



Analyzing Banking Sector Risk and Capital Allocation: A Study on the Improvement of Risk-Weighted Assets and CRAR Compliance in 2023

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Abstract: *This study examines the improvement in banking sector risk, measured by the Risk-Weighted Assets (RWA) density ratio, in 2023. It highlights the significant growth in RWA of credit risk compared to market and operational risks, and notes the banking industry's increased capital requirements despite a slight decrease in rated exposures as a percentage of total exposure. The overall Capital to Risk-weighted Asset Ratio (CRAR) surpassed the threshold, ensuring regulatory compliance. The analysis categorizes banks into five groups based on inherent features, ownership structure, and business models, providing insights into risk and capital allocation according to BASEL III.*

Keywords: *Banking Sector's Risk Profile, Risk-Weighted Asset Ratio, Banking Sector Risk, Risk-Weighted Assets.*

1. INTRODUCTION

In 2023, there was tremendous improvement in banking risk management, particularly in terms of risk-weighted assets (RWA) and capital to risk-weighted asset ratio (CRAR) compliance. Basel III According to the framework, market risk, which includes the risk of loss from market price changes, has played a significant part in this development, as indicated by the improvement in risk-weighted asset (RWA) concentration ratios. Notably, the RWA of credit risk in nominal terms has demonstrated a faster growth rate than that of market and operational risk, emphasizing the dynamic developments within the financial sector (MV Henriques, C Tomás - 2022).

During the study period, rate exposure decreased somewhat as a percentage of overall banking industry exposure. This tendency leads to increased capital reserve requirements for banks, which improves financial stability. The banking sector's overall capital to risk-weighted asset



ratio (CRAR) crossed the regulatory level, indicating strong adherence to Basel III principles (Addou, Khadija Ichrak, et al 2024).

In 2023, there was significant progress in banking risk management, particularly in terms of risk-weighted assets (RWA) and capital to risk-weighted asset ratio (CRAR) compliance. Basel According to the framework, market risk—defined as the danger of losing on-balance-sheet and off-balance-sheet holdings due to changes in market prices—has played a significant part in these developments. Market risk encompasses interest rate risk, equities price risk, foreign exchange risk, and commodity price risk (Basel Committee on Banking Supervision, 2010). Market risk is defined as the possibility for losses on balance sheet and off-balance sheet investments as a result of market price movements. These market risk positions include risks associated with interest-bearing instruments and stocks in the trading book, as well as foreign currency and commodity risks in the banking and trading books. The volatile nature of market pricing needs rigorous risk management methods to ensure the stability and resilience of financial institutions (Adeniran, Ibrahim Adedeji, et al.,2024).

Marked by advances in automation, institutional development, and regulatory reform, Bangladesh's financial sector has undergone significant changes over the past few years. Driven by the visionary vision of Bangladesh Bank, the banking sector has adopted numerous technological innovations to enhance efficiency and streamline services (UIHaque, Sadat , 2023)

Institutional progress also played an important role, with Bangladesh Bank launching initiatives such as Enterprise Resource Planning (ERP) and working on setting up an enterprise data warehouse. The effort aims to centralize and improve data sharing and oversight across the financial sector (Hassan, Md Saiful.2018)

In addition, several regulatory measures have been introduced, such as the phased implementation of Basel III, green banking guidelines, and improved risk management practices. These developments reflect Bangladesh's commitment to building a resilient, transparent and inclusive financial sector that is in line with global standards and meets the evolving needs of the economy. Through this comprehensive approach, Bangladesh is not only addressing immediate sectoral needs but also laying the foundation for a sustainable financial ecosystem for future growth (Tashmin N.2016)

2. RELATED WORK

The management of banking sector risk has been a critical area of study, especially in the wake of various financial crises that have highlighted the vulnerabilities within the financial system. According to the Basel III framework, market risk is defined as the risk of losses in on and off-balance sheet positions due to fluctuations in market prices. Market risk includes interest rate risk, equity price risk, foreign exchange risk, and commodity price risk (Basel Committee on Banking Supervision, 2010).



The concept of RWA is fundamental to understanding banking sector risk. RWA measures the risk of a bank's assets and is used to determine the minimum amount of capital that banks must hold to reduce the risk of insolvency. Improvements in RWA density ratios indicate more efficient risk management practices (Blum, 1999). Studies have shown that a higher RWA density is associated with greater financial stability (Acharya, Engle, & Richardson, 2012).

CRAR, also known as the Capital Adequacy Ratio, is a measure of a bank's capital. It is calculated by dividing the bank's capital by its risk-weighted assets. A higher CRAR indicates a stronger ability to absorb potential losses and is a key indicator of financial health (Van Roy, 2008). Basel III guidelines have set stringent requirements for CRAR to ensure banks can withstand financial distress (Basel Committee on Banking Supervision, 2011).

Effective market risk management is crucial for maintaining financial stability. The Basel III framework emphasizes the importance of managing market risks through advanced risk management practices, including stress testing and scenario analysis (Jorion, 2007). Studies have found that banks with robust market risk management frameworks are better positioned to handle economic shocks (Hull, 2012).

While market risk is a significant component, credit risk and operational risk also play vital roles in the overall risk management framework. Credit risk refers to the potential for losses due to borrower default, while operational risk encompasses losses from inadequate or failed internal processes, people, and systems (BCBS, 2006). The interplay between these risks and their impact on RWA and CRAR has been extensively studied (Allen & Saunders, 2004).

The aggregate lending exposure of banks to the corporate sector is a critical factor in assessing financial stability. High corporate lending exposure can lead to increased risk, especially during economic downturns (Altman & Saunders, 1998). The Basel III framework encourages diversification of lending portfolios to mitigate these risks (BIS, 2010).

For a comprehensive analysis, banks are often categorized based on their inherent features, ownership structures, and business models. This categorization helps in understanding the diverse risk profiles and capital allocation strategies employed by different types of banks (Gorton & Winton, 2003).

3. METHODOLOGY

This study focuses on studying the banking sector's risk profile, specifically the Risk-Weighted Assets (RWA) density ratio across different types of institutions. The RWA density ratio, which represents the proportion of RWA to total assets, is an important indication of a bank's exposure to credit, market, and operational risk. The study also examines the components of market risk, such as interest rate risk, equity price risk, and exchange rate risk.

1. Data Collection

The data for this study was gathered from the following primary sources:



- Bangladesh Bank: Data on the risk-weighted assets (RWA), credit risk, market risk, and capital charges for various bank categories.
- Department of Off-site Supervision: Information regarding asset and risk classifications of banks, including historical data from 2019 to 2023.

The Dataset Includes:

- Risk-Weighted Assets (RWA) density ratios for various bank groups (private commercial banks, state-owned banks, foreign commercial banks).
- Credit risk shares by industry and within different bank groups.
- Market risk breakdown, including equity price risk, interest rate risk, and exchange rate risk.
- Capital charges for different types of market risk.

2. Risk-Weighted Assets (RWA) Density Ratio Analysis

The RWA density ratio is calculated as:

$$\text{RWA Density Ratio} = \frac{\text{Risk-Weighted Assets (RWA)}}{\text{Total Assets}} \times 100$$

This ratio measures the relative risk exposure of each bank group, with higher ratios indicating a greater exposure to riskier assets.

- Trend Analysis: The RWA density ratio for each bank group from 2019 to 2023 is analyzed, with a focus on changes over time (the decrease in the overall RWA density ratio from 61.17% in 2022 to 59.31% in 2023).
- Comparison: The RWA density ratios of each bank group are compared to identify which groups have higher risk exposures and to assess the overall trend of risk reduction or increase in the sector.

3. Market Risk Structure

Market risks that are significant elements of the Basel III framework are assessed in the study, such as interest rate risk, equity price risk, and exchange rate risk. We compute and assess the ratio of market risk to overall risk:

- Market Risk Breakdown: The composition of market risks is detailed in terms of risk-weighted assets (RWA) for each risk type (equity price risk accounting for 53.77% of total market risk in 2023).
- Trend Analysis: A year-over-year analysis of the share of market risk components (interest rate risk, equity price risk, exchange rate risk) is conducted, highlighting shifts in their proportions (a decrease in interest rate risk from 26.04% in 2022 to 14.99% in 2023).
- Cross-Group Comparison: The share of market risks within each bank group is evaluated, focusing on the top banks within each category and analyzed to understand the financial burden on banks.
- Interest Rate Risk: Capital charge decreased from BDT 12.07 billion in 2022 to BDT 6.6 billion in 2023, with a corresponding reduction in risk-weighted assets linked to interest rate risk.



- Equity Price Risk: The capital charge for equity price risk increased from BDT 20.68 billion to BDT 23.68 billion in 2023, reflecting a higher exposure to equity price fluctuations.
- Exchange Rate Risk: The capital charge for exchange rate risk remained relatively stable (BDT 13.60 billion in 2022 to BDT 13.75 billion in 2023).

4. Statistical Methods

- Descriptive Statistics: Summary statistics such as means, medians, and standard deviations are calculated for key variables like RWA density ratios, capital charges, and risk shares across different bank groups.
- Trend Analysis: A time-series analysis of the RWA density ratio and market risk components (interest rate risk, equity price risk, exchange rate risk) over the period 2019-2023 is conducted to identify significant changes and trends.
- Correlation Analysis: The correlation between RWA density ratio and market risk components are assessed to understand how different risk types are related.
- Comparative Analysis: Statistical tests (ANOVA, t-tests) are used to determine whether the differences in RWA density ratios and market risk shares across bank groups are statistically significant.

4. RESULT AND DISCUSSION

The Risk-Weighted Assets (RWA) density ratio, which gauges the risk of the banking system, showed improvement in 2023. Compared to market and operational risks, the nominal RWA of credit risk increased at a comparatively faster rate. All banks combined had a 54.82 percent loan exposure to the corporate sector. Based on their business models, ownership structures, and fundamental characteristics, banks are divided into five types for easier analysis and comprehension. This classification and the corresponding proportion of each group in the total assets of the banking industry as of the end of December 2023 are shown in Table 1.

Table 1: Grouping of banks for risk analysis

Bank group	Description of the group	Number of banks	Share of total banking sector assets
Group 1	Private commercial banks (Long-standing conventional banks)	21	42.09%
Group 2	State-owned and Private commercial banks under special attention ³³	11	25.97%
Group 3	Private commercial banks (Full-fledged Islamic banks)	9	22.43%
Group 4	Foreign commercial banks	9	5.66%
Group 5	Fourth-generation ³⁴ private commercial banks	11	3.85%
	Total	61	100.00%

Source: Department of Off-site Supervision; Calculation: FSD, Bangladesh Bank.



4.1 Overall Risk Profile

The risk-weighted assets (RWA) density ratios, or the percentage of RWA to total assets, are shown for each bank group in Table 2. The trend in the ratios for 2019–2023 is depicted in Figure 1. Banks that have a higher density ratio are typically more exposed to risky assets. In 2022, the RWA density ratio was 61.17 percent; in 2023, it was 59.31 percent. Groups 1 and 5 showed the highest RWA density ratio among the identified categories. Nevertheless, the ratio decreased for each category in 2023.

Figure 1: Trends in risk-weighted asset concentration ratios

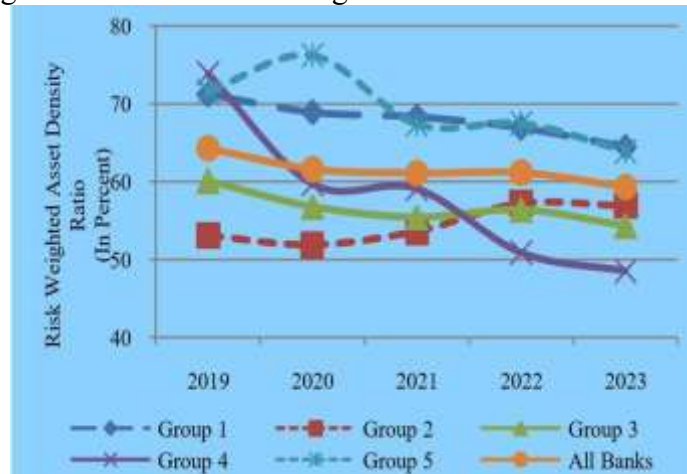


Table 2: Risk-Weighted Asset Density Ratio (Bank Groups)

In Percent					
Banks Group	2019	2020	2021	2022	2023
Group 1	71.20	68.90	68.33	66.91	64.48
Group 2	53.10	51.90	53.61	57.22	56.90
Group 3	60.10	56.80	55.46	56.42	54.33
Group 4	73.90	59.70	59.11	50.90	48.53
Group 5	71.60	76.20	67.36	67.49	63.91
All Banks	64.30	61.60	61.11	61.17	59.31

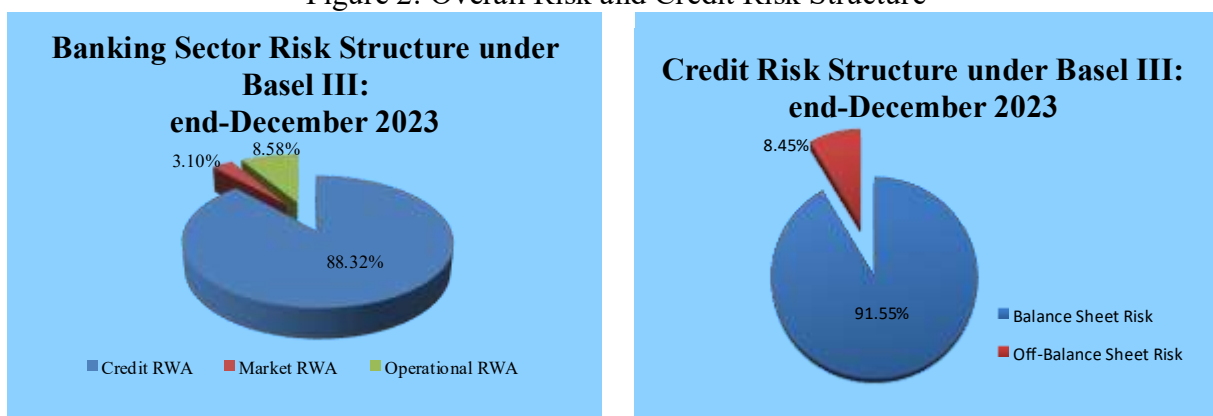
Source: Department of Off-site Supervision; Calculation: FSD, Bangladesh Bank.

4.2 Overall Risk Structure

According to the BASEL III capital framework, credit, market, and operational risk are the main causes of banks' RWAs. The banking sector's Credit Risk-Weighted Assets (CRWA) were BDT 12,563.89 billion, a 6.02 percent increase over those at the end of 2022. Operational Risk-Weighted Assets (ORWA) increased by 9.00 percent from BDT 1,119.76 billion at the end of 2022 to BDT 1,220.57 billion. Conversely, Market Risk-Weighted Assets (MRWA) dropped 4.98 percent in 2023, reaching BDT 440.37 billion. The banking industry's CRAR fell from 11.83 percent at the end of 2022 to 11.64 percent at the end of 2023, but it was still higher than the 10.0 percent minimum regulatory capital requirement.

At the end of December 2023, the market and operational risks were 3.10 and 8.58 percent, respectively, while the credit risk-weighted assets' RWA was 88.32 percent. In comparison to end-December 2022, market risk-weighted assets as a ratio of total RWA fell by 0.35 percentage points during the review period, while credit risk-weighted assets and operational risk-weighted assets as a ratio of total RWA increased by 0.11 and 0.25 percentage points, respectively (Figure 2). Notably, balance sheet exposures accounted for 91.55 percent of the credit risk.

Figure 2: Overall Risk and Credit Risk Structure



Source: Department of Off-site Supervision; Calculation: FSD, Bangladesh Bank

4.3 Credit Risk Structure:

The top 5 banks had credit risk shares of 24.22 percent and the top 10 banks had credit risk shares of 37.53 percent of the total banking industry risk. As of the end of December 2023, the top 10 banks had 42.50 percent of the system's credit risk, while the top 5 banks' credit risk made up 27.43 percent (Table 3). Comparing the top 5 and top 10 banks to the end of December 2022, the concentration of credit risk rose by 1.33 and 1.32 percentage points, respectively.

Table 3: Credit risk in the banking industry under Basel III (end-December 2023)

Banks	Share in industry credit risk	Share in industry overall risk
Top 5	27.43%	24.22%
Top 10	42.50%	37.53%
All Banks	100.00%	88.32%

Source: Department of Off-site Supervision; Calculation: FSD, Bangladesh Bank

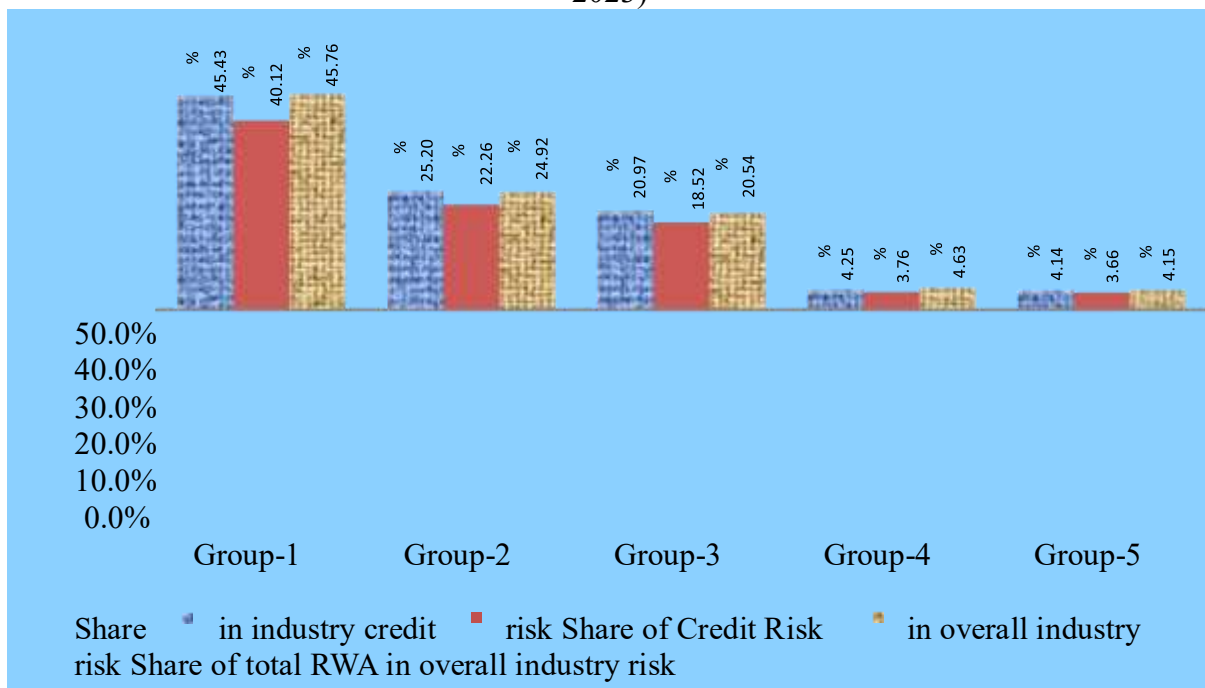
According to the group-wise credit risk study, Groups 1 and 2 continued to bear the majority of the industry's credit risk. In the review year, these two categories' combined share of industry credit risk was 70.68 percent. At 42.09 percent of total assets, Group 1 (21 banks) held 45.76 percent of industry risk and over half of the industry credit risk (45.43 percent).

Although Group 2 (11 banks) possessed 25.97 percent of the total assets, they also accounted for 24.92 percent of the total industry risk and around one-fifth of the industry credit risk (25.20 percent). Full-fledged Islamic banks made up Group 3 (9 banks), which owned 22.43 percent



of the total assets and had 20.97 percent of the industry credit risk and 20.54 percent of the industry risk overall (Table 1). While their respective shares of the industry's credit risk were 4.25 percent and 4.14 percent for foreign commercial banks (Group 4) and fourth-generation private commercial banks (Group 5), their respective shares of the industry's overall risk were 4.63 and 4.15 percent (Figure 3).

Figure 3: Category-Wise Dissection of Credit Risk in the Banking System (End-December 2023)



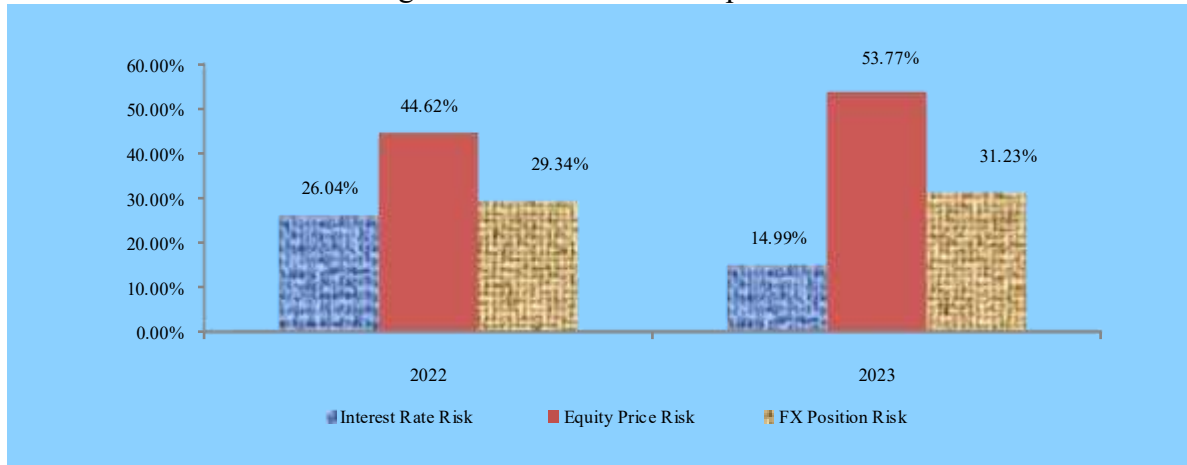
Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

4.4 Market Risk Structure

Figure 4 shows the breakdown of various market risk categories in banks as of the end of December 2022 and the end of December 2023. Just 3.10 percent of the total industry risk was attributable to market risk (Figure 2). Remarkably, the risk dropped in proportion to the overall risk of the banking industry (3.45 percent in 2022). Additionally, the nominal amount of risk-weighted assets declined by 4.98 percent in 2023, indicating a decrease in risk. Equity price risk accounted for more than half of market risk, or 53.77 percent, while interest rate and foreign exchange rate risk contributed 31.23 and 14.99 percent, respectively (Chart.4). Foreign exchange risk and equity price risk rose in 2023 compared to the previous year, despite a decline in interest rate risk.



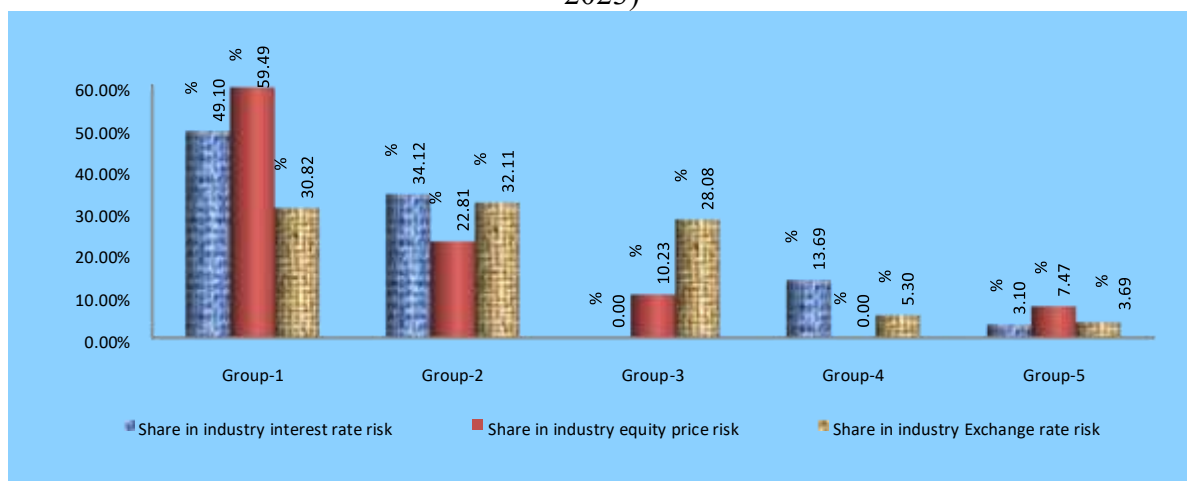
Figure 4: Market Risk Composition



Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

Groups 1 and 2 were collectively exposed to 83.22 percent of the entire interest rate risk during the evaluation period, which was 89.57 percent in 2022, according to category-wise analysis. These two groups' equity price risk was 82.30 percent in 2023 as opposed to 81.07 percent in 2022. Additionally, banks in Groups 1 and 2 held 62.93 percent of the industry's overall foreign exchange rate risks, which is a significant drop from 75.12 percent the year before. Furthermore, in 2023, Group 3, which includes all Islamic Shari'ah banks, held 28.08 percent of the currency rate risks, which shows an upward tendency (18.85 percent in 2022). It was discovered that the banks in Groups 4 and 5, which accounted for less than 10% of total assets, were less vulnerable to market risk in the banking sector (Figure 5).

Figure 5: Category-Wise Dissection of Market Risk in the Banking System (End-December 2023)



Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

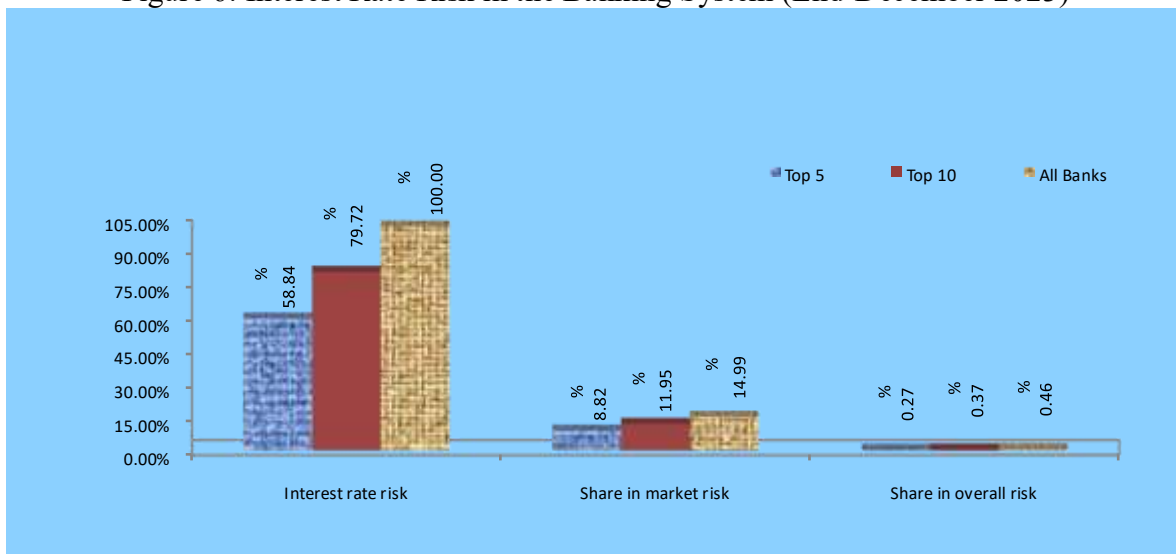


4.5 Interest Rate Risk (IRR)

In 2023, interest rate risk (IRR) accounted for 0.46 percent of the total RWA of the banking sector, up from 0.90 percent in 2022. The RWA associated with interest rate risk decreased by 45.29 percent from the previous year. In 2023, IRR accounted for 14.99 percent of the market RWA, up from 26.04 percent in 2022. In 2022, the banks' capital charge for interest rate risk was BDT 12.07 billion; in 2023, it was BDT 6.6 billion.

In 2023, 58.84 percent of the industry's interest rate risk was attributable to the top five banks. Two SOCBs, two conventional PCBs, and one overseas conventional PCB were in the top 5 in terms of capital charges for interest rate risk (IRR) in the banking sector. The top 10 banks held 11.95 percent of the market risk throughout the review period, with interest rate risk accounting for 14.99 percent. In comparison to 2022, interest rate RWA as a percentage of the industry's total RWA fell from 0.57 percent to 0.27 percent for the top 5 banks and from 0.71 percent to 0.37 percent for the top 10 banks. Compared to the previous period, the IRR shares of the top 5 banks fell, and the shares of the top 10 banks climbed marginally, but their market risk shares fell over the review period (Figure 6).

Figure 6: Interest Rate Risk in the Banking System (End-December 2023)



Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

4.6 Equity Price Risk

At the end of December 2023, the RWA allocated to equity price risk made up 53.77 percent of the total market risk and 1.66 percent of the banking system's overall RWA. By the end of 2023, the banks' capital charge for stock price risk was BDT 23.68 billion, up from BDT 20.68 billion at the end of 2022. In 2023, 31.36 percent of the industry's equity price risk was borne by the top 5 banks. Three PCBs and two SOCBs were among the top five in the banking system for capital costs related to equity price risk. The largest percentage (53.77 percent) of market risk throughout the assessment period came from equity price risk. Both the top 5 banks (0.50 percent in 2022) and the top 10 banks (0.84 percent in 2022) had higher equity price RWA shares in the industry's total RWA in 2023 compared to 2022 (Table 4).



Table 4: Equity Price Risk in the Banking System (End-December 2023)

Banks	Equity Price risk	Share in market risk	Share in overall risk
Top 5	31.36%	16.86%	0.52%
Top 10	54.08%	29.08%	0.90%
All Banks	100.00%	53.77%	1.66%

Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

4.7 Exchange Rate Risk

In 2023, the banking industry's share of market risk was 31.23 percent, while the RWA related to currency rate risk made up 0.97 percent of the overall RWA. The banks' capital charge increased from BDT 13.60 billion at the end of 2022 to BDT 13.75 billion at the end of 2023 due to exchange rate risk. The top 5 and top 10 banks were exposed to 41.94 and 59.84 percent of the industry's exchange rate risk in 2023, respectively; in 2022, the equivalent numbers were 43.81 and 67.96 percent. It is noteworthy that while overall risk decreased in 2023, the top 5 banks' share of exchange rate risk in market risk increased. Conversely, compared to 2022, the top 10 banks' proportions of exchange rate risk in market risk and overall risk declined (Table 5).

Table 5: Exchange Rate Risk in the Banking System (End-December 2023)

Banks	Exchange rate risk	Share in market risk	Share in overall risk
Top 5	41.94%	13.10%	0.41%
Top 10	59.84%	18.69%	0.58%
All Banks	100.00%	31.23%	0.97%

Source: Department of Off-site Supervision; Calculation: FSD, Bangladesh Bank.

4.8 Operational Risk

By the end of December 2023, operational risk's RWA accounted for 8.58 percent of the banking industry's overall RWA. As of the end of December 2023, the needed capital charge for operational risk was BDT 122.06 billion, a 9.01 percent increase over the previous year. The top 5 and top 10 banks in 2023 were exposed to 26.01 and 43.54 percent of the operational risk of the industry, respectively. This is a slight change (reduction) from the previous year (Figure 7).

The banks in Groups 1 and 2 were collectively exposed to 69.08 percent of the industry's operational risk, according to the category-wise operational risk study (Figure 8). Compared to 2022, the bank groups' operational risk shares of the overall industry risk rose.



Figure 7: Operational Risk in the Banking Industry in Line With Basel Iii

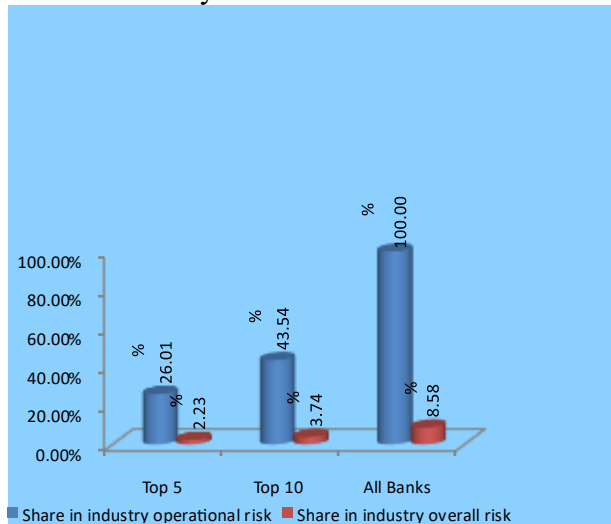
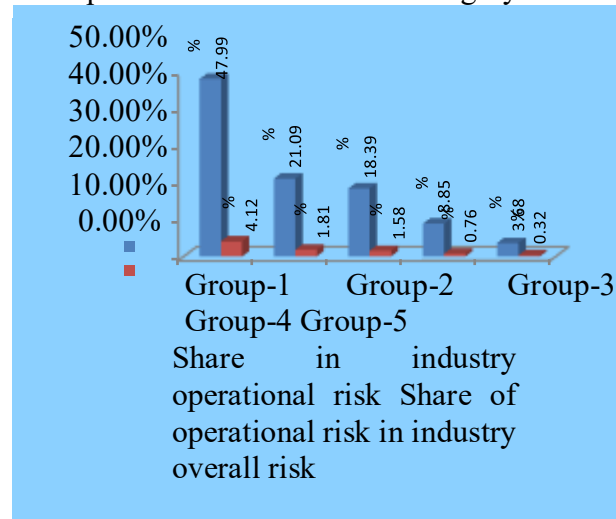


Figure 8: Category-Wise Dissection of Operational Risk in the Banking System



Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

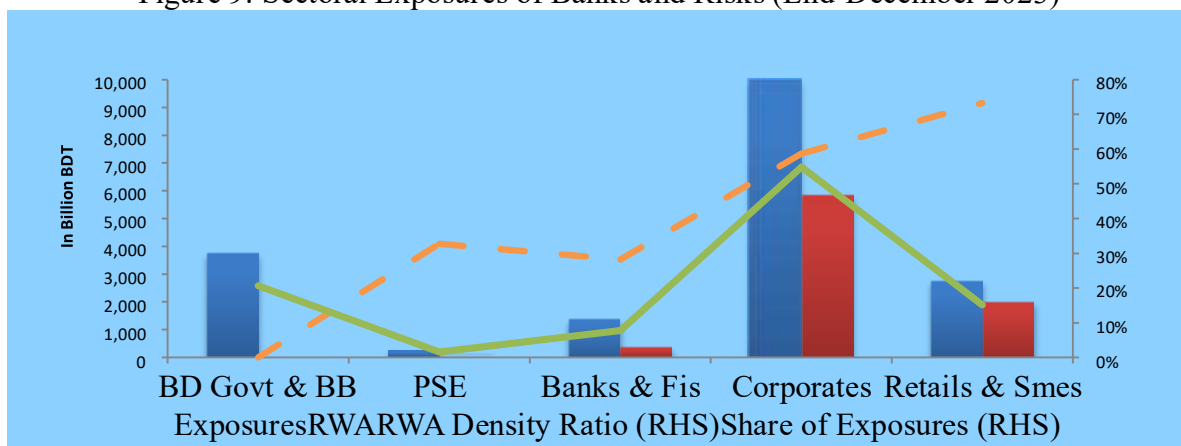
4.9 Sectoral Exposure and Risk

Banks' exposure to the corporate sector was 54.82 percent as of the end of December 2023. Retail and SMEs accounted for 15.13 percent of overall exposures, while Government Securities and Balance with Bangladesh Bank accounted for 20.68 percent (Figure 9).

Among the credit exposures of the sectors, the retail and small business sectors had the greatest RWA density ratio, at 73.25 percent. This resulted from the fact that, in accordance with the Basel Accords, retail and SME loans were issued primarily for trading purposes, where they were given greater risk weights.

While the RWA density ratio for placement and lending to banks and financial institutions was 28.19 percent in 2023, it was 58.70 percent for corporate exposures (Figure 9).

Figure 9: Sectoral Exposures of Banks and Risks (End-December 2023)



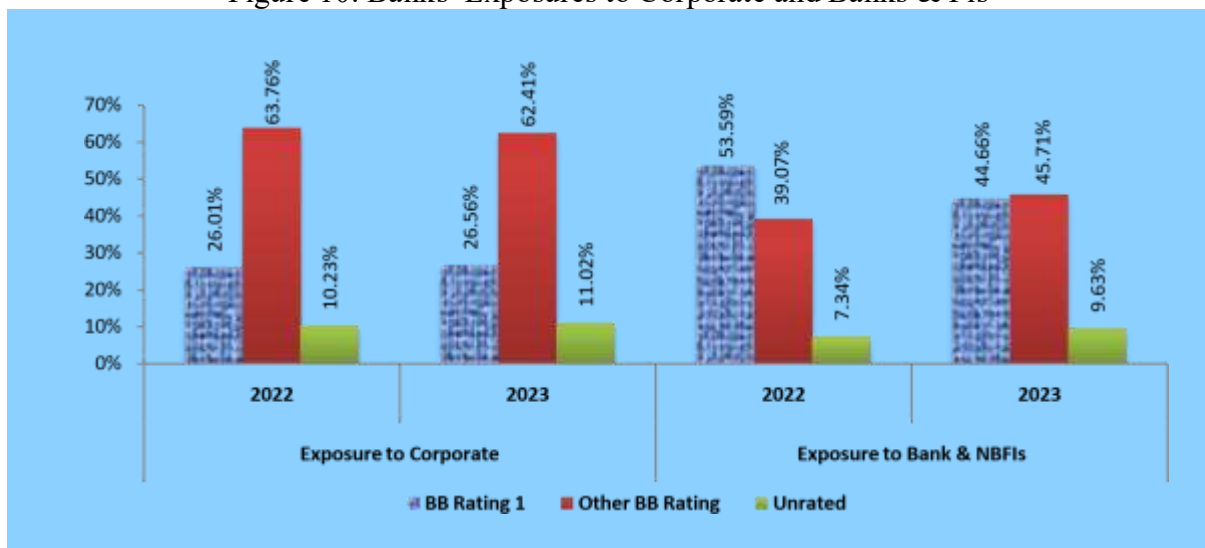
Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.



4.10 Credit Risk Mitigants

Compared to 2022, the overall exposure to banks, financial institutions, and the business sector increased in 2023. The entire amount of money exposed to the business sector at the end of 2023 was BDT 10,000.00 billion, which was BDT 864.36 billion more than the previous year. As illustrated in Chart 3.10, the banking system's overall rating exposure to the corporate sector decreased. With a total rated exposure of 88.98 percent, the best-ranked exposure in December 2023 was 26.56 percent. In comparison to December 2022, BB Rating 1 decreased by 8.93 percentage points for the banks and financial institutions sector and increased by 0.55 percentage points for the business sector in December 2023. The other BB rating for the corporate sector decreased 1.35 percentage points from 2022 to 2023, whilst the banks and financial institutions sector saw a 6.64 percentage point increase. The total amount of credit exposure to banks and financial institutions was BDT 1,418.70 billion, a decrease of BDT 48.55 billion from the year before. The total amount of unrated exposure to banks and financial institutions was substantially lower than the total amount of rated exposure. 44.66 percent of matured credit exposures to banks and financial institutions were recognized as having a BB Rating 1 in 2023, which is an 8.93 percentage point drop from 2022. But compared to 2022, the other BB-rated exposures to banks and financial institutions grew by 6.64 percentage points in 2023.

Figure 10: Banks' Exposures to Corporate and Banks & Fis



Source: Department of Off-site Supervision, Calculation: FSD, Bangladesh Bank.

5. CONCLUSIONS

This methodology offers a thorough framework for evaluating the banking industry's risk profile, with an emphasis on market risk components and RWA density ratios. The results provide insightful information about the risk management strategies of various bank types and advance knowledge of the general stability of Bangladesh's banking sector. The risk profile of the banking industry is thoroughly examined in this study, with particular attention paid to RWA density ratios and the segmentation of market risk. In addition to highlighting the general



trends in the stability and risk mitigation initiatives of the banking industry between 2019 and 2023, the report provides insightful information on how various bank categories manage their risk exposures by examining these important indicators.

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