Profitability, marketability, and CSR disclosure efficiency of the banking industry in Bangladesh

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1. Introduction

Banks play a crucial role in developing an economy through pumping funds into the financial sector, mobilizing funds from surplus units to deficit units, and providing numerous innovative services. The banking sector has attracted tremendous attention from customers, analysts, and regulators. However, banks have also encountered criticism for high non-performing loans, a lack of good governance, political intervention, money laundering, and mismanagement by some bankers in Bangladesh. It ultimately affects the banking sector's efficiency and productivity, which constrains firms and industries from expanding businesses that could become pillars of strength for long-term economic growth. Assurance of efficiency and productivity in the banking industry is crucial for the proper functioning of the banking system (Martens et al., 2021; Rashid et al., 2020c). It is also crucial to examine banks' efficiency since it directly affects the stability of the banking sector and the effectiveness of the country's economic policy. After the revelation of notorious fraudulent events in the banking sector caused by inadequate legislation and supervisory mechanisms, banks are under extreme condemnation for failing to provide feedback to stakeholders. The Hallmark scandal at Sonali Bank was one of such fraudulent cases in the banking industry of Bangladesh (Rashid and Hossain, 2022).

Bangladesh government has planned to see the country in the upper-middle class by 2030 and a high economic nation by 2041. However, it is pretty impossible to achieve these economic goals without improving the efficiency of the banking sector. According to the Bangladesh Bureau of Statistics (BBS), the contribution of the financial service sector to GDP fell from 7.38% in 2018–19 to 3.39% in 2019–20 (Kabir, 2020). Moreover, profitability and credit conditions are significantly shrinking. Due to the ongoing financial crisis, most banks have failed to demonstrate considerable progress on different banking indicators, such as non-performing loans, return on assets, risk capital retention, weighted assets, liquid assets, return on equity, and surplus liquidity. Additionally, the banking sector has become competitive over the years, compelling them to examine their performance for survival in the competitive market. Further, corporate social responsibility (CSR) disclosure

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performance is crucial for sustainable investment and growth. Given the above, it is essential to investigate the profitability, marketability, and CSR efficiency of listed banks in Bangladesh.

Prior studies focused on measuring banks' profitability efficiency. For instance, Vera-Gilces et al. (2020) have measured banking profitability based on Latin America. Chao et al. (2018) have analyzed the efficiency, profitability, marketability, and technology gaps in the banking industry in Taiwan. In addition, some studies have examined profitability and marketability efficiency (Abbas and Arizah, 2019). However, stakeholders, such as shareholders, creditors, governments, and the media, are concerned about whether the Bangladeshi banking industry performs any CSR in the societies where they operate their businesses (Jahid et al., 2020).

Further, customers' demand for Islamic banking products and services is increasing significantly in Bangladesh, a Muslim-majority country (Rashid et al., 2020b). Though the number of Islamic banks is lower than conventional ones, their deposit and investment growth are higher than conventional ones (Rashid et al., 2020a). Thus, it is crucial to investigate whether there is any significant difference between conventional and Islamic banks regarding efficiency. Prior studies have compared the profitability efficiency between conventional and Islamic banks in Islamic Cooperation Countries and the United Kingdom (Yanikkaya et al., 2018), Pakistan (Khan et al., 2017), and Indonesia (Sukmana et al., 2020). However, the comparison between conventional and Islamic banks regarding marketability and CSR efficiency has yet to be investigated.

A firm efficiency depends on several factors. Due to limited access to credit, difficulty in raising capital from the stock market, excessive reliance on loans, illiquidity of assets, liquidity problems, and financial constraints reduce trust in the capital and money markets, which reduces firm investment options (Bae et al., 2022; Bodnaruk et al., 2015). The financially constrained firm also depends on external debts, which charge high interest and reduce firm efficiencies. Ineffective capital management compromises a company's financial stability, which reduces its long-term investment potential and affects its efficiencies. The liquidity problem also prevents financially constrained businesses from funding specialized initiatives like climate mitigation (Ahmad et al., 2017). As financially constrained firms are less inclined to invest in socially responsible projects like climate projects (Bae et al., 2022; Rashid and Uddin, 2018), they may not be interested in investing in CSR activities. Therefore, financial constraints may also affect a firm CSR efficiency.

Moreover, corporate governance in Bangladesh is weak compared to developed countries, as politicians control the majority of Bangladeshi companies (Muttakin et al., 2018). Rashid and Hossain (2022) mentioned that among the members of parliament, 59% and 61.07% in the 10th and 11th parliaments, respectively, were businessmen. Moreover, Muttakin et al. (2018) found that politicians play a negative role in CSR disclosures and diminish the positive role of board independence. Moreover, while discussing the role of corporate governance, Sobhan and Bose (2019) mentioned that "in many Bangladesh companies, the board of directors and management is nothing but an extension of sponsors." As insider ownership (director ownership) is generally informed by incentive alignment and entrenchment, they significantly reduce CSR disclosure (Ullah et al., 2019). Therefore, weak corporate governance may also affect the efficiency of CSR disclosure. On the other hand, a firm with political connections obtains advantages in government resources, avoidance of regulatory compliance, and reduction of stakeholder pressure (Ullah et al., 2019), which positively impacts firm efficiencies. Nevertheless, Rashid and Hossain (2022) found that politicians show a negative attitude toward CSR disclosure in the Bangladeshi banking industry, which may reduce stakeholder satisfaction and affect firms' efficiencies. Therefore, the current study investigates the impact of firm financial constraints, political connections, and Shari’ah regulations on firm efficiencies.

This study used data envelopment analysis (DEA)—a popular approach to measuring comparative efficiency. Several prominent assumptions have made DEA a powerful and impressive method for performance analysis. First, DEA is a technique that focuses on boundaries rather than fundamental patterns (Cooper et al., 2000). Second, it does not have to make distributional features about the residuals as a non-parametric technique (Abbott and Doucouliagos, 2003). Third, it has the opportunity to avoid the need to make the former features the functional form of the best practice frontier, compared to conventional approaches according to predefined model structures, such as the Stochastic Frontier Analysis (SFA) (Cooper et al., 2000). Ruggiero (2007) has proved that the SFA model does not generate better results than DEA.

Based on the data of 29 listed banks in Bangladesh covering the period from 2011 to 2019, this study applies DEA to examine banks' efficiency from three dimensions: profitability efficiency, marketability efficiency, and CSR efficiency, considering a new area for measuring relative efficiency. Further, the study compares these efficiencies between conventional and Islamic banks. Finally, OLS regression has been used to check whether financial constraints, political connections, and Shari’ah regulations affect firms' different efficiencies.

The second section of this paper includes the literature review, conceptual framework, theoretical framework, and the DEA. Section three discusses the research methodology and data analysis method, while section four is related to the analysis of the results and discussion. The final section presents the conclusion, contribution, limitations of the study, and future research directions.

2. Literature review

Efficiency measurement has been a common field of study across disciplines for many years. Recently, it has become essential to evaluate the effectiveness of financial institutions because of the rapid growth of financial markets and the economic advancements of nations. Customers expect standard service, better returns, greater protection, and the soundness of financial systems. These expectations can be fulfilled only if financial institutions work efficiently. Further, financial institutions with higher efficiency can expect the opportunity to raise more funds and increase profitability. Henriques et al. (2018) stated that DEA could be used to measure bank performance, either by measuring efficiency indices or by a more in-depth discussion of different efficiencies, including return to scale (RTS) forms of efficiency.

2.1. Profitability

Profitability ratios determine the ability of a company to generate profit in relation to its revenue, operating costs, assets, or shareholders' equity. Profitability ratios represent how effectively a business produces profit and benefits shareholders. Higher ratio outcomes are often favourable but provide further insight when compared with the results of comparable firms, the company's historical success, or the industry average. Profitability ratios evaluate the ability of a business within a particular context to generate profit. On the other hand, efficiency ratios measure how effectively a business uses its resources to profit. Prior studies measured profitability with the help of profit on assets (ROA) and return on equity (ROE) (Shahwan and Hassan, 2013). Robin et al. (2018) have assessed banks' profitability through net interest margin (NIM), ROE, and ROA. Luo (2003) indicated profitability as an essential exponent of marketability since the actual value should be identified according to its current stock price.

2.2. Marketability

Marketability measures whether a commodity or service can appeal to consumers and be sold to make a profit at a specific price. Product developers should complete a marketability evaluation before selling products. Abbas and Arizah (2019) have stated that the marketability of a business to gain market power is expressed by the market concentration trend. Banking sectors in developed and emerging markets are
distinguished by increased market power. Market power can be described by structure-conduct performance, identifying market concentration and share (Masud et al., 2019). The marketability efficiency has been measured based on the prior studies of Rakshit (2019) in India, Abbas and Azriah (2019) in Indonesia, Chao et al. (2018) in Taiwan, and Shahwan and Hassan (2013) in the UAE.

2.3. Corporate social responsibility (CSR)

The European Commission (2001) defined CSR as a voluntary activity in which organizations are dedicated to contributing to social change and a healthier environment. According to Li and Lee (2012), CSR is a way for an organization to develop its public image and reputation through activities that meet the needs of society. CSR activities, in general, are more concerned with long-term success than short-term profit (Jahid et al., 2022). A business that adopts CSR principles gains several advantages, including an enthusiastic attitude towards brands, consumer engagement, positive advertising, customer trust, and improved financial results. In addition, CSR operations increase client loyalty and provide a competitive advantage. The involvement of banks in CSR activities has been seen as a win-win business model intended to improve the well-being of the people and the income of banks (Gangi et al., 2019). Furthermore, CSR is positively related to the financial performance of businesses (Rashid and Hossain, 2022). CSR increases a firm value and enhances its reputation and corporate image in the market (Jahid et al., 2020; Masud et al., 2022). Therefore, CSR engagement may have a significant impact on the efficiency of banks.

Studies concerning corporate governance of the banking industry in Bangladesh showed mixed results. For example, Jahid et al. (2020) found that the audit committee size has a significant negative impact. On the other hand, Khan et al. (2013) found a positive relationship between the audit committee and CSR disclosure. In the financial sector of Bangladesh, Jahid et al. (2022) found a significant positive impact of managerial ownership on CSR, while Ullah et al. (2019) found a significant negative effect. Moreover, Rashid and Hossain (2022) documented that while board independence positively influences the CSR discourse, politicians reduce CSR disclosure in the banking industry. Similarly, Muttakin et al. (2018) found that politicians not only play a negative role in CSR disclosures but also diminish the positive role of board independence. However, Sobhan and Bose (2019) commented that the board of directors of Bangladesh, including independent and non-sponsor affiliated executive directors, has either negligible or no ownership interest in the companies; they cannot hold up strong corporate governance. Therefore, it is necessary to investigate whether corporate governance plays a role in CSR disclosure efficiency.

2.4. The data envelopment analysis (DEA) and banking efficiency

Charnes, Cooper, and Rhodes originally founded DEA in 1978 (Charnes et al., 1978). Later, it was expanded by Banker and Kapoor (1984). The DEA is one of the most influential mathematical techniques for calculating the overall efficiency of units with specific inputs and outputs (Edalatpanah, 2020). It has been used by diverse institutions, including businesses, governments, and non-profit organizations, such as schools, hospitals, military units, police forces, court and criminal justice systems, countries, regions, etc. (Cooper et al., 2006). For example, Missiame et al. (2021) assessed the effect of bank access to loans on technical efficiency by farmers in Ghana. Thus, the term “Decision Making Unit (DMU)” was introduced to cover any such entity flexibly, with each entity being evaluated as part of a collection that uses similar inputs to produce equivalent outputs. The DEA is a well-known technique for assessing efficiency among DMUs (Azad et al., 2020). In the non-parametric research stream, DEA rapidly caught the attention of all areas of researchers and practitioners within a short time (Martins et al., 2021). It helps evaluate the relative efficiencies of DMU by calculating various inputs and outputs (Azad et al., 2020). On the other hand, Koopmans (1957) used the term “efficiency” first. According to him, technical efficiency defines the ability to optimize output, sustain constant input, or maximize input while maintaining the output level unchanged.

Many studies have used the DEA approach in numerous sectors in different countries. For example, Kaffash et al. (2018) used DEA to measure financial stability and bank efficiency, whereas Li et al. (2019) used it to measure the banks’ operating efficiency. Using the DEA model, Fernandes et al. (2018) measured the performance of European domestic banks, Vera-Gilces et al. (2020) measured the profitability of Latin American banks, and Henriques et al. (2018) measured the efficiency of Brazilian banks. Asmild et al. (2019) estimated the efficiency of Islamic banks during the global financial crisis in Bangladesh using DEA. Zheng et al. (2022) found a significant and positive impact of CSR disclosure on firm productivity in the Bangladeshi banking industry.

3. Research methodology

3.1. Sample size

This study is based on secondary data collected from the annual reports and websites of the sample listed banks. There were 30 listed banks in Bangladesh as of December 31, 2019. Due to continuous negative performance in operational activities, ICB Islami Bank Ltd. has been dropped from the sample. Thus, this study considers a sample of 29 banks (6 Islamic and 23 conventional) covering ten years of data from 2012 to 2021, and thus the sample consisted of a total of 290 firm-years of data (29 banks × 10 years) for input and output variables. The study considers its sample period from 2012 as the Bangladesh Securities and Exchange Commission (BSEC) issued Corporate Governance Guidelines in 2012 (BSEC, 2012). In addition, CSR disclosure data was collected from disclosures of CSR and corporate governance, directors’ reports, chairmen’s statements, and notes to the financial statements in annual reports.

3.2. The input and output of the DEA model

The most crucial step in calculating the relative efficiency of banks using DEA is the selection of suitable inputs and outputs (Yue, 1992). However, there is no specific policy to present acceptable inputs and outputs for calculating the efficiency of banks (Avkiran, 2011). Luo (2003) measured profitability with the help of three inputs (equity, employees, and total assets) and two outputs (profits and revenue). Rakshit (2019) evaluated the profitability and marketability efficiency of Indian commercial banks. The researcher used three inputs (assets, equity, and employees) and two outputs (revenue and profits) to measure profitability efficiency. On the other hand, two inputs (revenue and profits) and three outputs (market, stock price, and EPS) were used to measure marketability efficiency. Belasri et al. (2020) measured CSR and firm efficiency with the help of three inputs (staff costs, fixed assets, and equity) and two outputs (loans and securities). Fatema et al. (2019) investigated the efficiency and productivity of commercial banks in Bangladesh with the help of two inputs (number of employees and fixed assets) and two outputs (total deposits and total loans & advances).

Balci and Ayyaz (2020) analyzed the efficiency and productivity of Turkish banks by using four ratios as inputs (personal expenses/total assets, total loans/total assets, equity/total assets, and total deposit/total assets) and two outputs (ROA and ROE). Kaffash et al. (2018) measured the financial stability and efficiency of banks with the help of five inputs (total non-interest expenses, other operating expenses, fixed assets, deposits, and equity) and four outputs (gross interest & dividend income, total non-interest operating income, loans, and net income). Li et al. (2019) measured the operating efficiency of banks by applying three inputs (number of employees, deposits, and fixed assets) and three outputs (loans, investment, and other income). Qamruzzaman and Jianguo (2016) identified the financial efficiency of Bangladeshi banks by using five inputs (deposits, loans, total assets, investment, and capital) and
three outputs (ROE, ROA, and net profit margin). Shahwan and Hassan (2013) used six inputs (existence of audit committee, proportion of Sheikhs, percentage of institutional ownership, director ownership, EPS, and P/E ratio) and one output (social disclosure index) for measuring social disclosure efficiency.

Based on the previous literature, we selected profitability, marketability, and CSR as the metrics to measure the efficiency level of Bangladeshi commercial banks. Accordingly, the study has selected three inputs (total deposits, total operating expenses, and leverage) and two outputs (ROA and ROE) to measure profitability efficiency. Similarly, two inputs (ROA and ROE) and two outputs (P/E ratio and EPS) have been used for marketability efficiency. Therefore, we have used six inputs (the existence of audit committee, the board size, institutional ownership percentage, director ownership, EPS, and P/E ratio) and one output, CSRD. Table 1 summarizes the inputs and outputs of profitability, marketability, and CSR efficiency. It is noteworthy to mention that both Islamic and conventional banks are considered similar entities, and the same input/output variables are used to evaluate their efficiencies. Moreover, they are operated and controlled under same regulatory bodies, i.e., the central bank of Bangladesh and Bangladesh Securities and Exchange Commissions.

The CSR disclosure index was developed by incorporating all information into 22 items covering the central bank of Bangladesh and Bangladesh Securities and Exchange Commissions.

According to Sharma et al. (2013), there are two types of methods for measuring efficiency. The first one is SFA, and the second one is DEA. We used the non-parametric DEA model for efficiency analysis, similar to the Cooper et al. (2011) efficiency model. The efficiency is measured as below:

\[
\text{Min } \theta - \varepsilon \left( \sum_{i=1}^{m} s_i^{-} + \sum_{j=1}^{n} \eta_j^{+} \right) \quad \text{Subject to}
\]

\[
\sum_{i=1}^{m} \lambda_{ir} x_{ij} - s_i^{-} = y_{ir} \quad i = 1, 2, \ldots, m; \quad r = 1, 2, \ldots, s_i
\]

\[
\sum_{j=1}^{n} \eta_j^{+} = y_{00} \quad j = 1, 2, \ldots, n
\]

Where, \( \eta_j^{+} \) and \( s_i^{-} \) are the input and output results respectively. To find out the result of this model, we opt to equivalent linear programming transformation, which is explained in the following equations:

\[
\text{Min } h(\eta, \xi) = \sum_{r} \frac{\eta_{ir}}{\xi_{r0}} \quad \text{subject to}
\]

\[
\sum_{r} \frac{\eta_{ir} y_{0r}}{\xi_{r0}} - 1 \text{ for } j = 1, \ldots, n
\]

\[
\eta_{ir}, \xi_{r0} \geq 0 \text{ for all } i \text{ and } r
\]

In which, \( \Theta \) is an efficiency score. It presents the long-range distance from the measured production frontier to the DMU. The result of this model yields a maximum efficiency score.

### Table 1. Variable measurements.

| Variables | Nature | Measurement |
|-----------|--------|-------------|
| **Panel A: Variables used in assessing the banks’ efficiencies** | | |
| **Profitability efficiency** | | |
| Deposit | Input | The total amount of deposits |
| Operating expense | Input | The total amount of operating expenses |
| Leverage | Input | Total assets divided by total debts |
| ROA | Output | Return on assets is calculated as a ratio of net profit to total assets. |
| ROE | Output | Return on equity is calculated as a ratio of net profit to total equity. |
| **Marketability efficiency** | | |
| ROA & ROE | Input | Defined as above. |
| EPS | Output | Earnings per share are calculated as net profit divided by total outstanding shares. |
| P/E ratio | Output | A price-earnings ratio is calculated as market value per share divided by earnings per share. |
| **CSR efficiency** | | |
| EPS & P/E ratio | Input | Defined as above. |
| Board size | Input | Number of total members on the board |
| Audit committee | Input | Number of audit committee members on the board |
| Directors’ ownership | Input | Percentage of ownership held by the members of the board of directors |
| Institutional ownership | Input | Percentage of ownership held by institutions |
| CSRD | Output | It is a CSR disclosure index prepared based on the content analysis of 22 items. |
| **Panel B: Variables used in OLS regression analysis** | | |
| **Independent variables** | | |
| Financial constraints | It is a KZ proxy for financial constraints. |
| Shari’ah | If the firm follows Shari’ah regulations, the value is 1, and otherwise it is 0. |
| Political connection | A value of 1 is put if the firm has had any board members previously or is currently involved in party politics, and 0 otherwise. |
| **Control variables** | | |
| Firm size | The logarithm of total assets. |
| Leverage | Total debt divided by total assets. |
| Age | The number of years in business. |
| MB | Market to book value |
| GRI | A value of 1 is input if a firm follows global reporting initiative (GRI) guidelines, and 0 otherwise. |
| BIG4 | A value of 1 is put if a firm is audited by a representative of any of the big four recognized accounting firms and 0 otherwise. |
| Year dummy | Year dummy variables |
score is 0 or 1. $\lambda j$ are the highest weights of proposed units for unit j; $xij$ is the value of the ith input to j; $yij$ is the result of the rth output from point j, $\text{s}_r$ and $\text{s}_i$ are slacks of input & output gradually. On the other hand, $\varepsilon$ is non-archimedian, lower than other odd numbers and $> 0$. The DEA explained in equation (3) indicates (1) the Charnes, Cooper and Rhodes (CCR) model which is input-oriented, and CRS can be changed into (2) the Banker, Charnes, and Cooper’s model if it constrains the value $\sum \lambda j = 1 \lambda j = 1$ is adjusted. BCC model, as explained by Cooper et al. (2011) is as follows:

$$\text{Min} \ \theta - \varepsilon \left( \sum_{i=1}^{m} \lambda i - \sum_{r=1}^{n} s_r \right) $$ Subject to

$$\sum_{j=1}^{n} x_{ij} \lambda_i + s_i - y_{ij} \varepsilon = 0 K_{0} \ i = 1, 2, \ldots, m; \quad (4)$$

$$\sum_{j=1}^{n} x_{ij} \lambda_i - s_i = y_{ij} + \varepsilon \quad \lambda_j \geq 0 \ j = 1, 2, \ldots, n$$

### 3.4. Model

Finally, ordinary least square (OLS) regression has been used to check whether the financial constraints, political connections and Shari’ah impact on the banks’ efficiencies (profitability, marketability, and CSRD efficiencies). The following model has been used to run OLS.

#### Profitability Efficiency

$$\text{Profitability Efficiency}_{it} = \alpha_0 + \beta_1 \text{Financial constraints}_{it} + \beta_2 \text{Political connection}_{it} + \beta_3 \text{Shari’ah}_{it} + \beta_4 \text{Firm size}_{it} + \beta_5 \text{MB}_{it} + \beta_6 \text{GRI}_{it} + \beta_7 \text{BIG4}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{Year dummy}_{it} + \varepsilon_{it}$$

#### Marketability Efficiency

$$\text{Marketability Efficiency}_{it} = \alpha_0 + \beta_1 \text{Financial constraints}_{it} + \beta_2 \text{Political connection}_{it} + \beta_3 \text{Shari’ah}_{it} + \beta_4 \text{Firm size}_{it} + \beta_5 \text{MB}_{it} + \beta_6 \text{GRI}_{it} + \beta_7 \text{BIG4}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{Leverage}_{it} + \beta_{10} \text{Year dummy}_{it} + \varepsilon_{it}$$

#### CSRD Efficiency

$$\text{CSRD Efficiency}_{it} = \alpha_0 + \beta_1 \text{Financial constraints}_{it} + \beta_2 \text{Political connection}_{it} + \beta_3 \text{Shari’ah}_{it} + \beta_4 \text{Firm size}_{it} + \beta_5 \text{MB}_{it} + \beta_6 \text{GRI}_{it} + \beta_7 \text{BIG4}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{ROE}_{it} + \beta_{10} \text{Year dummy}_{it} + \varepsilon_{it}$$

Here, $\alpha_0$ = constant; $\beta_1$ to $\beta_{10}$ = are the coefficients of the variables; $\varepsilon = \text{error term}; i =$ number of banks and $t =$ number of periods. The variables are defined in Table 1.

### 4. Results and discussions

#### 4.1. Descriptive statistics

Descriptive statistics of all the variables are shown in Table 2. Table 2 represents that the average efficiency scores of profitability, marketability and CSRD performance are 0.70, 0.56 and 0.90, respectively, indicating that the Bangladeshi banks are inefficient. Nevertheless, among the efficiency scores, CSRD efficiency is higher compared to profitability and marketability efficiency. The average CSRD disclosure score of 17.76 is satisfactory within the range of 8–22, indicating that most banks disclose CSR items in their annual reports. Moreover, the descriptive statistics show that directors hold the highest shares in Bangladeshi listed banks, with a mean of 35.62%. Though the average board size 14.02 is good for banks, the average audit committee size of 4.36 is below the standard 5 set by Bangladesh Bank. The EPS ranges between BDT -3.99 and 21 with a mean value of 2.68, whereas the P/E ratio ranges between -7.72 to 116.67 with an average score of 11.02, indicating a high diversity among the sample banks. Some banks are performing well, while others are facing a critical situation with a severe loss as the profitability indicators of ROA and ROE vary among the sample banks, ranging from adverse to positive. However, many banks face financial constraints as the mean score of KZ is 41.56, within the range of 21.06 and 89.64. The descriptive results also show that 31% of firms are politically connected, 21% of banks comply with Shari’ah regulations, 44% of the sample banks are audited by any of the big four accounting firms, and 41% of the banks follow GRI guidelines while preparing their sustainability reports.

#### 4.2. Firms’ profitability, marketability and CSRD efficiency

Table 3 shows the average profitability, marketability and CSRD efficiencies scores of sample banks in Bangladesh. From the profitability efficiency perspective, the overall average efficiency score (0.703) and individual banks’ average efficiency scores over the sample period are less than 1, indicating no banks are efficient. The overall average score indicates that Bangladeshi banks are almost 30% inefficient from the profitability perspective. Among the sample banks, the average efficiency score of Southeast Bank Limited 0.976 is the highest over the sample period, 2012–2021, while Mutual Trust Bank Limited stands second with an average score of 0.885. However, the lowest average efficiency score is 0.495 for Jamuna Bank Limited.

In terms of marketability efficiency score, the average efficiency score of Dhaka Bank (0.987) is the highest within the period from 2012 to 2021. Just after Dhaka Bank, BRAC Bank secures its second position with a score of 0.859, while NCC Bank is in the last position with a score of 0.384. The results show that all sample banks’ average efficiency scores are less than 1 over the sample periods, indicating they are inefficient in terms of marketability performance. The overall average marketability efficiency score of 0.56 suggests that Bangladeshi banks are 44% inefficient.

In terms of CSRD efficiency score among the sample banks, the average efficiency score of only Dhaka Bank is 1, indicating Dhaka Bank is efficient, while all other banks’ efficiency scores are less than 1. Moreover, the average efficiency scores of First Security Islami Bank

### Table 2. Descriptive statistics of variables.

| Variables          | Obs. | Mean  | Std. Dev. | Min     | Max     |
|--------------------|------|-------|-----------|---------|---------|
| ROA                | 290  | 0.87  | 0.56      | -2.19   | 2.75    |
| ROE                | 290  | 10.77 | 4.48      | -2.94   | 22.14   |
| Deposit            | 290  | 224577.60 | 147212.40 | 53229.99 | 1381980 |
| Operating expenses | 290  | 6083.15 | 2735.05   | 1503    | 26772.37 |
| Earnings per share | 290  | 2.70  | 2.11      | -3.99   | 21      |
| Price–earnings ratio | 290 | 11.02 | 9.84      | -7.72   | 116.67  |
| Leverage           | 290  | 0.92  | 0.04      | 0.40    | 0.97    |
| CSR disclosure     | 290  | 17.76 | 2.28      | 8       | 22      |
| Board              | 290  | 14.02 | 3.93      | 6       | 23      |
| Audit committee    | 290  | 4.36  | 0.99      | 2       | 8       |
| Institutional ownership | 290 | 19.65 | 10.89     | 0       | 57.06   |
| Director ownership | 290  | 35.62 | 15.51     | 0       | 87      |
| Financial constraints (KZ) | 290 | 41.56 | 13.66 | 21.06 | 89.64 |
| Political connection | 290 | 0.31  | 0.46      | 0       | 1       |
| Shari’ah           | 290  | 0.21  | 0.41      | 0       | 1       |
| Market to book value | 290 | 0.07  | 0.03      | 0.01    | 0.19    |
| Firm size          | 290  | 12.44 | 0.49      | 11.31   | 14.31   |
| GRI                | 290  | 0.44  | 0.50      | 0       | 1       |
| Age                | 290  | 25.37 | 9.97      | 11      | 49      |
| Profitability efficiency | 290 | 0.70  | 0.26      | 0.02    | 1       |
| Marketability efficiency | 290 | 0.56  | 0.25      | 0.19    | 1       |
| CSRD efficiency    | 290  | 0.90  | 0.10      | 0.58    | 1       |
Table 3. Bank-wise average efficiency score of profitability, marketability and CSRD.

| Bank name                        | Profitability efficiency | Marketability efficiency | CSRD efficiency |
|----------------------------------|--------------------------|--------------------------|-----------------|
| AB Bank Ltd (ABBL)               | 0.561                    | 0.553                    | 0.934           |
| Al-Arrafah Islami Bank Ltd (AIBL)| 0.617                    | 0.515                    | 0.932           |
| Bank Asia Ltd (BAL)              | 0.658                    | 0.859                    | 0.984           |
| BRAC Bank Ltd (BRBL)             | 0.617                    | 0.577                    | 0.883           |
| Dhaka Bank Ltd (DBL)             | 0.561                    | 0.987                    | 1.000           |
| Dutch Bangla Bank Ltd (DBBL)     | 0.721                    | 0.730                    | 0.873           |
| Eastern Bank Ltd (EBL)           | 0.639                    | 0.465                    | 0.893           |
| EXIM Bank Ltd (EXIMBL)           | 0.587                    | 0.481                    | 0.943           |
| First Security Islami Bank Ltd (FSIBL) | 0.508                  | 0.692                    | 0.986           |
| Islami Bank Bangladesh Ltd (IBBL) | 0.661                    | 0.540                    | 0.929           |
| IFIC Bank Ltd (IFICBL)           | 0.760                    | 0.483                    | 0.968           |
| Jamuna Bank Ltd (JBL)            | 0.495                    | 0.496                    | 0.893           |
| Mercantile Bank Ltd (MBL)        | 0.823                    | 0.477                    | 0.928           |
| Mutual Trust Bank Ltd (MTBL)     | 0.885                    | 0.440                    | 0.939           |
| National Bank Ltd (NBL)          | 0.831                    | 0.415                    | 0.875           |
| NCC Bank Ltd (NCC)               | 0.778                    | 0.384                    | 0.960           |
| One Bank Ltd (OBL)               | 0.833                    | 0.424                    | 0.861           |
| Premier Bank Ltd (PMBL)          | 0.740                    | 0.581                    | 0.860           |
| Prime Bank Ltd (PBL)             | 0.608                    | 0.606                    | 0.708           |
| Pubali Bank Ltd (PPBL)           | 0.788                    | 0.762                    | 0.808           |
| Rupali Bank Ltd (RBL)            | 0.706                    | 0.445                    | 0.937           |
| Social Islami Bank Ltd (SIBL)    | 0.860                    | 0.524                    | 0.838           |
| Shahjalal Islami Bank Ltd (SIBL) | 0.690                    | 0.452                    | 0.941           |
| Southeast Bank Ltd (SEBL)        | 0.976                    | 0.412                    | 0.893           |
| Standard Bank Ltd (SBL)          | 0.808                    | 0.533                    | 0.933           |
| The City Bank Ltd (CBL)          | 0.725                    | 0.667                    | 0.870           |
| Trust Bank Ltd (TBL)             | 0.647                    | 0.460                    | 0.955           |
| United Commercial Bank Ltd (UCBL)| 0.746                    | 0.575                    | 0.859           |
| Uttara Bank Ltd (UBL)            | 0.561                    | 0.702                    | 0.809           |
| Overall Average                  | 0.703                    | 0.560                    | 0.903           |

(0.986) and Bank Asia (0.984) are almost near 1, indicating that they are efficient and secure in the second and third positions in CSRD efficiency. However, the overall CSRD efficiency score of 0.903 indicates that Bangladeshi banks are 10% inefficient within the 10 years sample period of 2012–2021. Further, the banks’ CSR efficiency score is higher in Bangladesh, within the range of 0.706–1, compared to Egyptian banks’ scores within the range of 0.357–0.786 (Shahwan and Habib, 2021).

The overall average efficiency scores of profitability (0.703), marketability (0.56), and CSRD (0.903) indicate that overall, Bangladeshi banks are inefficient. Nevertheless, the efficiency score of CSR (0.903) is comparatively higher than profitability and marketability efficiency. It is remarkable that, on average, the overall efficiency score indicates that the Bangladesh banking industry is in the vulnerable situation.

Table 4 shows the year-wise efficiency score of profitability, marketability, and CSRD performance. Over the ten years from 2012 to 2021, the highest profitability efficiency score was 0.754 in 2021, and the lowest was 0.574 in 2017. Over the years, the profitability efficiency score trend decreased up to 2017 and again started to go up. On the other hand, the highest marketability efficiency score was in 2017 and fluctuated among the sample periods. Finally, in 2021, the marketability efficiency score reduced dramatically to 0.475. However, regarding CSRD efficiency, the lowest score of 0.871 was in 2012, while the highest score of 0.936 was in 2021. Over the years, CSRD efficiency is increasing in trend. Despite the overall inefficiency of profitability and marketability of the banking industry, the banks are performing well in terms of CSRD efficiency.

4.3. Comparison of efficiencies between Islamic and conventional banks

Table 5 compares the efficiency between Islamic and conventional banks. From the viewpoint of overall profitability efficiency, the average efficiency of Islamic banks is 66 %, compared to 71 % of conventional banks. However, the average profitability efficiency score (0.66) of Islamic banks is lower than that of conventional banks (0.71) by 5%. As the interest is prohibited in Islam, the main focus of Shari’ah-based banking is not to maximize profit; rather, they try to protect the stakeholders’ interests (Rashid et al., 2020b). Though the banking sector of Bangladesh has shown a prolific growth of Islamic banks, profitability is not the main catalyst behind such growth in Bangladesh. Most of the population are Muslims, so they would like to follow Shari’ah in their practical life. Therefore, Rashid et al. (2022) argued that Shari’ah compliance is the most crucial factor for adopting Islamic banks in Bangladesh. In addition to 5% less efficiency of Shari’ah-based banks than conventional banks in terms of profitability efficiency, they are 8% less efficient than conventional banks, regarding marketability efficiency. More specifically, while computing the marketability efficiency score, conventional banks’ efficiency (0.58) is higher than Islamic banks (0.50). On the other hand, while comparing CSR efficiency, Islamic banks are 1% more efficient (0.91) compared to conventional banks (0.90). As the Shari’ah-based banks are more ethical than conventional banks, the former is expected to contribute more to CSR activities. Our findings are consistent with the results of Basah and Yusuf (2013), who documented that Islamic banks were more proactive in CSR policies and actions than conventional banks.

Further, the study uses a t-test to examine whether there are statistically significant variations in the efficiencies between Islamic and conventional banks. The study found no significant variations in profitability and CSRD efficiencies between Islamic and conventional banks. On the contrary, a significant variation in marketability efficiency is found between Islamic and conventional banks at a 5% level of significance. Conventional banks are comparatively more efficient than Islamic banks.

4.4. Financial constraints, political connections, Shari’ah regulations and firms’ efficiencies

Finally, the study runs an OLS regression to check whether financial constraints, political connections, and Shari’ah regulations impact the profitability, marketability, and CSRD efficiencies presented in Table 6. Since financial constraints reduce firms’ solvency (Rashid and Morshed,
results indicate that constraints on pro

Similarly, the negative effect of affect the banks

Table 5. Efficiencies between Islamic and conventional banks with t-test.

| Group           | Observations | Mean | Profitability efficiency | Marketability efficiency | CSRD efficiency |
|-----------------|--------------|------|--------------------------|--------------------------|-----------------|
| Islamic banks   | 60           | 0.67 | 0.50                     | 0.91                     |
| Conventional banks | 230         | 0.71 | 0.58                     | 0.90                     |
| p-value of t-test | 0.26       | 0.04 | 0.46                     |

(2021), it may impact their efficiency. Therefore, this study uses the formula of KZ proxies following the research of Bae et al. (2022)1 to measure financial constraints.

The study found a significant and negative impact of firms’ financial constraints on profitability, marketability, and CSRD efficiencies. The results indicate that financial constraints highly affect those three efficiencies. If the firms face financial constrained in operating their business, the profitability and marketability efficiency will be reduced. Therefore, firms’ efficiencies highly depend on whether they are financially solvent or financially constrained in operating their business. Similarly, the negative effect of financial constraints on firms’ CSR efficiency indicates that financially constrained firms are less likely to invest in CSR activities. This finding is almost similar to that of Bae et al. (2022). They documented that financially constrained firms are less likely to invest in climate projects because of the shortage of financial resources and related risks. Financially constrained firms face liquidity problems and capital shortages.

In addition, financially constrained firms seek external sources of financing, which cause higher operating expenses. It, in turn, affects firms’ profitability and marketability efficiencies. Moreover, financially troubled firms have a tendency to commit informal transactions, such as fraud and corruption, that may deter CSR performance (Bae et al., 2022; Masud et al., 2022). Recently, the banking industry in Bangladesh has been heavily criticized due to the large drop in the growth of the financial sector. Such criticized also caused due to lending scams, increasing non-performing loans (NPLs), issues with interest rates, and poor demand for funds from the private sector. These issues cause the banks’ financial constraints and reduce their efficiencies in results. Consequently, the contribution of the financial sector to GDP has decreased over the years. For example, according to the Bangladesh Bureau of Statistics (BBS), the financial sector’s contribution to GDP has declined to 3.39% in 2020 from 3.42% in 2019 (Kabir, 2020).

Moreover, the study examines whether the firms’ political connections affect firm efficiencies. The study found a significant and negative impact of political connection on marketability efficiency and an insignificant effect on profitability and CSRD efficiency. Despite the insignificant effect, firms’ political connections negatively affect all types of efficiencies. The result supports the findings of Zheng et al. (2022). As the firms with political connections are highly involved with non-performing loans, lack of good governance, money laundering, and mismanagement of the banking industry in Bangladesh, these make firms inefficient and unproductive (Zheng et al., 2022).

Additionally, the study investigates whether Shari’ah regulations affect the banks’ efficiencies. The insignificant impact of Shari’ah on the profitability and CSRD efficiencies indicates that Shari’ah regulations do not affect firms’ efficiencies. On the other hand, Shari’ah regulations significantly and negatively affect firms’ marketability efficiency. The results imply that Shari’ah regulations reduce marketability efficiency. Though the Shari’ah-compliant banks have an insignificant effect on

Table 6. OLS regression results.

|                  | (1) Profitability efficiency | (2) Marketability efficiency | (3) CSR efficiency |
|------------------|-----------------------------|-------------------------------|--------------------|
| Financial constraints | -0.0027* (0.0015)           | -0.2291** (0.0982)           | -0.0011** (0.0005) |
| Political connection | -0.0081 (0.0362)            | -0.612** (0.0306)            | -0.0087 (0.0122)   |
| Shari’ah           | 0.0309 (0.0503)             | -0.1095** (0.0429)           | -0.0146 (0.0170)   |
| Firm size          | -0.0765 (0.0659)            | 0.0468 (0.0564)              | 0.0318 (0.0225)    |
| MB                 | -0.1614 (0.6417)            | 2.519** (0.5507)             | 0.0589 (0.2266)    |
| GRI                | 0.0857** (0.0402)           | -0.0105 (0.0346)             | -0.0276* (0.0136)  |
| BIG4               | -0.0801* (0.0426)           | 0.0363 (0.0362)              | 0.0046 (0.0145)    |
| AGE                | 0.0027 (0.0223)             | 0.0711 (0.0545)              | -0.0033*** (0.0008) |
| LEV                |                            | 4.2551*** (0.9567)           |                    |
| ROE                |                            | 0.0048*** (0.0013)           |                    |
| Year dummy         | Yes                         | Yes                           | Yes                |
| cons               | 1.7077** (0.7435)           | -3.7146*** (0.9823)          | 0.5601** (0.2550)  |
| N                  | 290                         | 290                           | 290                |
| F                  | 2.0007                      | 5.0124                        | 4.3951             |
| ε2                 | 0.1111                      | 0.2498                        | 0.2260             |
| ε2,a               | 0.0556                      | 0.1999                        | 0.1746             |

Standard errors in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

CSRD efficiency, they have a negative impact. The finding implies that conventional banks are more efficient in CSRD. The result is consistent with the prior study of Zheng et al. (2022). Similarly, Azam et al. (2019) documented that the relationship between firm profitability and CSR is stronger for non-Shari’ah-compliant firms than for Shari’ah-compliant firms. However, the control variables, firm size, market-to-book value, age, leverage, and ROA have a mixed effect on firm efficiencies.

5. Conclusion and implications

This study applies the DEA to measure the efficiency level of 29 listed commercial banks from 2012 to 2021 in Bangladesh by using three valuable dimensions of efficiency—profitability, marketability, and CSRD. Furthermore, the study compares the results between Islamic banks and conventional banks. Finally, the study runs OLS to investigate the factors that impact the efficiencies.

The empirical results show that overall average efficiency scores of profitability (0.703), marketability (0.56), and CSRD (0.903) of all sample banks during the study period were less than 1, indicating the inefficiency of the banking sector in Bangladesh. The results indicate that the Bangladeshi banks are almost 30% inefficient from the profitability perspective while 44% inefficient in marketability efficiency. However, the overall CSRD efficiency score of 0.903 indicates that Bangladeshi banks are 10% inefficient within the same period. The findings represent that the banking sector of Bangladesh is comparatively more efficient in terms of CSRD than profitability and marketability. While we compared the three efficiencies between Islamic and conventional banks, the study found conventional banks are more efficient than Islamic banks in terms of profitability and marketability at 5% and 8%, respectively. This is because conventional banks promote their products more to survive in the market, making them more efficient regarding profitability and marketability. On the other hand, CSRD efficiency perspective, Islamic banks are 1% more efficient than conventional banks. However, the t-test shows a statistically significant variation in the marketability efficiency between Islamic and conventional banks, while no significant variations were found in profitability and CSRD efficiencies.

1 KZ proxy for financial constraints, which is calculated as follows (Bae et al., 2022; Masud et al., 2022): KZ Index\(_{i}\) = -1.002 × Cash\(_{i}\) + 3.139 × Leverage\(_{i}\) − 39.368 × Dividends\(_{i}\) + 1.315 × Cash\(_{i}\) + 0.283 × Q\(_{i}\)
These findings will draw policymakers’ attention to the need for Bangladesh’s banks to achieve increased profitability and market value, enhanced net profit, earnings per share, and a reduced price-earnings ratio. The overall inefficiency of CSRD performance also implies that the board size, audit committee size, and institutional and director ownership may not play a significant role in motivating the management of the banks to contribute CSR and disclose CSR information. As a result, the study advocates for strict adherence to corporate regulations as well as considerable contributions to CSR, which could lead to increased stakeholder loyalty and improved banks’ efficiency. Furthermore, banks and regulatory authorities should keep board and audit committee sizes as small as possible, as larger boards and audit committees need more resources and may reduce banks’ efficiency. Conventional banks should concentrate more on CSR activities to survive in the competitive market against the prolific growth of Islamic banks. Thus, the study suggests Islamic and conventional banks’ management to focus more on the environment, community, human resources, and products and services-related CSR activities instead of philanthropic ones.

Finally, OLS results found that financial constraints negatively impact the firm efficiencies. Due to the financial constraints, the Bangladeshi banking sector faces a shortage of capital, liquidity crises, and lack of required investment which reduce profitability and marketability efficiencies. Similarly, financially troubled firms are less likely to invest in CSR activities, which reduces firms’ CSR efficiency. The central bank of Bangladesh should also undertake such initiatives that reduce financial constraints. It helps the banking sector invest in more profitable sectors. Moreover, the study found that political connections and Shari‘ah regulations negatively affect the banks’ marketability efficiency. The negative effect of political connections on the banks’ efficiencies implies that politicians decrease the firms’ efficiencies. The results suggest that the regulatory bodies and bank management should not be involved with political connections. The study demotivates the banks’ management to include politicians or their relatives on the board of directors as it reduces firms’ efficiencies. Additionally, Shari‘ah regulations do not impact the profitability and CSRD efficiencies but reduce marketability efficiency. The findings suggest that the management of Islamic banks captures the market shares offering the stakeholders lucrative benefits. To sum up, bank management should be more careful regarding lending scams, increasing NPLs, money laundering, and issues with interest rates.

This study contributes in diversified ways. First, the study provides valuable understanding to the bank management about their weakness and efficiency level so that they can take necessary steps for further improvement. Second, the current study suggests policymakers and regulators strict adherence to corporate regulations as well as considerable contributions to CSR guidelines, which could lead to increased stakeholder loyalty and improved banks’ efficiency. Third, this study helps investors, account holders and depositors make proper judgments and compare results for better decisions concerning their investment and opening accounts. Fourth, the study compares different dimensions of efficiencies between Islamic and conventional banks for better decision-making. Fifth, as the use of the DEA approach in Bangladesh is comparatively low, the study offers researchers valuable insight into the use of DEA in different industries from different dimensions of efficiency and productivity. Finally, applying OLS regression, the study provides empirical realizations of what determinants affect bank efficiencies.

This study has some limitations. First, this study is based on 29 listed commercial banks; thus, it does not reflect the whole financial sector of Bangladesh. Second, the study used only board size, audit committee size, and institutional and director ownership as corporate governance inputs to measure CSR efficiency. In contrast, other corporate governance mechanisms have not been considered. Therefore, the result may not represent the whole of corporate governance. Hence, the study suggests that future researchers consider board independence and having female and foreign directors on the boards. Finally, this study has not focused on the productivity of banks. Therefore, further studies can be conducted to analyze the productivity efficiency of commercial banks.

Declaration

Author contribution statement

Mohammad Nur Uddin, MSS student: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Md. Harun Ur Rashid, BBA & MBA: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Md. Tahidur Rahman, PhD: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data will be made available on request.

Declaration of interest’s statement

The authors declare no conflict of interest.

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