\$100 million and four big commercial banks with assets of more than US\$1 billion. To ensure the impartiality of the results, the researchers randomly selected a sample of each type of bank for the study. (Alsadiq, Aboud, and Hamdan 2023) explained that random sampling ensures a fair selection process for banks. Meanwhile, (Hoque and Liu 2023) suggested using the model size formulation to estimate the appropriate sample size. At least six Islamic banks, fifteen mini-commercial banks, and four big commercial banks were produced by the formula employed in this study. To measure changes in the performance of various banks, we use a data envelopment analysis (DEA) from 2006 to 2009, with 2006 as the reference year. By comparing performance scores for 2007, 2008, and 2009 with scores from a base year, the study

determined how much performance has changed. The study uses labor costs, fixed assets, and total deposits as input variables of DEA, while total loans and total investments are output variables. By shedding light on how bank classification impacts performance in times of financial crises, the results of this study may have practical implications for the business community and could help to improve Sector practices. Through encouraging regulators, managers, and investors to monitor banking system performance for the purpose of avoiding future bank defeats, this study seeks to promote social change. One of the social benefits of fewer failing banks is greater economic stability in the communities in which banks operate. Current research is based on traditional economic performance theory, which governments that firms should strive to achieve output at the lowest possible unit production cost. First proposed by Adam Smith in the 1700s, it has been used by governments and businesses ever since. Because businesses have both fixed and variable costs, producing a low level of output is generally regarded as inefficient because fixed costs are distributed among a relatively mini number of units. In line with conventional economic performance theory, the most efficient level of production is thought to involve economies of scale, but there comes a point at which the costs of increased production begin to outweigh the benefits. In the short term, the greatest operational efficiencies are achieved when all available economies of scale are exploited. In the long run, increasing the volume of existing systems can rise the optimum level of production performance.

The theory of economic performance involves the allocation of resources, which asserts that producers are unable to generate excessive profits by artificially inflating prices above marginal cost due to the presence of fierce competition. At the enterprise level, achieving maximum allocative performance requires producing the optimal mix of goods and services to maximize the overall benefit of the organization. Moreover, the theory acknowledges

that business resources are limited and can only be utilized for one purpose, thereby incurring an opportunity cost for firms that forego the chance to use those resources for alternative ends. This research is based on the traditional theory of economic performance. This theory governs that firms should produce goods at the lowest possible unit production cost. Adam Smith first introduced the traditional theory of economic performance in the 1700s, and it has been used by governments and businesses ever since (Khokhar et al. 2020). Since most businesses have both fixed and variable costs, producing low levels of output is generally considered inefficient because the fixed costs are spread across a relatively small number of units. According to traditional economic performance theory, economies of scale allow for optimal production, but the apparent benefits are often offset by increased costs associated with overstressing existing systems. In the short term, maximize operational performance at output levels that exploit all available economies of scale. In the long run, enhancing the capabilities of current systems can raise the optimum level of production performance. The efficient allocation of available resources is a fundamental principle of traditional economic theory. The theory suggests that intense competition among producers prevents them from charging a price above marginal cost and thus earning excess profits. Allocative performance is achieved when a firm produces the optimal combination of goods and services that maximizes the firm's overall benefit. However, the theory acknowledges that using a limited amount of material creates an opportunity cost that prevents companies from using the same material for other purposes.

Methodology

Researchers have a choice of three approaches for conducting research: quantitative, qualitative, and mixed methods (Hussain Qureshi, Hussain, and Banking 2022). To select the most appropriate design for a study, all three approaches are taken into consideration. The

approach and design of the study are chosen based on its purpose, the participants involved, and the intended audience. According to (Gazi et al. 2022), research can be conducted using either quantitative or qualitative methods, depending on whether numerical or textual data is being collected. Mixed methods research, which incorporates elements of both approaches, is a third option. The researchers selected a quantitative approach for this study because of its ability to formulate research questions and hypotheses, compare variables (such as bank classification, total assets, and performance changes), and explore potential relationships between them (Begum Siddiqui et al. 2023). Additionally, the measurable approach was appropriate for analyzing the mathematical data essential to examine ups and downs in bank performance based on the type and total assets during economic crises. (Hussain Qureshi et al. 2022) It has been observed that the quantitative approach is especially appropriate for analyzing numerical data.

The quantitative design selected for this study was non-experimental. Experimental designs typically involve applying treatments to measure the impact of one variable on another, with the objective of establishing causal relationships between variables (Khokhar, Devi, et al. 2022). A measurable design that does not include treatment is classified as non-experimental (Gazi et al. 2022). The non-experimental design was selected for this study because it did not involve changing any settings or participants, which was not the purpose of the research. This type of design was best suited to achieving the study's objectives. The research used a non-experimental quantitative design to achieve the study's goals, which did not require changing settings or participants (Hou et al. 2023). Experimental designs are commonly used to determine causation between variables through administering a treatment, as opposed to non-experimental designs, which do not involve administering treatments. (Sutikno, Nursaman, and Muliwati 2022) also notes that

experimental designs are employed to determine the impact of one variable on another. To obtain the population of Islamic banks, the researchers used the IBIS database, which contains records of all Islamic banks worldwide that follow Islamic Sharia laws and conduct various business transactions (Yumei Hou 2020). Meanwhile, the population of commercial banks was limited to those operating in Pakistan, whose list was available on the SBP database website. (Kazarian 1993) Work was utilized to categorize commercial banks as big or mini based on their size. The researchers selected 4 big commercial banks and 15 mini commercial banks randomly, with assets greater than \$1.5 billion and under \$103 million, respectively, from the population representing the commercial banking system in Pakistan. The researchers examined these banks' balance sheets and income government from 2020 to 2023, using data from their respective websites and the SBP.

To measure performance, the researchers employed the DEA model, a linear programming framework developed to evaluate the efficiency of individual decision-making units or banks. Using a standard set by efficient banks, the DEA system compared each bank's performance with that of its inefficient peers, and banks were assigned scores of either 0 or 1. Therefore, the Performance Assessment Model (DEA) was used in this study to evaluate performance, establishing a standard for efficient banks to compare themselves to their inefficient counterparts, with a score of 0 or 1 assigned to each bank (Khokhar 2019). To use the DEA model, it is crucial to select either an input or output-oriented approach, depending on the objectives of the study. In this research, input-oriented measures were employed because cost control is one of the banks' primary goals. In input orientation, the objective is to minimize inputs while maintaining or surpassing the necessary output levels, while in output orientation, the goal is to maximize outputs without increasing any of the observed input values (Cooper et al., 2000). Cost performance refers to a firm's ability

to minimize costs while meeting the required output levels at specific input prices, indicating its proximity to the best-performing firms that generate the same output volume. To utilize the DEA effectively, it is crucial to decide on the selection of inputs and outputs and whether the approach is input-oriented or output-oriented. Given that cost control is one of the primary objectives of banks, this study utilizes input-oriented measures. While output orientation strives to maximize outputs without additional input values, input orientation seeks to minimize inputs while still achieving the required output levels (Cooper et al., 2000). Cost performance refers to a firm's ability to minimize costs by comparing its cost to that of a best-practice company producing the same output at the same price as the given input prices.

$$\begin{aligned}
 \min \sum_p w_{jp} x_{jp} \\
 \sum_i \lambda_i x_{iq} &\geq y_{jq} && \forall q \\
 \sum_i \lambda_i x_{ip} &\leq x_{jp} && \forall p \\
 \sum_i \lambda_i &= 1; \lambda_i \geq 0; i = 1, \dots, N
 \end{aligned}
 \tag{1}$$

the input demand vector $x_j^* = (x_{j1}^*, \dots, x_{jp}^*)$ that minimizes the cost with the given input prices p and produces the same amount of output or less than firm j is known as the cost-efficient input vector. The cost performance for the firm j (CE_j) can be calculated as follows:

$$CE_j = \frac{C_j^*}{C_j} = \frac{\sum_p w_{jp} x_{jp}^*}{\sum_p w_{jp} x_{jp}} \tag{2}$$

Where CE_j is the ratio between the minimum cost C_j^* using the input vector x_j^* and the observed cost c_j for firm j .

The concept of profit performance is wider in scope compared to cost performance, as it takes into account the effects of selecting a production vector on both expenses and earnings. Profit performance evaluates a bank's ability to generate the highest possible profit considering the quantities of inputs and outputs, along with their corresponding price levels. Two types of profit functions can be identified based on the inclusion of market forces in output prices: standard profit performance (SPE) and alternative profit performance (APE). Under SPE, it is assumed that firms operate in a perfectly competitive market for both input and output factors, meaning they are price takers and lack market power in output prices. The linear programming model suggested it can be used to represent the SPE of company j (Mothafar et al. 2022) as follows:

$$\begin{aligned} & \max \sum_q r_{jq} y_{jq} - \sum_p w_{jp} x_{jp} \\ \text{s.t} \quad & \sum_i \lambda_i y_{iq} \geq y_{jq} \quad \forall q \quad (4) \\ & \sum_i \lambda_i x_{ip} \leq x_{jp} \quad \forall p \\ & \sum_i \lambda_i = 1; \lambda_i \geq 0; i = 1, \dots, N \end{aligned}$$

The optimal solution of the linear programming model corresponds to the output vector $y_j^* = (y_{j1}^*, y_{j2}^*, \dots, y_{jq}^*)$ and the input demand vector $x_j^* = (x_{j1}^*, x_{j2}^*, \dots, x_{jp}^*)$ that results in the highest profits for company j, considering the given output prices r and input prices w. To obtain this solution, a linear combination of firms that produce the same or greater output than firm j, while utilizing an equal or fewer number of inputs, is computed. The profit of this hypothetical $p_j^* = \sum_q r_{jq} y_{jq}^* - \sum_p w_{jp} x_{jp}^*$ firm would be greater than or equal to the profit of firm j by definition. ($p_j = \sum_q r_{jq} y_{jq} - \sum_p w_{jp} x_{jp}$). The standard profit performance of firm J (SPEj) can be computed as follows:

$$SPE_j = \frac{p_j}{SP_j^*} = \frac{\sum_q r_{jq} y_{jq} - \sum_p w_{jp} x_{jp}}{\sum_q r_{jq} y_{jq}^* - \sum_p w_{jp} x_{jp}^*} \quad (4)$$

Here, represents the ratio of the actual profits (Pj) to the maximum achievable profits (SP_j^*) when producing the output vector y_j^* and input demand vector x_j^* for firm j.

The APE, which takes into account the presence of imperfect competition or firms with market power in output price setting, can also be formulated as a linear programming problem.

$$\begin{aligned} & \max \quad R_j - \sum_p w_{jp} x_{jp} \\ \text{s.t} \quad & \sum_i \lambda_i R_i \geq R_j \quad (5) \\ & \sum_i \lambda_i y_{iq} \geq y_{jq} \quad \forall q \\ & \sum_i \lambda_i x_{ip} \leq x_{jp} \quad \forall p \end{aligned}$$

The optimal solution of the linear programming model for APE corresponds to the revenue R_j^* and the input demand vector $x_j^* = (x_{j1}^*, \dots, x_{jp}^*)$ that results in the highest profits for firm j, considering the given input prices w. To obtain this solution, a linear combination of firms that produce the same or greater output than firm j, while utilizing an equal or fewer number of inputs and generating equal or greater revenue than firm j, is computed. The alternative profit performance of firm j (APEj) can be computed as follows:

$$APE_j = \frac{P_j}{AP_j^*} = \frac{R_j - \sum_p w_{jp} x_{jp}}{\sum_q R_j^* - \sum_p w_{jp} x_{jp}^*} \quad (6)$$

Where $APE_j \leq 1$ designates the ratio between the observed profits ($P_j = R_j - \sum_p w_{jp} x_{jp}$) and the all-out profits ($AP_j^* = \sum_q R_j^* - \sum_p w_{jp} x_{jp}^*$) This is computed in reference to the maximum revenue

and input x_j^* demand vector that result in the highest profits for firm j .

Results and Discussions

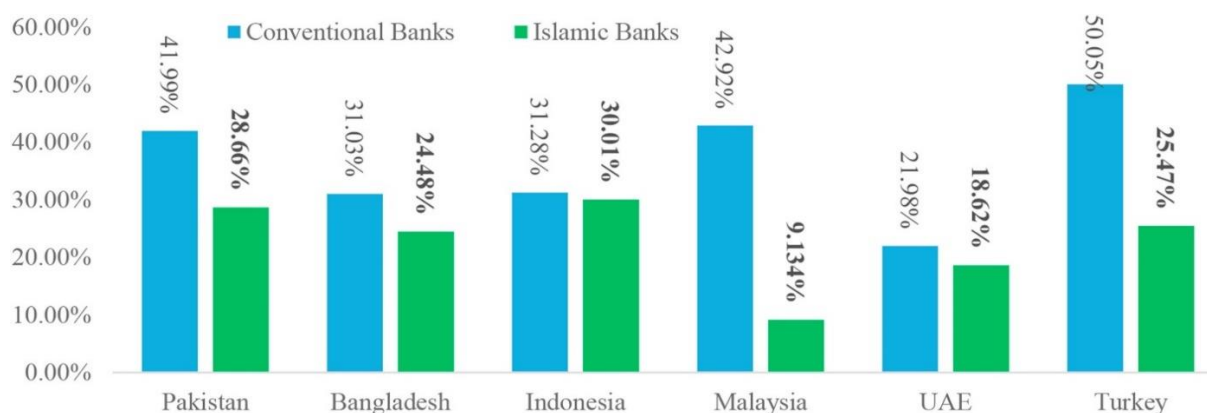
The study collected data from the financial statements and income statements of all 44 banks in the sample. To ensure adherence to Islamic law, the sample of 6 Islamic banks was restricted to those with a Shariah compliance committee. The big commercial sample included only banks with total assets exceeding USD 1 billion, whereas the mini commercial sample was composed of banks with total assets below USD 100 million. The study's research data was sourced from both IBIS and bank websites and then recorded in Excel spreadsheets. The collected data were categorized into three groups: Islamic Banks, Mini Commercial Banks, and Big Commercial Banks. In every category, the data is organized such that the first three columns contain input variables, while the following three columns contain output variables. After entering the data into Excel, the

performance score was calculated using the DEA model.

The study aims to address gaps in bank defeat research by examining and comparing the performance of the two banking systems during financial crises. Specifically, the study aims to compare the change in performance of the Islamic banking system with that of big and mini commercial banking systems during the economic downturn from 2020 to 2023, using 2006 data as a baseline. The study's findings could help address gaps in bank defeat research by measuring and comparing the performance of the two banking systems as shown in Figure 2. Amidst the financial crisis, researchers sought to showcase the varying levels of effectiveness exhibited by banks in their individual systems. The objective of this study is to contrast the alterations in performance within the Islamic banking system and both big and mini commercial banks during the economic recession spanning 2020 to 2023 while utilizing 2006 as a benchmark year for reference.

Figure 2

The average maximum drawdowns of Islamic and conventional banks



The findings of this study may identify effective practices to maintain performance and support banking operations, thereby reducing the risk of defeat during financial crises. Sustaining the performance of banking has a favorable influence on society by upholding or enhancing

employment rates, promoting the growth of enterprises, and facilitating the expansion of the global economy efficient banks are better able to lend to businesses, thereby creating jobs. Moreover, the results of this study might furnish supplementary information for investors,

businesses, borrowers, and governments to recognize banks that could be vulnerable to collapse and proffer timely intervention before such institutions falter, potentially triggering economic and societal turmoil. The study's conclusions may aid in pinpointing particular optimal procedures to sustain performance and bolster banking operations, mitigating the probability of collapse in the event of a financial crisis. Efficient banks have a positive impact on society, contributing to increased employment, business growth and global economic development. These banks can lend money to businesses, thereby creating jobs. The study's findings could also serve as a valuable resource for investors, businesses, borrowers, and governments to identify early warning signs of distressed banks and provide support to prevent financial stress in the economy and society.

Throughout the quantitative research study, the researcher was responsible for collecting, arranging, analyzing, and interpreting the data. Once the data had been gathered, the researcher proceeded to organize and analyze it, ultimately generating performance scores for the banks included in the study. To test for changes in performance, the researcher employed both the DEA method and a t-test to determine statistical significance. The researcher proactively addressed and managed any potential ethical concerns throughout every phase of the research process. Since the study solely employed secondary data, there were no ethical issues regarding the gathering of primary data. Regardless, the researcher took precautions to employ solely credible data sources in the study. During the comparative analysis phase, the researcher interpreted the findings of the comparison and relied on statistical test results to assess whether to reject the study's null hypotheses-based predictions or not. In conclusion, the researcher shared the study's results, accompanied by interpretive remarks, and provided recommendations for future research.

In the quantitative research study, it was the responsibility of the researcher to collect, organize, compare, and explain the data. After collecting the data, the researcher proceeded to organize and utilize it to calculate performance scores for the banks included in the sample. To evaluate the statistical significance of performance changes, both the DEA method and a t-test were employed. According to (Hussain Qureshi et al. 2022), at every stage of the research, the researcher must actively engage and deal with any potential ethical issues. Because all of the data in the study was secondary, there were no ethical concerns about collecting primary data. However, the researcher ensured that the data sources used in the study were trustworthy.

There were 44 banks that participated in the study, and work was employed to ascertain the commercial banks' sizes for classification as mini or big. The Government Bank of Pakistan (SBP) and the banks' websites offered information on the number of banks categorized into various classes. Based on data from the SBP, there were 15 mini commercial banks with assets below \$100 million in the population, while the population consisted of 4 big commercial banks with assets exceeding \$1 billion. The IBIS website reported that there were six Islamic banks in total. This approach allowed each bank to have an equal chance of being selected. To establish statistical significance, (Toymuxamedov et al. 2023) recommended applying a sample size formula to determine the appropriate sample size. Using a formula, the researcher determined that, at a confidence level of 90%, testing was required on 6 Islamic banks, 15 mini-commercial banks, and 48 big commercial banks. All bank data used in the study was considered secondary. Previous studies, such as those by (Alsadiq et al. 2023) the effectiveness of Islamic and commercial banks, using sample sizes similar to those employed in this study.

The study included 44 banks, which were classified as either big or mini commercial banks

based on the categorization method. The SBP and banks' websites provided information on the number of banks in different categories. As per the SBP data, there were 15 mini commercial banks with assets under \$100 million, while the population of big commercial banks with assets over \$1 billion was 4. The IBIS website reports that there was a total of six banks operating under Islamic principles. The researchers used a random sampling technique in this study. As noted, the use of random sampling ensured that every bank had an equal opportunity to be selected for the study. According to (Gazi et al. 2022), it is advisable to use a sample size formula to determine the appropriate sample size necessary to achieve statistical significance. After applying the formula, it was determined that in order to achieve a 90% confidence level, the researcher needed to test six Islamic banks, 15 mini-commercial banks, and 48 big commercial banks. The study treated all bank-related data as secondary data.

Conclusion and Future Recommendation

At the beginning of the study, the researcher postulated several hypotheses. One of which was that the financial data presented by both commercial and Islamic banks in Pakistan from 2020 to 2023 were precise and reliable. As for the second assumption, the researcher presumed that the Government Bank of Pakistan (SBP) had incorporated all the big and mini commercial banks operating in Pakistan, comprising the entire population. Regarding the third assumption, it was presupposed by the researcher that the IBIS website encompassed the entire population of Islamic banks worldwide. The fourth assumption made by the researcher was that the banks listed on the IBIS website conducted their business operations in accordance with Islamic laws. Several assumptions were posited by the researcher at the beginning of the study, the first of which was that the financial data disclosed by both commercial and Islamic banks in Pakistan from 2020 to 2023 were accurate. The researcher's

second assumption was that the Government Bank of Pakistan (SBP) had encompassed all big and mini commercial banks in Pakistan, constituting the complete population. As for the third assumption, the researcher presumed that the IBIS website had catalogued all the Islamic banks worldwide.

The researcher's fourth assumption was that the banks featured on the IBIS website conducted their operations based on Islamic laws. It is worth noting that the study's focus was confined to comparing the efficacy of two banking systems amid the economic recessions from 2020 to 2023. The study solely analyzed the impact of bank classification and asset size on the variation of banks' performance from 2020 to 2023. The researcher exclusively examined commercial banks operating in Pakistan with total assets exceeding \$1 billion and below \$100 million, in addition to Islamic banks that adhered to Islamic laws from 2020 to 2023. The study was constrained to evaluating the efficacy of two banking systems amid the economic recessions from 2020 to 2023. From 2020 to 2023, the study solely concentrated on bank classification and the influence of asset size on the alteration of bank performance. From 2020 to 2023, the researcher exclusively analyzed commercial banks functioning in Pakistan with total assets exceeding \$1 billion and below \$100 million, in addition to Islamic banks complying with Islamic laws.

Limitations of the Study

The researchers did not take into account the many internal and external factors that could influence changes in the performance of these banks. Although data envelopment analysis is used in studies to measure bank performance, it is susceptible to measurement error. Data envelopment analysis is a useful tool for comparing approximate cost and profit efficiencies between Sector peers when relative to theoretical maximums. Another limitation of the study may be the different economic cycles in

different countries. The researchers relied on the banks' financial government without taking into account the many variables that could affect their accuracy. Furthermore, the study does not take into account some internal and external factors that may affect bank performance.

References

- Afif, Muhammad, Tatik Mariyanti, Nanda Septiani, and Ellen Dolan. 2023. "Factor Affecting Employee Motivation to Increase Performance of Sharia Bank in Indonesia on Islamic Perspective." *APTISI Transactions on Management (ATM)* 7(2):131–42. <https://doi.org/10.33050/ATM.V7I2.1860>.
- Ahmed, Salman, Sayma Zia, Ayla Wajahat, and Maryam Khokhar. 2022. "Why New Businesses Fail Due To Ineffective Services In Marketing Strategy." 19(3).
- Alsadiq, Yousuf, Ali Aboud, and Mohammad Naqib Hamdan. 2023. "Applying of Islamic Economic Principals and Its Impact on Reducing Administrative Corruption in Libyan Islamic Banks Model Percetakan Bio Tiga Dimensi Patuh Syariah View Project Shariah Compliant 3D Bioprinting View Project." *Article in International Journal of Academic Research in Economics and Management Sciences*. <https://doi.org/10.6007/IJAREMS/v12-i1/16081>.
- Begum Siddiqui, Mehtab, Maryam Khokhar, Tayyaba Rafique Makhdoom, Anila Devi, Azeem Akhtar Bhatti, Najaf Hussain, Benazir School of Business, Benazir Bhutto Shaheed University Lyari, and Crossponding Author. 2023. "Exploring the Rural Development of China Pakistan Economic Corridor Project Impact on Social Responsibilities and South Region of Pakistan." *International Journal of Special Education* 38(1):135–50.
- Gazi, Md.Abu Issa, Md.Aminuzzaman Talukder, Md.Sazib Molla, Mobarak Hossain, and Abu Ishaque Hossain. 2022. "DOES THE FINANCIAL PERFORMANCE OF ISLAMIC BANKS ARE HIGHER THAN THE TRADITIONAL BANKS IN BANGLADESH? PANEL DATA ANALYSIS." *Indian Journal of Finance and Banking* 9(1):33–46. <https://doi.org/10.46281/IJFB.V9I1.1549>.
- Hailiang, Zeng, Maryam Khokhar, Tahir Islam, and Anshuman Sharma. 2023. "A Model for Green-Resilient Supplier Selection: Fuzzy Best-worst Multi-Criteria Decision-Making Method and Its Applications." *Environmental Science and Pollution Research* (123456789). <https://doi.org/10.1007/s11356-023-25749-4>.
- Hasan, Mona. 2023. "The Impact of Financial Technology (Fintech) on the Financial and Banking Services Sector and Its Applications in the Islamic Financial Industry." *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.4369683>.
- Hoque, Hafiz, and Heng Liu. 2023. "Impact of Bank Regulation on Risk of Islamic and Conventional Banks." *International Journal of Finance & Economics* 28(1):1025–62. <https://doi.org/10.1002/IJFE.2462>.
- Hou, Yumei, Maryam Khokhar, Anshuman Sharma, James Bakul, Sarkar Mohammad, and Amzad Hossain. 2023. "Converging Concepts of Sustainability and Supply Chain Networks: A Systematic Literature Review Approach." *Environmental Science and Pollution Research*. <https://doi.org/10.1007/s11356-023-25412-y>.
- HOU, Yumei, Maryam Khokhar, Mumtaz Khan, Tahir Islam, and Intiaz Haider. 2021. "Put Safety First: Exploring the Role of Health and Safety Practices in Improving the Performance of SMEs." *SAGE Open* 11(3). <https://doi.org/10.1177/21582440211032173>.
- Hou, Yumei, Maryam Khokhar, Sayma Zia, and Anshuman Sharma. 2021. "Assessing the Best Supplier Selection Criteria in Supply Chain Management During the COVID-19 Pandemic." *Frontiers in Psychology* 12:804954. <https://doi.org/10.3389/FPSYG.2021.804954>.
- Hussain Qureshi, Muhammad, Talat Hussain, and Islamic Banking. 2022. "Challenges and Issues of Green Banking in Islamic and

- Traditional Banks of Pakistan.” *Journal on Innovation and Sustainability* RISUS 13(3):4–24. <https://doi.org/10.23925/2179-3565.2022v13i3p4-24>.
- Irshad, Muhammad, Wenyuan Liu, Jehangir Arshad, M.Noman Sohail, Aparna Murthy, Maryam Khokhar, and M.Musa Uba. 2019. “A Novel Localization Technique Using Luminous Flux.” *Applied Sciences (Switzerland)* 9(23):5027. <https://doi.org/10.3390/app9235027>.
- Khaskhelly, Farhan Zeb, Ali Raza, Hemal Azhar, Nida Zehra, Hassan Safdar, and Maryam Khokhar. 2023. “Corporate Social Responsibility through Collaboration in the Supply Chain: Insights into a More Sustainable Economy.” 5(1):50–62.
- Khokhar, M., Y. Hou, MA Rafique, W.Iqbal-Problemey Ekorozwoju, and undefined 2020. n.d. “Evaluating the Social Sustainability Criteria of Supply Chain Management in Manufacturing Industries: A Role of BWM in MCDM.” *Yadda.icm.edu.pl*.
- Khokhar, Maryam, Anila Devi, Mehtab Begum Siddiqui, and Azeem Akhtar Bhatti. 2022. “Performance of the Cosmetics Industry from the Perspective of Corporate Social Responsibility and Circular Economy: A Cross-Cultural Current Challenges Faced In the Cosmetics Industry.” 10(4):1569–77.
- Khokhar, Maryam, Sayma Zia, Tahir Islam, Anshuman Sharma, Wasim Iqbal, and Muhammad Irshad. 2022. “Going Green Supply Chain Management during Covid-19, Assessing the Best Supplier Selection Criteria: A Triple Bottom Line (Tbl) Approach.” *Problemey Ekorozwoju* 17(1):36–51. <https://doi.org/10.35784/pe.2022.1.04>.
- Khokhar, Maryam, Wasim Iqbal, Yumei Hou, Majed Abbas, and Arooj Fatima. 2020. “Assessing Supply Chain Performance from the Perspective of Pakistan’s Manufacturing Industry Through Social Sustainability.” *Processes* 2020, Vol. 8, Page 1064 8(9):1064. <https://doi.org/10.3390/PR8091064>.
- Khokhar, Maryam. 2019. “OCCUPATIONAL HEALTH & SAFETY IMPLEMENTATION FRAMEWORK FOR PAKISTANI CONSTRUCTION INDUSTRY IN.” (November):253–85.
- Mothafar, Nora A., Maryam Khokhar, Nida Zehra, Farhan Zeb Khaskhelly, Muhammad Haris Mirza, Muhammad Asim Rafique, and Ali raza. 2022. “Aligning Organization And Human Resource Management Practices For Business Strategy.” *Journal of Positive School Psychology* 2022(12):236–48.
- Sutikno, Sutikno, Nursaman Nursaman, and Muliwati Muliwati. 2022. “The Role Of Digital Banking In Taking The Opportunities And Challenges Of Sharia Banks In The Digital Era.” *Journal of Management Science (JMAS)* 5(1):27–30. <https://doi.org/10.35335/JMAS.V5I1.125>.
- Toymuxamedov, Ibroxim Rixsiboyevich, Akmal Ruzimamatovich Norov, Ma’rifat To’lqin qizi Ibodullayeva, Gavkhar Bekmurodova, and Ugiloy Aliqul qizi Farmanova. 2023. “Prospects of Implementing Islamic Financial Mechanisms to Uzbekistan.” *EUROPEAN JOURNAL OF BUSINESS STARTUPS AND OPEN SOCIETY* 3(2):34–41.
- Yudaruddin, Rizky. 2023. “Financial Technology and Performance in Islamic and Conventional Banks.” *Journal of Islamic Accounting and Business Research* 14(1):100–116. <https://doi.org/10.1108/JIABR-03-2022-0070/FULL/PDF>.
- Yumei Hou, Jingde Weng, Qiuye Gao, Yimin Wang, Maryam Khokhar, Jie Liu. 2020. “Considering the Patient Satisfaction and Staffing Skill the Optimization of Surgical Scheduling by Particle Swarm and Genetic Algorithm.” *Solid State Technology* 2096–2111.
- Zeb Khaskhelly, Farhan, Maryam Khokhar, Nida Zehra, Hemal Azhar, Muhammad Haris Mirza, Ali Raza, and Karachi Campus. 2022. “Closed Loop Supply Chain: Evaluating Ecological Footprint.” *Reviews of Management Sciences* 4(2):69–94. <https://doi.org/10.53909/rms.04.02.0195>.