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Early Warning Signals of Bank Bankruptcy: A Ratio-based Approach

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	Abstract
<p>Hammadullah Abro Department of Management Sciences, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology (SZABIST) University, Larkana, Pakistan. hammadullah237@gmail.com</p> <p>Asra Shaikh Department of Management Sciences, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology (SZABIST) University, Karachi, Pakistan. asra.shaikh@szabist.edu.pk</p> <p>Muhammad Mujtaba Department of Management Sciences, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology (SZABIST) University, Karachi, Pakistan. smmujtaba14@gmail.com</p>	<p>The Study highlights the importance of bankruptcy prediction in maintaining financial stability, and when it comes to bankruptcy prediction, interventions can be made early enough in order to mitigate any losses and protect the interests of the stakeholders. This paper assesses the predictive capacity of the financial ratios in Pakistani commercial and Islamic banks' bankruptcy based on the z-score model of five facets, i.e., Altman. Findings suggest, the majority of commercial banks fall within the safe zone, while a few Islamic banks may be in the gray or distressed space, reflecting a distinction in financial resilience levels. The results are helpful to bank management, monitors, and investors, as they provide an early signal and indicate the necessary immediate improvement. The main contribution of the research material to the literature is the application of the well-established model of estimation to the Pakistani banking sector and its relevance to the risk management practice within the emerging market.</p>
<p>Keywords:</p>	<p>Bankruptcy, Altman Z-score, Financial Ratios & Pakistani Banks.</p>

1. Introduction

Bankruptcy is a legal status that provides debt relief for people and companies that need it the most (Naeem et al., 2025a,b; Naeem et al., 2024). It is a proceeding that takes place in a court, where the assets of the company are sold or restructured to enable the fulfillment of the stipulated legal plan for the payment to creditors. Specifically, the bankruptcy courts must manage a multi-sided process of corporate turnaround. Therefore, bankruptcy serves the purpose of optimizing the return on the assets of the debtor to frustrate agendas of ferreting them through individual efforts. It enables resources to be moved from bad hands, which are insolvent firms, to better use them with ease. An effective mechanism for bankruptcy structures promotes investment because of debt restructuring. The explicit use of consensus building to address such market failures and achieve an efficient reorganization of the firm (Burkart, 2024). There are several theories that proponents of bankruptcy can put forward on behalf of the idea. According to the Creditors Bargain theory, the bankruptcy laws are perceived as a bargain between the creditors and debtors where the creditors would agree to follow some rules that would guarantee them better working conditions and a predictable resolution to the debt (Jackson, 1986). According to the communitarian theory, the responsibility to repay the debts lies on the borrower, but the theory acknowledges that banks and people have the right to seek bankruptcy when there is no other way out, so as to protect the wider community (Korobkin, 1991). It is necessary to note that the aims and theoretical principles of bankruptcy legislation may be largely inconsistent in different jurisdictions. However, the overall aim of bankruptcy processes is to effectively and fairly settle trades that entail insolvent debts to the debtor, creditors, and society.

Bankruptcy in the banking sector refers to a condition where a financial institution can no longer meet its obligations to depositors, creditors, and other stakeholders. In banks, bankruptcy is typically preceded by sustained financial distress, where liabilities outweigh assets or where liquidity shortages prevent the timely settlement of obligations. Causes often include poor asset quality, insufficient capital buffers, mismanagement, excessive exposure to risky investments, or adverse macroeconomic shocks. Unlike bankruptcy in non-financial firms, the collapse of a bank has systemic consequences, as banks are deeply interconnected within the financial system. Such failures can trigger bank runs, disrupt payment systems, and lead to broader economic instability, often prompting regulatory intervention, bailouts, or forced mergers.

Although the models of bankruptcy prediction can be informative in determining the financial position of a firm, they are considerably different in their approach and usage. Academicians have used various approaches, such as market-based indicators (Changes in stock price volatility), macroeconomic variables, cash flow analysis, or qualitative assessment of the qualities of management, corporate governance, or an industry outlook (Shumway, 2001; Tinoco & Wilson, 2013). Several studies have documented various methods to measure the risk of bankruptcy across industries (Altman, 1968; Barboza et al., 2017; Ohlson, 1980; Tinoco & Wilson, 2013). However, the Altman Z-score, a financial ratio-based model, is among the widely used models due to its ease of use, transparency, and capacity to measure the operational efficiency, profitability, leverage, liquidity, and solvency of a firm that can be quantified. In this regard, audited financial statement ratios provide reliable, standardized comparative measures across firms and over time. Although these models do not necessarily capture all qualitative or sudden exogenous shocks, their track record, simplicity, and cross-industry applicability make them most suitable for predicting financial distress and bankruptcy, especially in emerging markets.

It is important because any nation's ability to develop economically depends on how well its financial system performs. Poor asset quality, inadequate capital buffers, governance issues, excessive risk-taking, and macroeconomic shocks can all contribute to financial fragility, which quickly pushes the institution to the point where it can no longer fulfill its responsibilities (Hameer et al., 2025; Jamal & Mujtaba, 2019; Shaikh, 2021; Shaikh et al., 2023; Ali et al., 2022; Farooq & Ahmad, 2023; Farooq et al., 2023). When banks collapse, it can set off a chain reaction that isn't conceivable when other firms fail. On the other hand, the banking sector's ineffective operations have the potential to obliterate both domestic and even global economic advancement (Sharma, 2013; Naeem, 2023). So far, various studies have been conducted in Pakistan to predict bankruptcy through alternative econometric models (Chapra, 2012; Khawaja, 2023; Lai et al., 2019; Tahir, 2019; Khan et al., 2024). However, comparatively little has been done in comparing the commercial and Islamic banks and analyzing recent statistics. To close that gap, this paper uses the Altman five-factor Z-score approach, which provides current comparative data for both industries to detect possible weaknesses in the banking sector before they may cause systemic crises.

In Pakistan's context, several banking institutions have faced severe distress and eventual closure over the past few decades. Notable examples include the collapse of Bankers Equity Limited in 1997 due to excessive non-performing loans and mismanagement, and the failure of Prudential Commercial Bank in the early 2000s, which led to its forced merger. These cases highlighted weaknesses in regulatory oversight, inadequate risk management practices, and poor corporate governance. One of the most widely accepted approaches for predicting bankruptcy is the use of financial ratio analysis. Ratios such as liquidity, profitability, solvency, and efficiency provide a quantitative snapshot of an institution's financial health. When analyzed over time, these metrics can reveal patterns that signal impending distress. Among various bankruptcy prediction models, the

Altman Z-score has remained one of the most enduring and widely applied frameworks since its introduction in 1968. Originally developed for manufacturing firms, the model has been adapted for non-manufacturing and emerging market contexts, demonstrating strong predictive power across different sectors and geographies.

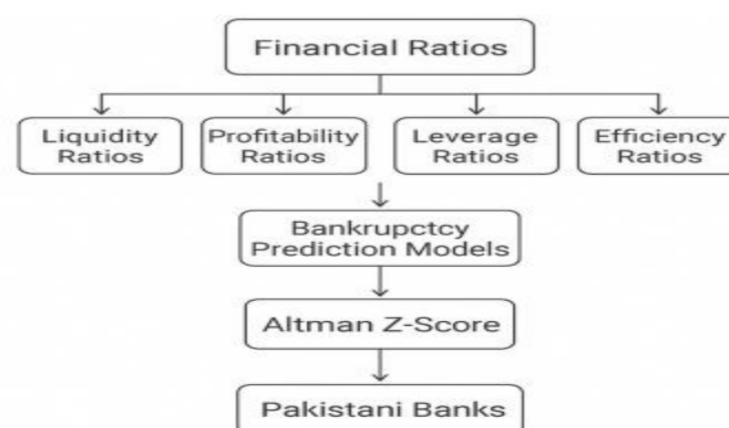
Therefore, this paper has considered financial ratios as a measure of the firm's financial health and as an early warning indicator of the firm's future emergence of financial distress in the banking sector of Pakistan. In Pakistan's banking context, the application of Altman's Z-score offers a structured, quantitative means of classifying banks into risk zones safe, gray, or distressed. While global literature supports the utility of financial ratios in forecasting financial trouble, limited research has been conducted specifically on Pakistani banks, and even fewer studies have compared commercial and Islamic institutions within the same framework. This creates a notable gap in understanding how such models function in Pakistan's unique economic, cultural, and regulatory environment. The present study addresses this gap by applying the Altman Z-score model to a representative sample of Pakistani banks over six years. By comparing commercial and Islamic banks, the study evaluates the model's effectiveness in classifying banks into safe, gray, and distress zones. The findings aim to contribute to both academic literature and policy formulation by providing early warning indicators that can guide intervention strategies.

2. Literature Review

This chapter analyzes the association between the financial ratios and bankruptcy prediction in commercial and Islamic banks, utilizing existing literature (Altman, 1968; Ohlson, 1980). Firstly, it describes the nature of financial ratios, including liquidity, profitability, efficiency, and solvency ratios, as well as their components, as suggested by Horcher (2017), Jafari & Nabavi (2017). Then, it focuses on the measurement of these ratios evident from previous researchers (Kumar & Kumar, 2016). Along with this, the role of financial ratios in predicting bankruptcy has been studied in terms of their relationship, control variables, and industry settings, with special focus on commercial and Islamic banks (Alaka & Oyewo, 2018). The Altman Z-score model has been used to support the theoretical framework of Altman (1968); Kumar & Kumar (2016). Numerous models have been developed to identify early warning signs of distress, with financial ratios forming the core of most predictive frameworks. These ratios condense complex financial statement data into interpretable indicators, offering insight into an institution's liquidity, profitability, efficiency, and solvency.

In this regard, predicting bankruptcy in Pakistani banks, financial ratios are regarded as the most important tools for analysis of a bank's financial health and projection of its probable prospects (Horrigan, 1965). These ratios can be broadly categorized into liquidity ratios, profitability ratios, and solvency ratios. Liquidity ratios like current ratios and quick ratios indicate the ease with which a bank can settle its short-term obligations. Profitability ratios, including ROA and ROE, measure how a bank generates profits from its assets and equity, respectively. Altman (1968) asserts that bankruptcy could be predicted through the application of financial ratios by analyzing patterns and trends within financial statements, which indicate the firm's distress. The Z-score model developed by Altman (1968) has been the most widely used bankruptcy prediction model. Therefore, this paper has examined the adequacy of financial ratios in predicting bankruptcy for commercial and Islamic banks in Pakistan. For this purpose, a combination of some of the liquidity, profitability, efficiency, and Solvency ratios is used to develop the bankruptcy prediction model. i.e., the Altman Z-score model.

In Pakistan, the majority of bankruptcy prediction studies have been concerned with the corporate environment (Tahir, 2018; Khan, 2015; Shaikh et al., 2025; Memon et al., 2025; Anser et al., 2024; Anser et al., 2025). In general, these studies have proven the utility of financial ratios in forecasting failure, although this has hardly been addressed in the banking industry. A brief literature review reveals that very few studies have explored the analysis of the Z-score in banks in Pakistan and concluded that it may be an effective early warning signal, although not comparing types of banks (Ali and Iqbal, 2019). In recent years, the industry of Islamic banking has expanded in Pakistan, so its share in the total banking assets is more than 20 percent at the moment (SBP, 2024). However, work has been done less based on whether models based on financial ratios work equally well on Islamic banks due to the unique nature of the alterations in their asset portfolio and revenue generation. The research framework of this study is as follows:



H1: There is significant variation in the bankruptcy rate of Pakistani Commercial and Islamic banks between 2019 to 2024

H2: The Altman Z-score five-factor model accurately predicts bankruptcy in the Pakistani banking sector

H3: Pakistani banks are effectively categorized into safe, gray, and distressed zones using the Altman Z-score model.

3. Research Methodology

In this chapter, the demographic, the research design, and the thorough sample selection procedure are all explained. Secondly, this chapter provides a detailed explanation of the data collection and analysis procedure. The methodology combines statistical analysis of secondary financial data with well-established frameworks for predicting bankruptcy. Hence, this quantitative research uses the deductive approach, aiming to test a hypothesis that examines the relationship between financial ratios and bankruptcy prediction in Pakistani banks with the help of Altman's Z score model. Additionally, this explanatory research uses secondary data to examine the effectiveness of financial ratios in predicting bankruptcy. The required (annual) data is collected from secondary sources, including published financial statements and annual reports, and the State Bank website from 2019 to 2024. Hence, the population considered by this study is Pakistan, and the sample includes all 20 Pakistani banks (commercial & Islamic) listed in the Pakistan stock exchange (PSX – all share index).

3.1 Research Procedure

This research study has considered Altman's Z-score model to predict bankruptcy in the banking sector of Pakistan. This model is a valuable tool for predicting bankruptcy in Pakistani banks. Its proven reliability and adaptability make it an essential component of financial analysis in this sector. The benefit of this model is that it will give accuracy regarding bankruptcy. The study outlines a theoretical framework for generating and testing hypotheses regarding the topic. The information will incorporate auxiliary research, fiscal summaries, and the yearly report of the bank. The factual breakdown of the information will be made with the E-See programming. The tests to be performed include: Straightforward measurable examination, relationship investigation, Various relapses, and strategic relapses to foresee an association's insolvency.

3.2 The Altman Z-score Five Factor Model

$$Z = 1.2 (X_1) + 1.4 (X_2) + 3.3 (X_3) + 0.6 (X_4) + 1.0 (X_5) \quad (1)$$

Where:

Z = Altman Z-score

X1 = Working Capital / Total Assets

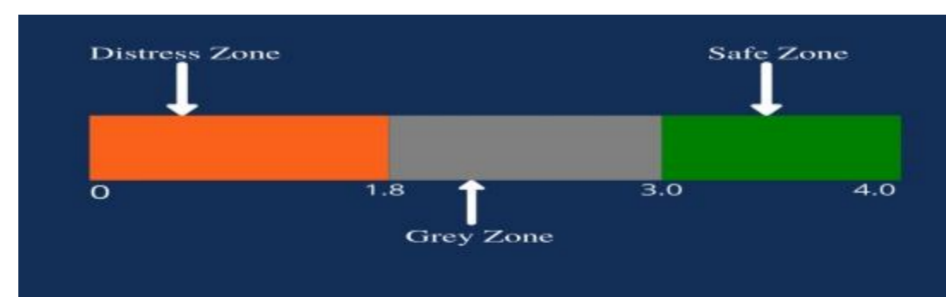
X2 = Retained Earnings / Total Assets

X3 = EBIT / Total Assets

X4 = Book Value of Total Assets.

X5 = Sales/ Total Assets

The Altman Z-score is a different investigation tool that can gauge the possibilities of an organization going into insolvency by applying the financial ratios. In view of the weightage connected to every proportion, the all out of all these proportions, weighted, comprises a Z-score as illustrated in the prediction model below. By utilizing this prediction model for Pakistani banks, we can determine bankruptcy and identify potential areas for improvement.



- Z-score > 2.99: Low risk of bankruptcy (Safe Zone)
- 1.8 < Z-score < 2.99: Medium risk of bankruptcy (Gray Zone)
- Z-score < 1.8: High risk of bankruptcy (Distress Zone)

4. Results and Findings

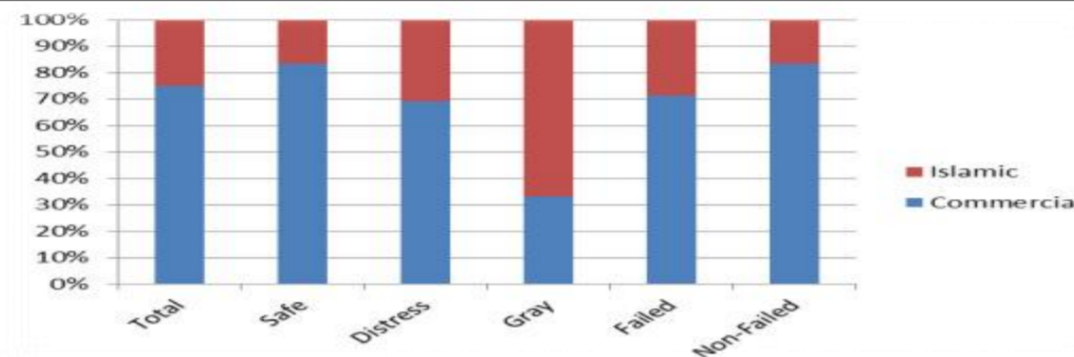
This research uses the Altman Z-score model to forecast bankruptcy among Pakistani banks through financial ratios. The research findings are as follows:

4.1 Empirical Findings of Altman Z-Score Implementation

In Table (4.1.1), Altman Z-score model for 20 Pakistani banks (15 commercial and 5 Islamic) from the period 2019-2024 reveals that 4 banks are in the safe zone with no financial distress, 1 in the gray zone, and 7 banks are in the distress zone with possible financial issues. The remaining banks have mixed results, with some having both safe and distress zones for the period. Specifically, for commercial banks, some are always safe or distressed, and others have alternating safe, gray (neither safe nor distressed), and distressed zones. For Islamic banks, the results also differ, with one being always safe, while others have different zones. Bank results reveal the need for banks to assess and improve their financial stability.

Table 4.1.1: Failed and Non-Failed Banks

Bank Type	Total	Safe	Distress	Gray	Failed	Non-Failed
Commercial	15	4	7	1	10	5
Islamic	5	1	1	2	4	1



4.1.2 Commercial Bank

Allied Bank Limited (ABL), Bank of Punjab (BOP), Bank Alfalah (BAFL), and Habib Metropolitan Bank (HMB) were observed to have Z-scores above 2.99 during the entire period. The retained earnings of these banks were high (X 2) and the EBIT- to total - assets ratios were healthy (X 3). Throughout the years, JS Bank has stayed between 1.9 and 2.5, which describes it as not very stable but being exposed to shocks. National Bank of Pakistan (NBP), Habib Bank Limited (HBL), Bank of Khyber (BOK), Askari Bank, Samba Bank, MCB Bank, and Soneri Bank always scored below 1.8. A number of factors were persistent weaknesses in profitability levels and equity-to-liabilities balances (X4).

The table is as follows:

Table 4.1.2: Commercial Banks: Analysis of Financial Performance Evaluation

Year	ABL	Zone	BOP	Zone	BAFL	Zone
2019	888,671,7.91	Safe Zone	21.44	Safe Zone	601.2	Safe Zone
2020	954,274,8.68	Safe Zone	26.15	Safe Zone	661.18	Safe Zone
2021	1,207,259,8.83	Safe Zone	33.64	Safe Zone	721.17	Safe Zone
2022	1,350,583,9.49	Safe Zone	43.29	Safe Zone	781.16	Safe Zone
2023	1,397,590,1.50	Safe Zone	52.08	Safe Zone	841.15	Safe Zone
2024	1,690,181,3.75	Safe Zone	-		901.14	Safe Zone

Year	HBM	Zone	JS	Zone
2019	151,387,086.79	Safe Zone	-	-
2020	954,274,809.63	Safe Zone	2.404	Gray Zone
2021	967,783,286.45	Safe Zone	2.528	Gray Zone
2022	1,013,483,232.65	Safe Zone	2.405	Gray Zone
2023	1,075,528,074.04	Safe Zone	2.445	Gray Zone
2024	1,125,925,926.64	Safe Zone	2.641	Gray Zone

Year	BAL Habib	Zone	HBL	Zone	MCB	Zone	Samba Bank	Zone
2019	0.0499	Distress Zone	0.87	Distress Zone	1.6952	Distress Zone	0.7241	Distress Zone
2020	0.1221	Distress Zone	0.68	Distress Zone	1.7186	Distress Zone	0.782	Distress Zone
2021	0.2265	Distress Zone	0.66	Distress Zone	1.6848	Distress Zone	0.3385	Distress Zone
2022	0.3223	Distress Zone	0.65	Distress Zone	1.7042	Distress Zone	0.3738	Distress Zone
2023	0.871	Distress Zone	0.65	Distress Zone	1.7111	Distress Zone	0.4173	Distress Zone
2024	1.16	Distress Zone	0.65	Distress Zone	1.72	Distress Zone	0.5705	Distress Zone

Year	BOK	Zone	Askari Bank	Zone	NBP	Zone
2019	0.3531	Distress Zone	1.074	Distress Zone	0.0043	Distress Zone
2020	0.2904	Distress Zone	1.0818	Distress Zone	0.0032	Distress Zone
2021	0.7554	Distress Zone	1.0883	Distress Zone	0.0018	Distress Zone
2022	0.5067	Distress Zone	1.0938	Distress Zone	0.0023	Distress Zone
2023	1.4445	Distress Zone	1.0986	Distress Zone	0.0043	Distress Zone
2024	1.5432	Distress Zone	1.1027	Distress Zone	-	

Year	Soneri bank	Zone	UBL	Zone	SCB	Zone
2019	1.55	Distress	1.7767	Distress	0.8139	Distress
2020	3.41	Safe	1.8401	Distress	1	Distress
2021	-	-	2.3439	Gray	0.9273	Distress
2022	5.47	Safe	4.0265	Safe	0.1946	Distress
2023	5.54	Safe	6.0123	Safe	0.2872	Distress
2024	-	-	-	-	4.169	Safe

In Table 4.1.2, the Altman Z-score model makes an extensive evaluation of commercial bank and Islamic bank financial conditions throughout Pakistan. From the analyzed bank Z-scores from 2019 to 2024, we observe diverse financial strength. HBM and BOP showed exceptionally high scores among several commercial banks that consistently operated in the Safe Zone ($Z > 2.99$), which include: ABL, BOP, BAFL, and HBM. JS Bank was still in Grey Zone ($1.81 < Z < 2.99$). On the other hand, BAL Habib, HBL, MCB, Samba Bank, BOK, Askari Bank, and NBP remained mostly in the Distress Zone ($Z < 1.81$). However, at the end of 2024, Soneri Bank, UBL, and SCB moved into the Safe Zone. There were no distinguishing records between Islamic banks, with Faysal Bank having a strong financial health; MBL was mainly safe except in 2024. Islamic Bank and Dubai Islamic Bank both remained in the Distress Zone consistently, and NBP Modarba improved, landing in the Safe Zone in 2024, spending the better part of the time in the Distress Zone. Generally, the financial stability was significantly different between the types of both commercial and Islamic banks in the analyzed period. The data demonstrates Pakistani commercial banks, together with Islamic banks, maintain solid financial positions that allow them to honor their short-term along long-term debt commitments. Commercial banks showed ever so slightly better Z-score results, yet both bank types maintained stable operations. The financial evaluation reveals crucial information about Pakistan's banking sector stability, which must be supported by continued monitoring for maintaining sustainable growth.

4.1.3 Islamic Banks

Faysal Bank also performed better with a score higher than 2.99 because its asset turnover and earnings ratio were very high. The Meezan Bank has typically stable outcomes that shifted into distress in 2024, whereas those of Dubai Islamic Bank and two smaller Islamic banks in the three remained continuously distressed. These banks did not have high EBIT margins, and their retained earnings were experiencing sustained growth in line with the results of the studies of Islamic banking in the Gulf area (Alqahtani et al., 2018).

The tables of Islamic banks' financial performance are as follows:

Table 4.1.3: Islamic Banks: Analysis of Financial Performance Evaluation

Year	MBL	Zone	Islamic bank	Zone	Faysal bank	Zone	NBP Modarba	Zone
2019	2.467	Gray	0.526	Distress	66.23	Safe	0.6409	Distress
2020	3.058	Safe	1.289	Distress	72.26	Safe	0.673	Distress
2021	55.585	Safe	40.314	Safe	23.75	Safe	0.6	Distress
2022	8.798	Safe	4.266	Safe	42.51	Safe	1.1017	Distress
2023	9.995	Safe	7.299	Safe	54.35	Safe	2.3396	Gray
2024	0.805	Distress	279.7	Safe	86.62	Safe	21.2678	Safe

Year	Dubai Islamic Bank	Zone
2019	0.5337	Distress
2020	0.4355	Distress
2021	0.3623	Distress
2022	0.3297	Distress
2023	0.4767	Distress
2024	0.4719	Distress

The findings of the present study regarding the effectiveness of financial ratios in predicting bankruptcy in the Pakistani banking sector during 2019 to 2024 present a unique picture of the effectiveness of such quantitative indicators for a particular emerging market context. The differences in predictive power experienced with different banks and throughout the years highlight the complexity of financial distress and the trouble with the rigid application of the same financial ratios. Although specific institutions were repeatedly identified by a limited range of ratios as being in "Distress Zones", indicating possible hidden financial weaknesses, the failure to observe actual bankruptcy cases during the studied period allows only for a qualified interpretation of such signals. If regulatory actions hadn't been able to step in, the companies hadn't engaged in internal reorganization, or the economic climate hadn't improved, these possible distress circumstances might have resulted in bankruptcy. The "Gray Zones" of some banks further prove

the point of the necessity of a more advanced methodology of financial risk assessment. Such classifications imply that the financial health of such institutions cannot be straightforwardly labelled either “safe” or “distressed” based on the selected ratios, which necessitate the additional explorations of a greater number of analytical tools and qualitative evaluations. It is consistent with some of the existing literature on bankruptcy prediction that financial ratios may give useful early warning indicators but are not hornbook predictors, especially in emerging markets where data quality and market dynamics can be highly volatile. However, country-specific ratios that work out best might vary in terms of industry, country, and time. Accordingly, the need for Pakistan-specific research as well as customized prediction models is prioritized. Notwithstanding these limitations, this research yields an essential understanding of the trends of financial health in the Pakistani banking sector and highlights the need for a multi-dimensional approach in bankruptcy risk evaluation. The repeated appearance of specific banks in “Distress Zones” requires a second look by both regulators and the institutions. The recommendations put forward, towards improving the refinement of ratio selection, incorporating qualitative factors, and strengthening regulatory oversight, are a blueprint for strengthening monetary stability and augmenting the power of predictive risk assessment structures in Pakistan. Prospective research can build on these results by using more advanced approaches to modeling and additional ratios to forecast bankruptcy risk on the Pakistani banking market in a longer time perspective.

5. Conclusion

The present study examines how well financial ratios predict bankruptcy in the banking industry of Pakistan through the use of the Altman Z-score model. It also provides a distinct view of how well these quantitative indicators work in a specific developing market setting. Predictive power variations between commercial and Islamic banks and over time underscore the intricacy of financial crisis and the challenges associated with the strict use of identical financial criteria. The overall results show that while most commercial banks are in the safe zone, with good financial performance. However, a few banks, including the BAL Habib, HBL, MCB, Samba Bank, BOK, Askari Bank, and NBP, are found in distressed zones at the end of 2024. In Islamic banks, only MBL and Dubai Islamic Bank are categorized in the gray or distressed area, which requires urgent risk management. If regulatory actions hadn't been able to step in, the companies hadn't engaged in internal reorganization and restructuring, these possible distress circumstances might have resulted in bankruptcy.

5.1 Recommendations and Policy Implications

- The SBP should integrate Z-score monitoring into its regulatory oversight.
- Banks in the Distress Zone should adopt earnings retention strategies or risk management strategies to avoid future consequences.
- Operational efficiency programs are necessary to improve EBIT margins.
- Islamic banks require product diversification to strengthen profitability.
- A combined quantitative-qualitative risk framework should be adopted.

These recommendations cover how to package the information and set up the system, and this will help the banking sector better spot and handle financial problems, making the sector stronger in the long run.

5.2 Practical Implications

The findings of this study provide important practical implications for the stability and governance of the Pakistani banking sector:

- **Regulatory Application by the State Bank of Pakistan (SBP)**

Among the benefits offered by the Altman Z-score model is the capability to introduce it into the supervisory toolkit of the SBP to allow greater proactive regulation by focusing on detecting an early indication of financial distress between Pakistani commercial and Islamic banks by including it in the supervisory framework of this institution as a standardized tool.

- **Bank-Specific Risk Management**

With the help of the Z-score model, Pakistani banks, especially those that prefer to stay in the distress zone regularly (e.g., NBP, HBL, BOK), will be able to enhance internal risk monitoring and minimize the chances of future defaults.

- **Investor Protection and Market Confidence**

Investors and depositors can meaningfully make decisions to improve the principle of transparency and market discipline in the Pakistani financial system based on the classification of banks in terms of safe, grey, and distressed zones based on the financial data.



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- **Policy Design for Financial Stability**

The findings can also guide policymakers to draft Pakistan-specific regulatory procedures of early intervention, particularly in the case of banks that exhibit signs of distress repeatedly, thus enhancing the financial stability of the country.

- **Strengthening Islamic Banking Supervision**

Due to the increasing Islamic banking sector in Pakistan, it is found that there is a need to develop tailored models in bankruptcy prediction of the Islamic banks, given that they are not structured like a conventional banking model in the risk sharing and banking asset portfolio classification.

5.3 Future Areas of Study

To strengthen bankruptcy prediction and financial oversight in the Pakistani context, the following areas are recommended for future research:

- **Integration of Machine Learning in Pakistani Banks**

The Pakistani scholars will be able to investigate locally driven machine learning models that can enhance the predictability of bankruptcy patterns among Pakistani banks with the help of models such as logistic regression, decision trees, or neural networks.

- **Cross-Sectoral Comparison**

This research can be repeated in the future to compare banking and non-banking financial institutions in Pakistan to track the different responses of these sectors subject to the indicators of financial distress.

- **Islamic vs. Commercial Bank Model**

Further Pakistan-based relationship between the activities of Islamic and commercial banks may provide an answer to what models are more sustainable and the existence of different financial distress models.

- **Validation in the Long-Term- Pakistan**

The banks identified in the distress area beyond 2024 should be monitored in the future to determine whether the forecast is upheld as defaults or recoveries to confirm the predictive ability of Altman's Z model in Pakistan.

References

- Abdulrahman, M., & AbdulRahman Bala, S. (2025). The role of financial ratios in bankruptcy prediction: An empirical study using contemporary financial data. *FUDMA Journal of Accounting and Finance Research*, 3(2), 43–55. <https://doi.org/10.33003/fujafr-2025.v3i2.164.43-55>
- Ali, S., Murtaza, G., Hedvicakova, M., Jiang, J., & Naeem, M. (2022). Intellectual capital and financial performance: A comparative study. *Frontiers in Psychology*, 13, 967820.
- Altman, E. I. (1968). Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy. *The Journal of Finance*, 23(4), 589–609. <https://doi.org/10.1111/j.1540-6261.1968.tb00843.x>
- Altman, E. I., Haldeman, R. G., & Narayanan, P. (1977). ZETA™ analysis: A new model to identify bankruptcy risk of corporations. *Journal of Banking & Finance*, 1(1), 29–54. [https://doi.org/10.1016/0378-4266\(77\)90017-6](https://doi.org/10.1016/0378-4266(77)90017-6)
- Alzayed, N., Eskandari, R., & Yazdifar, H. (2023). Bank failure prediction: Corporate governance and financial indicators. *Review of Quantitative Finance and Accounting*, 61, 601–631. <https://doi.org/10.1007/s11156-023-01158-z>
- Anser, M. K., Naeem, M., Ali, S., Ali, S., & Javid, R. (2025). The relationship between artificial intelligence and environmental performance: the mediating role of external environmental factors. *Humanities and Social Sciences Communications*, 12(1), 1-7.
- Anser, M. K., Naeem, M., Ali, S., Huizhen, W., & Farooq, S. (2024). From knowledge to profit: business reputation as a mediator in the impact of green intellectual capital on business performance. *Journal of Intellectual Capital*, 25(5/6), 1133-1153.
- Atif, S. (2010, September 13). Islamic way to solve crises. Dawn. <https://www.dawn.com>
- Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 4, 71–111. <https://doi.org/10.2307/2490171>
- Ben, C. F. Y., David, G. F. Y., & Wai, C. P. (2010). How well do financial ratios and multiple discriminant analysis predict company failures in Malaysia. *International Research Journal of Finance and Economics*, 54, 166–175.
- Cybinski, P. J. (2000). The path to failure: Where are bankruptcy studies now? *Journal of Business and Management*, 7(1), 11–39.



Advance Journal of Econometrics and Finance

Vol-3, Issue-3, 2025

- Dr. Khawaja, A. S. (2009). Islamic banking in Pakistan—A review. *Journal of Islamic Banking and Finance*, 26(4), 43–52.
- Dr. Mohammad, U. (2010). Certain features of the capitalistic financial system and their position in an Islamic system. *Journal of Islamic Banking and Finance*, 27(1), 15–28.
- Edtiyarsih, D. D. (2023). Analysis of bankruptcy prediction with financial ratios Altman Z-Score model: Case study of oil and gas companies listed on IDX in 2017–2021. *West Science Interdisciplinary Studies*, 1(03), 111–123. <https://doi.org/10.58812/wsis.v1i02.44>
- Farooq, M., & Ahmad, N. (2023). Nexus between board characteristics, firm performance and intellectual capital: an emerging market evidence. *Corporate Governance: The International Journal of Business in Society*, 23(6), 1269-1297.
- Farooq, M., Noor, A., & Naeem, M. (2023). Does family ownership moderate the relationship between board characteristics and corporate social responsibility? Evidence from an emerging market. *Asian Journal of Business Ethics*, 12(1), 71-99.
- Grice, J. S., & Ingram, R. W. (2001). Tests of the generalizability of Altman's bankruptcy prediction model. *Journal of Business Research*, 54(1), 53–61. [https://doi.org/10.1016/S0148-2963\(00\)00126-0](https://doi.org/10.1016/S0148-2963(00)00126-0)
- Hosaka, T. (2019). Bankruptcy prediction using imaged financial ratios and convolutional neural networks. *Expert Systems with Applications*, 117, 287–299. <https://doi.org/10.1016/j.eswa.2018.09.039>
- Hussain, S., Ahmed, S., & Khan, M. (2017). Bankruptcy prediction using financial ratios: A study of Pakistani companies. *Journal of Business and Economic Studies*, 3(1), 1–12.
- Jamal, S., & Mujtaba, M. (2019). Fostering Entrepreneurship with Microfinance. A Study on Karachi-Pakistan. *Development*, 39(6), 938-948.
- Jo, H., Han, I., & Lee, H. (1997). Bankruptcy prediction using case-based reasoning, neural networks, and discriminant analysis. *Expert Systems with Applications*, 13(2), 97–108. [https://doi.org/10.1016/S0957-4174\(97\)00015-7](https://doi.org/10.1016/S0957-4174(97)00015-7)
- Kainth, A., & Wahlstrøm, R. R. (2021). Do IFRS promote transparency? Evidence from the bankruptcy prediction of privately held Swedish and Norwegian companies. *Journal of Risk and Financial Management*, 14(3), 123. <https://doi.org/10.3390/jrfm14030123>
- Karas, M., & Režňáková, M. (2014). To what degree is the accuracy of a bankruptcy prediction model affected by the environment? The case of the Baltic States and the Czech Republic. *Procedia, Social and Behavioral Sciences*, 156, 564–568. <https://doi.org/10.1016/j.sbspro.2014.11.241>
- Khan, A., Ahmed, R., & Ali, S. (2020). Bankruptcy prediction using financial ratios: A comparative study of Pakistani and Indian companies. *Journal of Financial Management and Analysis*, 33(1), 1–15.
- Khan, N., Naeem, M., & Siraj, M. (2024). Evaluating Green Supply Chain Performance Using Multi-Criteria Decision-Making (MCDM) Models. *RADS Journal of Business Management*, 6(2), 113-123.
- Kitowski, J., Kowal-Pawul, A., & Lichota, W. (2022). Identifying symptoms of bankruptcy risk based on bankruptcy prediction models, A case study of Poland. *Sustainability*, 14(3), 1416. <https://doi.org/10.3390/su14031416>
- Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th ed.). Pearson Education Limited.
- Lennox, C. S. (1999). The accuracy and incremental information content of audit reports in predicting bankruptcy. *Journal of Business Finance & Accounting*, 26(5–6), 757–778. <https://doi.org/10.1111/1468-5957.00275>
- Memon, S., Shaikh, M. R., & Naeem, M. M. (2025). Board Diversity and Green Innovation: A Systematic Literature Review. *Advance Journal of Econometrics and Finance*, 3(3), 158-165.
- Naeem, M. (2023). Corporate governance mechanism and financial performance in Pakistan commercial banks: moderating role of credit risk management. *RADS Journal of Business Management*, 5(2), 95-112.
- Naeem, M., Khan, A., Rehman, A., Farooq, S., Mehboob, A., Abdali, A. S., & Ahmad, B. (2025). Does Artificial Intelligence With Blockchain Reduce the Costs of the Financial Sector?. In *Generative AI for Web Engineering Models* (pp. 147-160). IGI Global.
- Naeem, M., Siraj, M., Abdali, A. S., & Mehboob, A. (2024). The Impact of Investment in AI on Bank Performance: Empirical Evidence from Pakistan's Banking Sector. *KASBIT Business Journal*, 17(1).
- Naeem, M., Siraj, M., Ali, S., Rehman, A., & Farooq, S. (2025). The Role of Artificial Intelligence in Risk Management: Practices of the Banking Sector. In *Generative AI for Web Engineering Models* (pp. 83-106). IGI Global.



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- Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18(1), 109–131. <https://doi.org/10.2307/2490395>
- Papana, A., & Spyridou, A. (2020). Bankruptcy prediction: The case of the Greek market. *Forecasting*, 2(4), 505–525. <https://doi.org/10.3390/forecast2040029>
- Shah, H. H., Shaikh, A., Mujtaba, M., & Shah, T. H. (2025). Impact of cryptocurrency adoption on various financial markets in Pakistan. *NICE Research Journal*, 18(2). <https://doi.org/10.51239/nrjss.v18i2.50>
- Shaikh, A. (2021). Speculative Bubble and Its Existence in the Stock Market of Pakistan. *Global journal for management and administrative sciences*. 2(2), 1-19. DOI: <https://doi.org/10.46568/gjmas.v2i2.40>
- Shaikh, A., Kashif, M., Rehman, M. U., & Rehman, S. U. (2023). Driven by Fundamentals or Exploded by Sentiments: Testing Bubbles in Emerging Markets. *Pakistan Business Review*. 25(1), 1-27. DOI: <https://doi.org/10.22555/pbr.v25i1.746>
- Shaikh, M. R., Ali, M. I., Tunio, M. M. S. M., & Naeem, M. M. (2025). Green Human Resource Management and Sustainability Performance: A Systematic Review Using PRISMA Methodology. *Journal of Management & Social Science*, 2(3), 330-344.
- Springate, G. L. V. (1978). Predicting the bankruptcy of companies in the UK. *Journal of Business Finance & Accounting*, 5(3), 305–323. <https://doi.org/10.1111/j.1468-5957.1978.tb00175.x>
- Zmijewski, M. E. (1984). Methodological issues related to the estimation of financial distress prediction models. *Journal of Accounting Research*, 22, 59–82. <https://doi.org/10.2307/2490859>

Appendix A

Figure 1-15 Key performance ratios of Commercial Banks of Pakistan

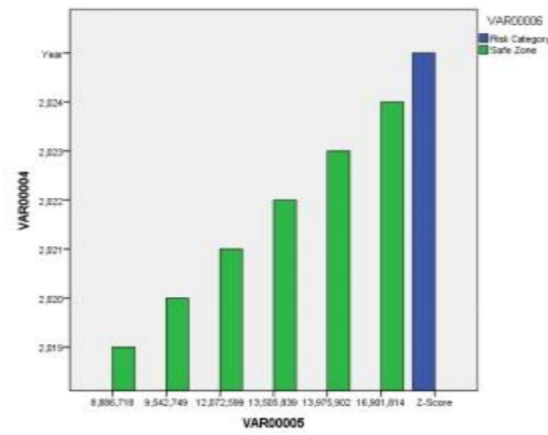


Figure: 1 (ABL Bank)

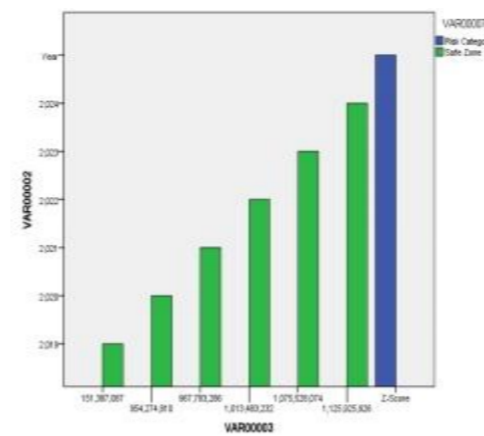


Figure: 2 (HMB Bank)

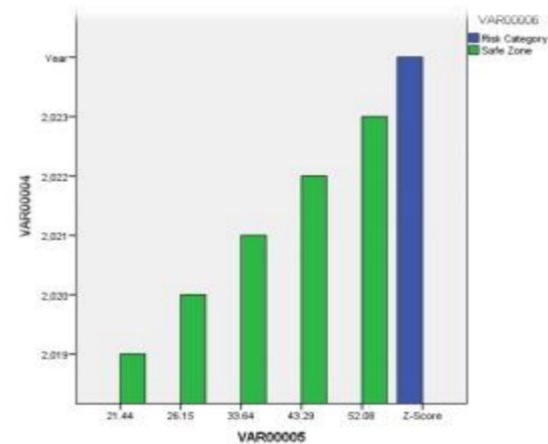


Figure: 3 (BOP Bank)

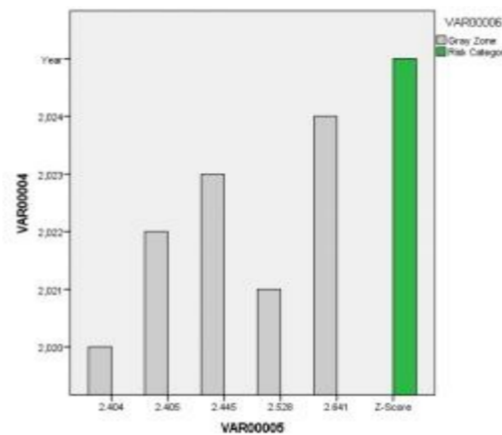


Figure: 4 (JS Bank)

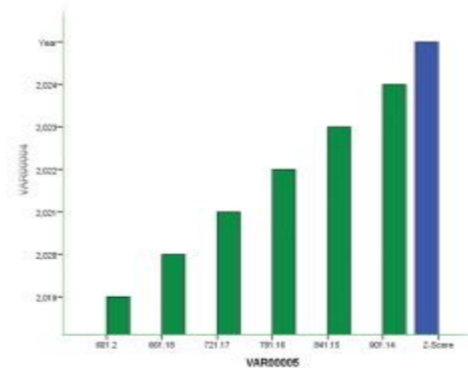


Figure: 5 (BAFL Bank)

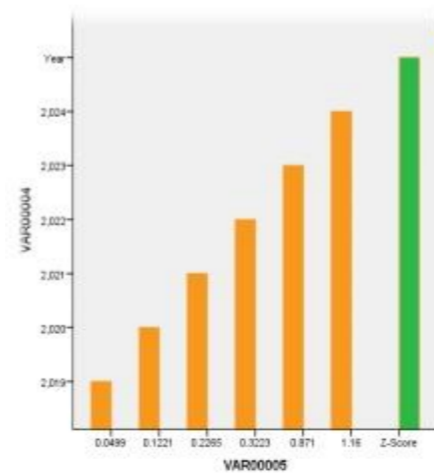


Figure: 6 (BAL Habib)

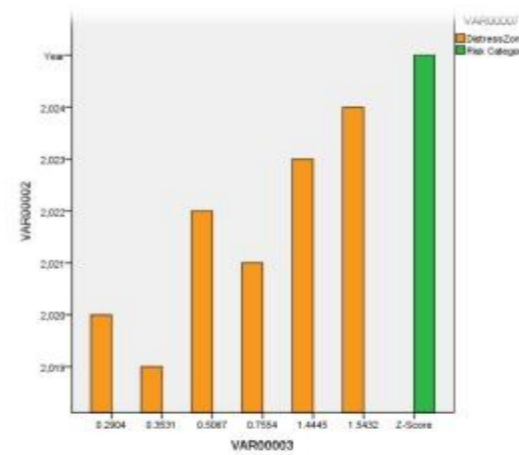


Figure: 7 (BOK Bank)

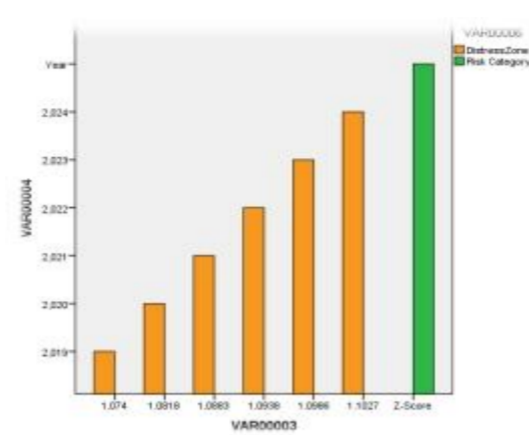


Figure: 8 (Askari Bank)

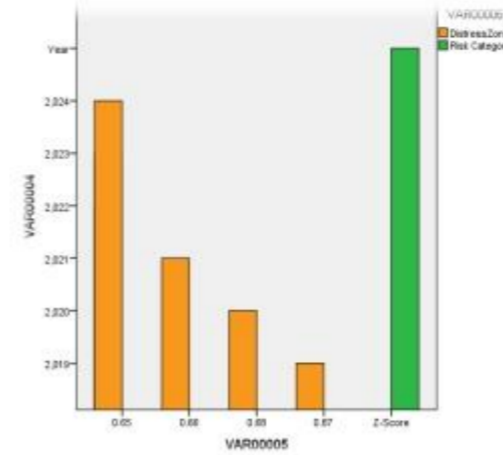


Figure: 9 (HBL Bank)

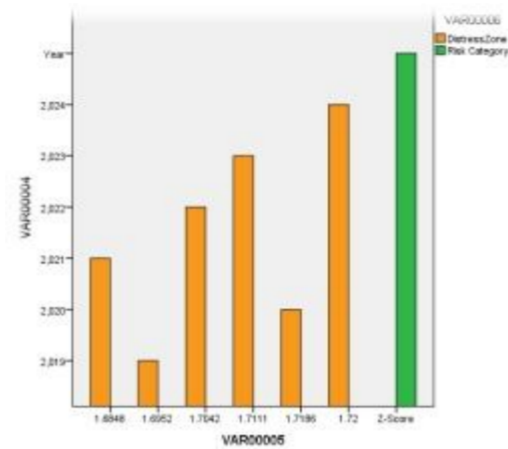


Figure: 10 (MCB Bank)

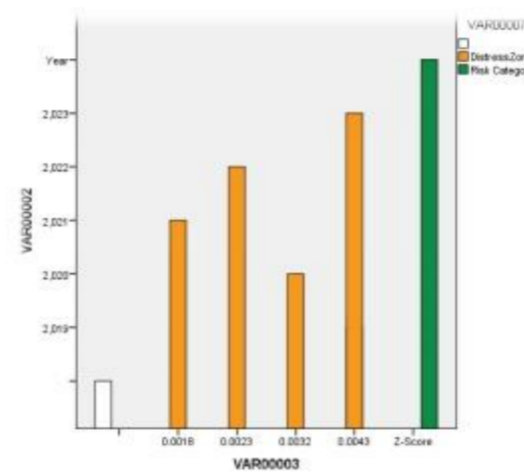


Figure: 11 (NBP Bank)

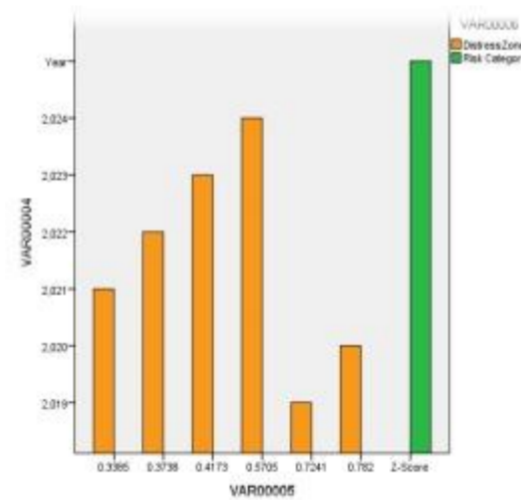


Figure: 12 (Samba Bank)

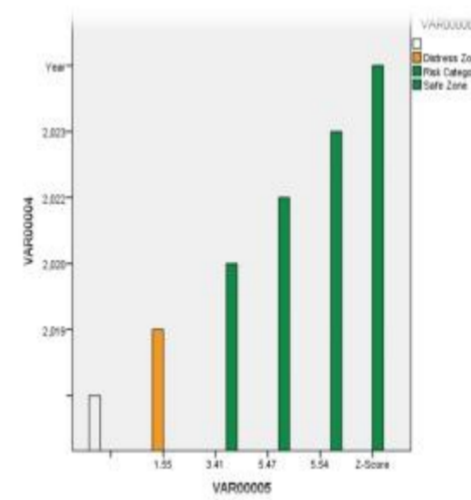


Figure: 13 (Soneri Bank)

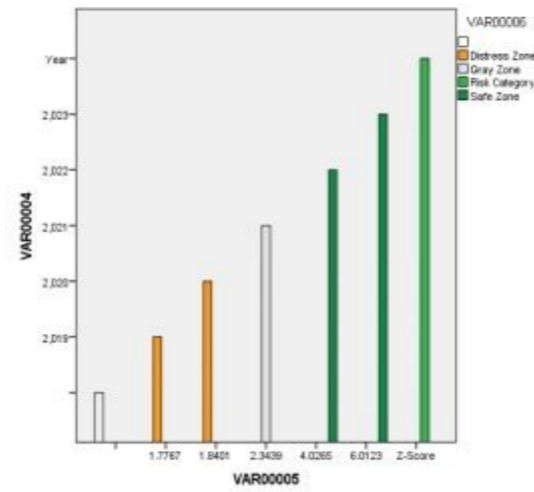


Figure: 14 (UBL Bank)

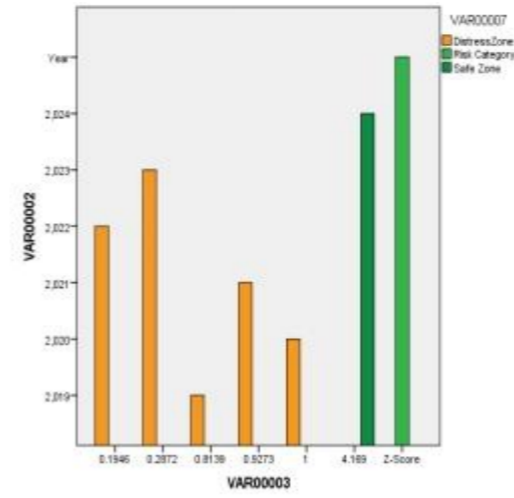


Figure: 15 (SCB Bank)

Figures 16-20 Key Performance ratios of the Islamic Banks of Pakistan

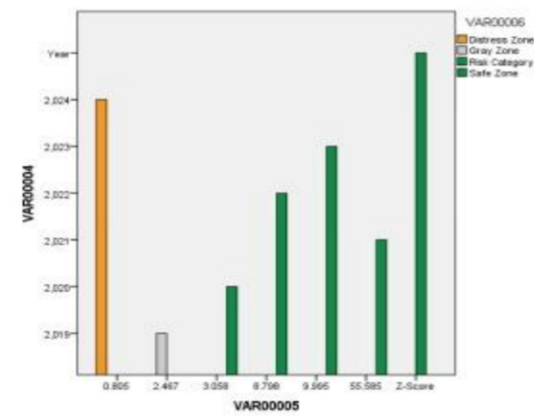


Figure: 16 (MBL Bank)

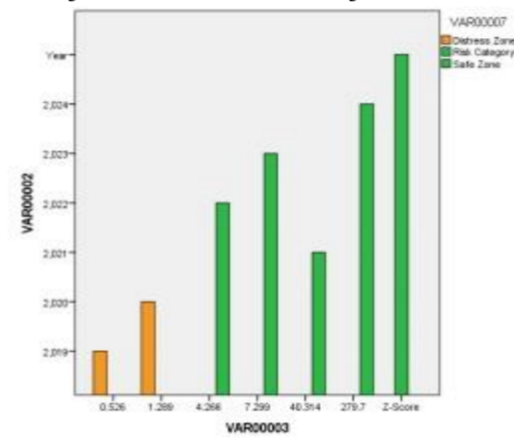


Figure: 17 (Islamic Bank)

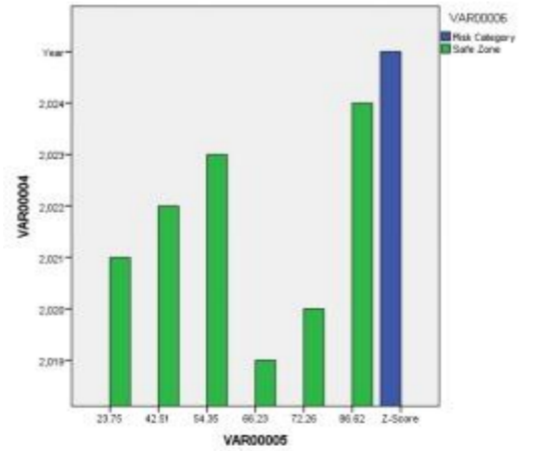


Figure: 18 (Faysal Bank)

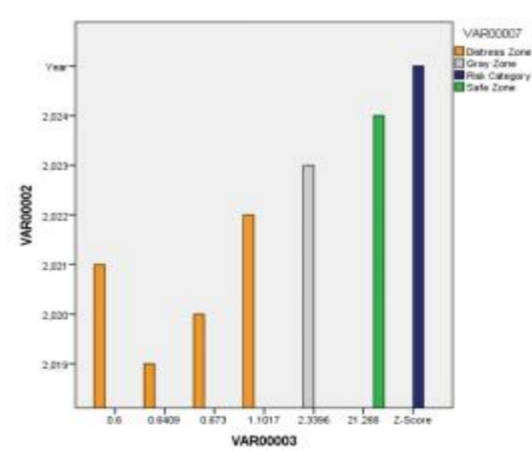


Figure: 19 (NBP Modarba Bank)

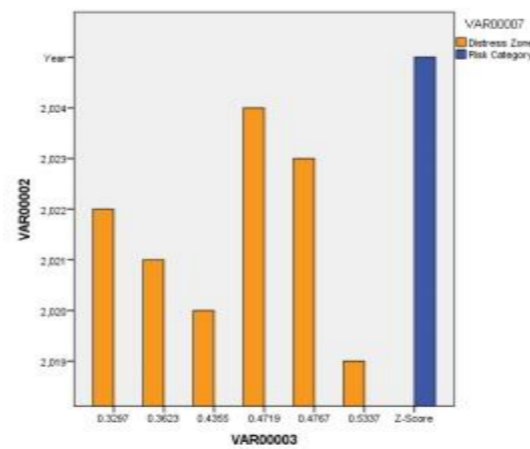


Figure: 20 (Dubai Islamic Bank)