Resilience exploring the adaptive capacities of Corporate Governance practices in influencing Banking Efficiency in emerging market

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Abstract

The purpose of this study is to investigate the impact of corporate governance on the efficiency of listed banks in emerging markets between 2012 and 2022. Data envelopment analysis (DEA) is a tool used to measure different types of efficiency, including scale, pure technique, and technical efficiency. In this study, regression models were used to test research hypotheses using panel data techniques. The data were obtained from annual financial statements provided by state-owned banks in emerging markets. Efficiency can result from the deployment of resources, as learning curve theory and agency theory suggest. There is no evidence of multi-collinearity based on the variance inflation factor or correlation. The regression results indicate a positive correlation between corporate governance and bank financial efficiency. Institutional and internal ownership negatively affect the efficiency of companies, while independent boards, women on boards, and managerial ownership of directors have a beneficial effect on the effectiveness of banks. Our findings provide valuable information for policymakers in emerging markets who are responsible for improving the governance structure in the banking sector.

Keywords: corporate governance, efficiency, ownership structure, agency theory.

1. Introduction

In today's era where the concept of the term efficiency, particularly in the banking sector, means the best utilization of limited resources at minimum cost and maximum output. They should then develop strategies to reduce unnecessary costs and boost productivity. Efficient banking systems in emerging markets contribute to economic

stability and growth. In addition to supporting entrepreneurship and attracting investments, they improve capital allocation. For sustainable economic growth in emerging nations, a healthy banking industry is essential for streamlining financial transactions, lowering costs, and stimulating optimism regarding the economy's financial system. The effectiveness of a bank may enable it to shoulder debt burdens while enhancing the welfare of regular customers and deposits. The effectiveness of a bank may have a major impact on how the actual economy develops and contributes to mitigating economic growth. The Emerging Markets are represented by a group of 24 countries in World Economics. From 2012 to 2022, these countries represent 50% of world GDP and 66% of global GDP growth.

"Emerging markets and characteristic of emerging markets" WriteWork.com.

Examining the effectiveness of banks is crucial in order to guarantee favorable outcomes for investment, saving, economic growth, and the most significant macroeconomic metrics. An effective corporate governance process takes into account the connection between the company's owners and managers, ensuring that a company is efficient. Corporate governance, in general, refers to the systems, connections, and procedures that govern how a company is run. Corporate governance, represented by the board of directors, should include managerial responsibilities for the organization's financial standing as well as executive positions (John & Senbet, 1998).

As part of evaluating performance and competing in the banking industry, efficiency is an important component. A country's long-term growth performance is influenced by the efficiency of its financial sector (Novickytė & Droždz, 2018)(Dvorsky et al., 2021). However, (Belas et al., 2014) showed that the characteristics influencing banks customer satisfaction are essentially the same across nations, (Belas et al., 2014). Assessing a bank's efficiency makes it easier to determine how efficient it is overall and what needs to be done to close any gaps. These financial crises have made corporate governance a major concern for investors and scholars alike. A weakness in the corporate governance framework and a lack of management control are shown by investigations into the events leading up to the incidents. Furthermore, delegating unrestricted authority to executives created a fertile field for exploitation. The efficiency of a firm can be evaluated in two ways, according to (Grmanová & Ivanová, 2018),. DEA is the most commonly used non-parametric method for assessing efficiency in the banking sector. An efficiency score is used in the Data Envelopment Analysis method to convert a large number of inputs into a large number of outputs effectively. An analysis of technological efficiency by (Charnes et al., 1978), was

the first to use DEA (data envelope analysis). As part of this study, we develop methods for measuring gaps and divergences in Dynamic Network DEA models based on financial and accounting data, adding to the body of knowledge about banking efficiency.

As a result of the model methodology used, the results reported here offer insight on how economic factors, bank efficiency governance, and M&A may affect the discriminating power of the efficiency scores. We believe that none of the previous research has addressed the problem of score comparison computed between parametric and non-parametric dynamic network models. Additionally, none of these studies made use of socioeconomic and business-related contextual characteristics to understand the underlying variations in score ranking, dispersion, and discriminative strength. However, the majority of banking performance studies (Apergis & Polemis, 2016)&(Ben Selma Mokni & Rachdi, 2014)&(Phan et al., 2016), emphasized on the US and other wealthy regions with a slight emphasis on emerging markets and economic regions.

The majority of research concentrated on comparing state-owned, foreign, local, and Islamic banks or employed DEA to estimate a bank's efficiency while disregarding other factors, particularly those related to emerging markets. These innovations make it imperative to apply the Data Envelopment Analysis model to investigate the new determinants of banking efficiency in emerging markets. Banks are seen as the engines of the economy, and the stability of the economy may be aided by the banks' efficiency. The financial efficiency system is a fundamental part of the global financial system.

The current study investigates the relationship between CG structure and the financial efficiency of banks. Generally, this study fills the gap in the literature series this paper is the first to compare corporate governance practices between EBs in Emerging countries At this point, several studies such as; (Ullah et al., 2023),(Wanke et al., 2020). Our study contributes significantly to the existing literature by highlighting the impact of cultural, economic, and social contexts on the corporate governance structure, ownership structure, and efficiency of banks operating in emerging markets. Second, our paper focuses a unique approach to measuring the level of efficiency of 30 banks in the emerging markets sector using the nonparametric (DEA) method, during the period between 2012-2022.The use of DEA allows for a more robust and multidimensional analysis of bank efficiency, a method that has been underutilized in the examination of emerging markets. This unique methodological approach, combined with the regional focus, sets our research apart and provides new avenues for understanding efficiency in the banking sector of emerging economies.

2 Literature and Theoretical background

2.1. Banking Efficiency.

DEA is a linear programming technique used to gauge the effectiveness of decision-making units, or DMUs. According to (Charnes et al., 1978), made the initial proposal for the approach. Since DEA is non-parametric and supports numerous inputs and outputs, it does not rely on any particular functional form to establish the efficient frontier. Rather, the DMUs that comprise the sample's input/output set are the basis for its convex construction. Because of this, DEA is an effective instrument for evaluating the effectiveness of DMUs. (Hayat, 2011) Defines efficiency as "the most effective and productive use of existing resources." In view of these definitions, efficient firms show higher performance with lower input. (Othman et al., 2016) Defined efficiency as "producing more output per unit of input indicates more significant efficiency. "Technical efficiency it means optimizing resources and technology to achieve the highest level of output or productivity. Improving technical efficiency often

involves using technology, refining processes, and managing resources effectively to enhance overall performance and output. Argued that technical efficiency can assist managerial decision-making (Hayat, 2011). Efficiency of Scale (Farrell, 1957), states that using is the way to obtain maximum production. Measured in maximum input level, scale efficiency is the best value. Measured at a scale, scale efficiency represents efficiency, (Khan & Khattak, 2016). Research indicates that banks that operate efficiently are likely to take on more risk. This finding reinforces the belief that efficient banks perform better during global financial crises. It also highlights the importance of regulatory changes that promote efficiency to mitigate the negative impacts of recent crises, such as the COVID-19 pandemic.(Mateev et al., 2022).

2.2 Governance and Firm Efficiency;

The learning curve can be attributed to the growing efficiency of corporate governance in emerging banks. An increased output yields experience that lowers manufacturing costs and raises prices in a competitive market in its purest form. An experience factor is supposed to reduce the cost of units by an equal amount when the quantity produced doubles (Burr & Pearne, 2013). Governance is the process by which corporate power and authority are balanced to provide accountability to, stakeholders in general and shareholders in particular (Jensen & Meckling, 2019). When sound corporate governance is put into practice, enterprise resource management should be productive, economical, efficient, and goal-oriented, and it should pay respect to stakeholders' approaches, (Jenkinson & Mayer, 1992).

The literature on corporate governance mainly focuses on two aspects - ownership structure and board structure. These two aspects play a significant role in monitoring and controlling mechanisms that improve a firm's efficiency (S. Aslam et al., 2018) and (E. Aslam et al., 2019). Previous research has raised the question of whether corporate governance is essential for improving bank performance, and empirical research has yielded mixed results. Some studies have revealed a strong and favorable correlation between ownership and business profitability (Ullah et al., 2023) and (Naushad & Malik, 2015).

2.2.1 Board Size and Efficiency of Banks

Explore by (Uribe-Bohorquez et al., 2018)&(De Andres et al., 2005), accentuates the value of an effective board of directors in cutting expenses for businesses. All business operations are managed and controlled by the board of directors, which is essential (Johnson et al., 1996)&(Bennedsen et al., 2008).

Moreover, a small board would probably be excellent because it will create an effective decision-making procedure for the company (Leblanc & Gillies, 2005). Comparably, a business with larger directors of board size is worth less than the other (Jenkinson & Mayer, 1992). Nevertheless, according to some research, the board's and the firm efficiency are not significantly impacted by the size of the board (Ramdani & Witteloostuijn, 2010) and (Berger et al., 2016)&(Kusuma & Ayumardani, 2016).

H1. Board size insignificantly impacts on banking efficiency

2.2.2 Independent Directors and Efficiency of Banks

The board's independence implies that particular board members are outsiders of the business's governance. Independent directors contribute to the overall efficiency of the business. According to (Kallamu, 2016), independent directors have a significant and positive impact on financial efficiency.

As this section demonstrates, there is conflicting empirical evidence currently in use, yet regulators and policymakers in the banking industry actively pursue measures to persuade banks to foster heterogeneity in the board room (Ghosh & Ansari, 2018)(Kusuma & Ayumardani, 2016). This study investigates the following general hypothesis: boards with better diversity and independence of directors are superior at supervising bank managers, which leads to less hazardous and more effective banking institutions.

(H2): The boards of Independence have a positive effect on banking efficiency

2.2.3 Female Board and Efficiency of Banks

A higher representation of women on boards has been demonstrated to have a significant impact on governance dynamics in an abundance of ways. However, the evidence of the influence on firm efficiency and risk is mixed. According to (Kang et al., 2010) and (Tran et al., 2022), investors' responses to the appointment of women as directors in Singapore's publicly traded companies have been favorable. However, as evidenced by a recent study by (Ahern & Dittmar, 2012), on Norwegian businesses, a higher percentage of female boards hurts the value of the firm, either as a result of over-monitoring (Adams & Ferreira, 2007), as a result of inexperience. When it comes to gender variations in risk attitude, organizational psychology, and economics research clearly shows that, generally speaking, women are more risk-averse than males. There is a dearth of relevant literature specifically about the banking industry.

H3: The female boards have a positive relationship with firm efficiency

2.2.4 CEO-Duality and Efficiency of Banks

Effective boardroom governance relies heavily on the selection of a competent CEO and Chairman. The literature on the possible consequences on the performance and operations of organizations presents two opposing viewpoints. Agency theories dispute against CEO duality on the one hand because it increases risks and increases the costs of internal governance while weakening the boards' monitoring authority. Various conclusions are drawn from empirical research on the banking industry. (Aebi et al.., 2012)&(Berger et al.., 2014), concentrating on US banks, do not discover any evidence in support of entrenchment theory. CEO duality has been shown to reduce bank performance by Larcker, Richardson, and Irem (2007), and (Wang et al., 2012), nevertheless, (Grove et al.., 2011), and (Hunjra et al., 2020), find evidence that it raises bank risks.

H4: The CEO duel will hurt bank efficiency.

2.3 Ownership concentration

The corporate governance code and other financial sector reforms have changed the banking sector's ownership structure during the last two decades. Ownership concentration is the first requirement. We talked about in Section Indeed, this can occur when high ownership concentration offers an incentive for the largest shareholder to extract control benefits and expropriate the wealth of outside or minority shareholders. Relatively high ownership concentration characterizes most East Asian markets, including China. Through the entrenchment effect

mentioned in the previous section, this trait may have an impact on the internal governance, operations, and performance of banks (see also (Kallamu, 2016), (De Andres et al., 2005)(La Porta et al., 2000), (Claessens et al., 2002), and (Claessens & Yurtoglu, 2013). In comparing various bank ownership structures, it has been proposed by (Yue et al., 2018), Findings support the theoretical premise that ownership improves governance and monitoring practices, which is compatible with agency theory. During the financial crisis in emerging countries, all types of banks saw a decline in performance and efficiency.(Hutchinson et al., 2015)(Elyasiani & Jia, 2010), Investors should be interested in the positive influence that pressure-resistant institutional investors have on company investment efficiency and the pathways via which they improve firm investment efficiency. (A El-Masry & El-Ghouty, 2017) argued that the institutional investors or ownership increase the return of firm and growth of firms. Institutional investors also help reduce the conflicts or Managerial ownership can have a significant impact on an organization's success. Managers need to take responsibility for any problems that arise within the organization. The ownership of businesses by management increases their efficiency and reduces the issues associated with the agency. A board of directors or senior management may receive certain shares from the shareholders. Managerial ownership reduces agency problems, according to (Short et al., 1999). The period when the enterprises separated from share ownership is caused by moral hazard issues (Suman et al., 2016). According to our research, having multiple board appointments (known as a busy director) does not result in missing board meetings, even when considering the difference between executive and non-executive directors. Furthermore, our findings indicate that non-executive directors with higher ownership percentages tend to attend more board meetings despite being busy with other appointments, (Latif et al., 2023). Our research on companies in the DACH region indicates that corporate-owned companies have lower sales growth than non-institutionally owned companies, especially in high-growth companies. However, there is no significant difference in employee growth between foundation-owned and non-corporate companies. This is due to the long-term approach to business ownership and asset preservation objectives, (Block & Fathollahi, 2023).

H5: (Ha) There is a significant relationship between institutional ownership and bank efficiency.

H5: (Hb) The managerial ownership has positive effects on bank efficiency.

2.4: Conceptual Framework;

The following theoretical framework shows the relationship between Corporate Governance which is the independent variable and the dependent variable banking efficiency.
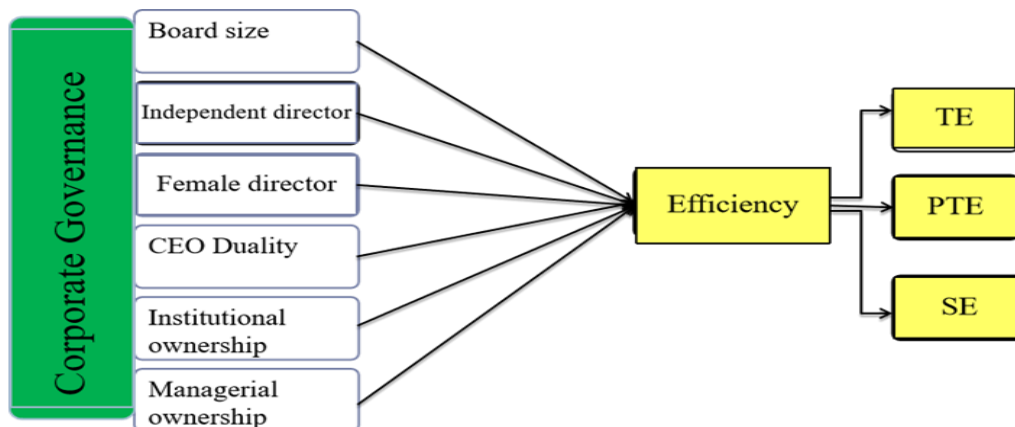
3 Research Method:

(3.1) Data sampling and measurement

The data set used for this analysis includes from a sample of 65 banks within the emerging market. There are 24 countries in the emerging market, but we are taking the data of only 10 countries) between 2012 and 2022. The annual report of commercial banks was used to collect the longitudinal data; moreover, external variables affecting banking performance were collected from the International Monetary Fund (IMF). The DEA technique produces a binary score of one or zero for the bank's efficiency-dependent variable. Using the DEA technique, a binary score of one or zero is produced for the bank's efficiency-dependent variable.

Variables measurement

Variables	Proxy	Measurement
Dependent variable		
Efficiency	**DEA**	DEA=output/input ,INPUT=Non interest EX + HR - cost + operating fixed cost (Sathye, 2001)(Wanke et al., 2020)
Independent variables		
Institutional ownership	**INSO**	No. of share held institutions over the total number of shares Or outstanding shares (Bulan et al., 2009)
Managerial ownership	**MO**	Number of shares held by managers or directors divided by total number of shares or outstanding shares (Bulan et al., 2009)
Board size	**BSZ**	Total number of board of directors
Independent directors	**IND**	Percentage independent board of directors (Bulan et al., 2009)
Female directors	**FMD**	Percentage of numbers board of directors
CEO-Duality	**CEO-D**	If the chairman of the board and CEO are the same person otherwise "0"
Control Variables		
Firm size	**FSZ**	Log of Total Assets
Profitability	**PRO**	Return on Assets

The numbers of staff members, branches, HR costs, non-interest expenses, and operating cost all included in the input variable. All values are transformed into zero and one after being normalized. Investment cost, financing, and net interest income make up the output variable. The non-parametric data model is used in the study since it has multiple benefits. Specifically, DEA is a non-parametric method that can analyze an unfixed number of outputs. It does not require transformed or distributed samples like parametric methods. DEA helps to project inefficient DMUs onto the efficient frontier, as proposed by (Charnes et al.., 1978), (Banker, 1984), (Emrouznejad & Yang, 2018) and (Mateev et al., 2022).

3.2. Estimation of the model

The first presented the DEA approach in 1957 but the model was proposed by (Charnes et al., 1978) proposed the (CRS) model with continuous returns to scale in 1978. Every Decision-Making Unit's (DMU) efficiency is evaluated using this approach. The efficiency is determined by taking the maximum efficiency score and dividing

the weighted outputs by the weighted inputs. To estimate efficiency, DEA relies on a relaxed normality assumption. Both parametric stochastic frontier analysis (SFA) and non-parametric data envelope analysis (DEA) can be used to evaluate homogenous decision-making units (DMUs). We describe three procedures for assessing the performance analysis of 120 commercial banks empirically (emerging countries) (refer to Figure 2). First, the technical efficiency of EBs is estimated using data envelopment analysis (CCR, BCC).

Considering a-set of J DMU that have n input and m output during T periods (t = 1,.., T). Assume that decision-makers use inputs xt 2 Rn þ along with outputs yt 2 Rm þ during time period t. Describe the required input that was set during time t, which is:

L_t (y_t) {x_t : x_t can produce y_t }

Assume that $L_t(y_t)$ meets the considerable elimination an asset of inputs and outputs and is non-empty, closed, convex, and bounded. The input isoquant, or production boundary of constant returns to scale (CRS), bounds $L_t(y_t)$ from below.

$$L_t (y_t) \{x_t : x_t \; \epsilon \; L_t(y_t), \lambda \, x_t \in L_t(y_t), \text{for } \lambda \; < \; 1 \}$$

To clarify, let us define the input distance function of period t in the following manner;

$$L_t (y_t , x_t) = \; \sup\{ \theta : x_t/\theta \; \epsilon L_t (y_t), \theta > 0\}$$

TE^t (y_t : x_t)= 1D^t y_t , x_t)

The following is a model for measuring TE in time t using DEA-CCR

A DMU with TE = 1 is being compared to other DMUs, which implies that it is productively inefficient since it uses excessive inputs. However, a DMU with TE = 0 indicates that it is completely efficient.

The DEA BCC model, developed by (Banker, 1984), is designed to measure inefficiency, which is calculated by the difference between technical-efficiency and pure-technical efficiency;

$$TE = CRS \times SE$$

$$\text{Max } h_k \; = \sum_{r=1}^{s} U_r Y_k + \; + \omega$$

In the BCC model, variable returns to scale (VRS) are taken into account and the PTE is represented without the SE. The BCC model for the PTE is as follows:

Subject;

$$\sum_{i=1}^{m} v_r x_{ik} = 1$$

$$\sum_{r=1}^{s} U_r Y_k - \sum_{i=1}^{m} v_r x_{ik} \; \omega < 0$$

$$U_r \geq 0; \; V_i \geq 0;$$

$$r = 1, \dots 1; \; ; s; I, \dots 1, \quad m ; j =, \dots 1,; n;$$

ω =free

While DMU jb is Pareto efficient if qb = 1, where qb represents pure technical efficiency, DEA becomes lowering when w is less than o due to growing returns to scale for w greater than o. It becomes inefficient when Pure-technical or Scale Efficiency is less than 1. When a DMU converts inputs into outputs less effectively than other DMUs, it can be a sign that the conversion process is not done well. To measure scale effects using DEA, the standard approach is to use both CRS and VRS models. The efficiency score from the CRS model divided by the efficiency score from the VRS model yields the scale efficiency. (Emrouznejad & Yang, 2018), carried out a survey and examined DEA models and their practical uses between 1978 and 2016. Their work emphasized the development of the DEA model and its practical uses.
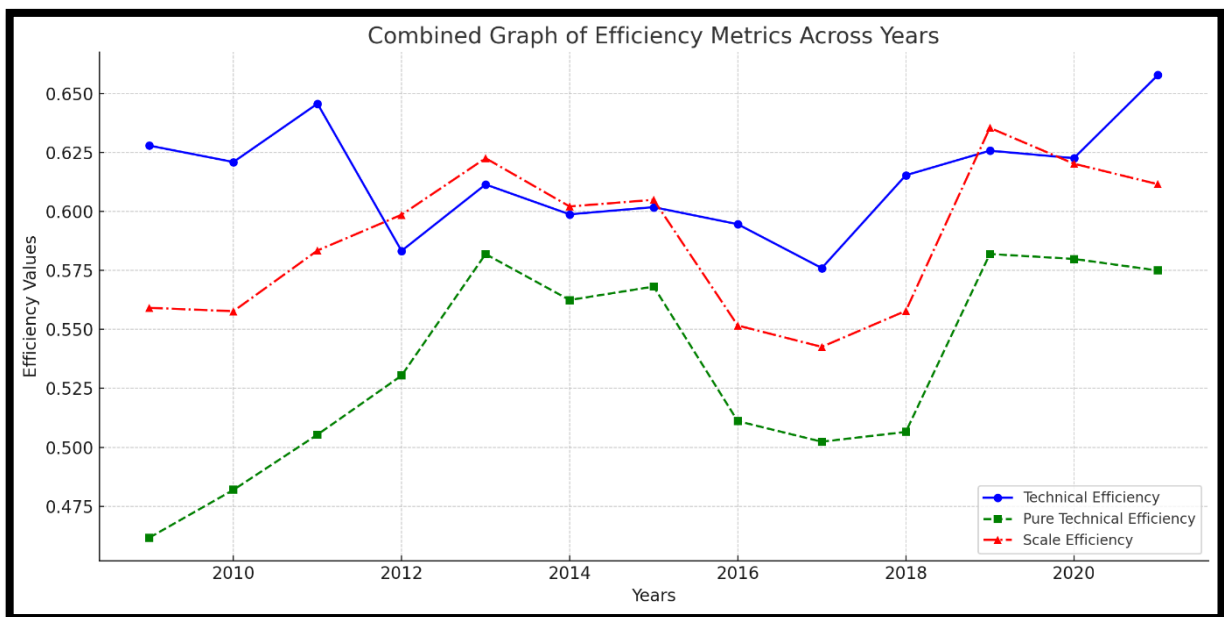
Fig. 1 Graphical represents data the efficiency-wise data

3.3: Equation of model

This focuses on specific corporate governance dimension and their usage.

Given by: $Y_{it}=\beta 0_{it}+\beta 1_{it}\, CG+\epsilon_{it}$

Where:

- Y_{it}=represents metrics related to different Efficiency types (like Technical efficiency, pure technical efficiency and Scale efficiency).
- $B_{it}1$=is the intercept.
- ϵ= is the error term.

(TE)= $\beta 0_{it}+ + \beta_1\, INSO_{it} + B_2\, MO_{it}+ \beta_3\, BSZ + \beta_4\, IND_{it}+ \beta5\, FMD_{it}+ \beta_6\, CEOD_{it}+$ (control variables) $\beta_8 FSZ_{it}+$
$$PRO_{it}+\mu t$$
(PTE)= $\beta 0_{it}+ + \beta_1\, INSO_{it} + B_2\, MO_{it}+ \beta_3\, BSZ + \beta_4\, IND_{it}+ \beta5\, FMD_{it}+ \beta_6\, CEOD_{it}+$ (control variables) $\beta_8 FSZ_{it}+$
$$PRO_{it}+\mu t$$

$(SE) = \beta 0_{it} + + \beta_1 \ INSO_{it} + B_2 \ MO_{it} + \beta_3 \ BSZ + \beta_4 \ IND_{it} + \beta5 \ FMD_{it} + \beta_6 \ CEOD_{it} + \text{(control variables)} \ \beta_8 FSZ_{it} +$

$$PRO_{it} + \mu t$$

4.1: Descriptive-Statistics

All the variables in this study from 2012 to 2022 are shown in Table 2' descriptive statistical analysis. The maximum value in the data represents the highest value, the minimum value is the lowest, and the mean value is the average value of the variables. The standard deviation (SD) shows the distance between each variable and the mean. A mean (median) TE efficiency of 62.20% (62.10%) is comparable to results from previous recent studies on the efficiency of Chinese banks (Berger et al., 2009) and much higher than the PTE efficiency, as expected. This table indicates that 55.77% (58.68%) of PTE efficiency is (are) efficient, with a range from 17.1% to 99%. The average standard deviation for the period's SE (scale efficiency) is 0.62, with a maximum level of 1 and a low level of 0.0019. The highest mean and standard deviation are found in the (BSZ) board size. A board size of not more than 7 or 8 members is considered reasonable if the mean value (9.45) of board size is used, e.g. (Hakimi et al., 2018) suggest that a board-size of not more than that is acceptable to ensure effective governance. In terms of mean and standard deviation (0.0155), PSZ has the highest value.

Table.2 Descriptive-statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev
TE	0.6220	0.6210	0.9991	0.0109	0.2242
PTE	0.5577	0.5868	0.9059	0.0432	0.2306
SE	0.5817	0.6201	0.9991	0.0119	0.2791
BSZ	9.4571	9.0000	20.0000	4.0000	3.3011
IND	3.7500	3.0000	10.0000	0.0000	2.7357
FMD	0.4786	0.0000	2.0000	0.0000	0.6729
CEOD	0.6214	1.0000	1.0000	0.0000	0.4868
INSO	0.6615	0.6439	0.9991	0.0990	0.2310
MO	0.1692	0.0833	0.6725	0.0002	0.2042
PRO	0.0155	0.0096	0.0392	-0.3155	0.0312
FSZ	7.4553	7.4489	11.9957	5.1230	1.5833

4.3 Correlation-Matrix

The analysis of the correlation matrix (Table 3) shows that (BSZ) Board size positively correlated with firm size and negatively correlated with (MO) Managerial ownership, independent board members, CEO Duality, SE, and PTE. (IND) mean the independent Director in the firm, the INDP is positively correlated with PTE and profitability and negatively correlation with institutional ownership and SE in the firms. Female director (FMD) has insignificant relation with (CEO-D), (ISO), and (PRO) mean profitability but a negative insignificant relation with firm size and managerial ownership. CEO Duality positively correlated with firm size, TE, and PTE but

negatively correlated with institutional ownership and (MO). (MO) Managerial ownership positively correlated with profitability.

Table3 Correlation Matrix
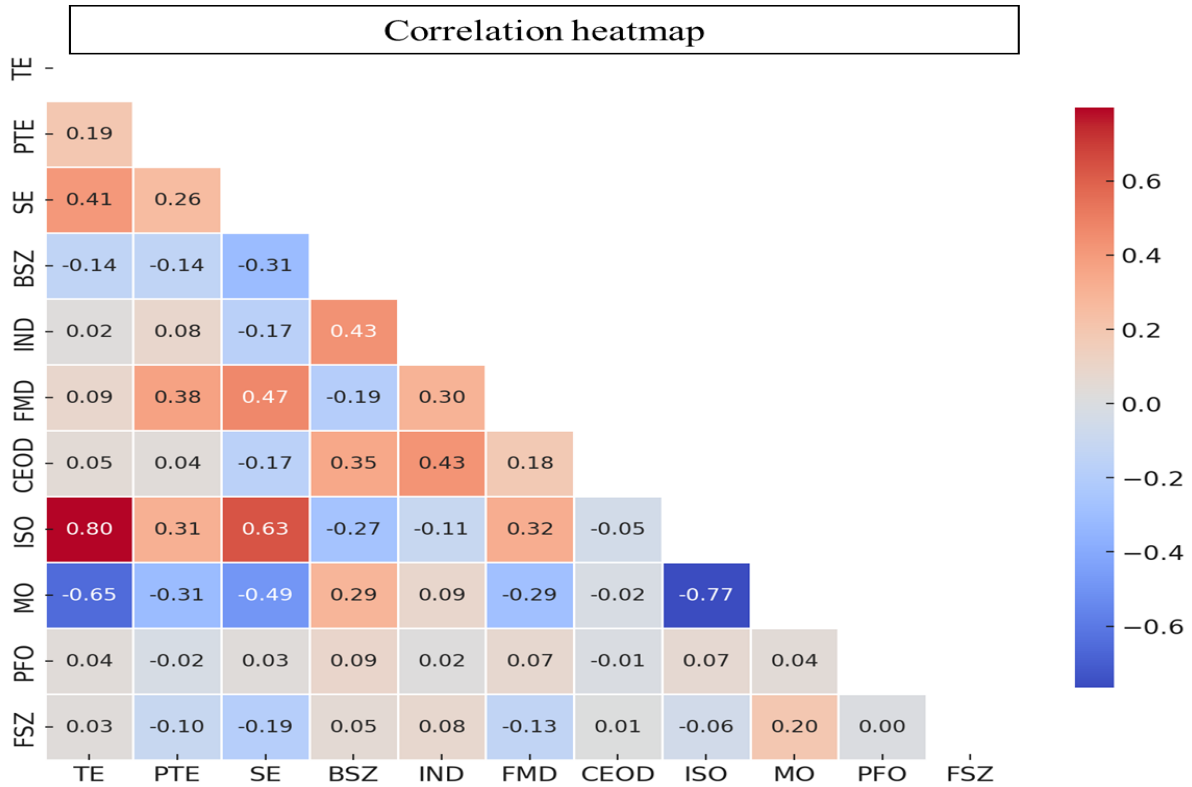
***Correlation level of significance .10, ** Correlation level of significance .05 and * Correlation level of significance .01.

4.3 Cross-sectional Dependency CD tests

Variables	CD	CDw	CDw	CD*
TE	-0.640	-1.500	117.250	0.870
	-0.525	-0.134	0.000	-0.386
PTE	0.080	-1.600	167.900	-0.550
	-0.935	-0.109	0.000	-0.584
SE	-0.230	-2.350	131.050	-0.210
	-0.818	-0.019	0.000	-0.833
BSZ	0.590	-0.810	101.200	2.560
	-0.556	-0.419	0.000	-0.010
IND	-0.730	0.350	113.350	-0.980
	-0.463	-0.730	0.000	-0.327
FMD	1.980	0.680	26.690	-1.410
	-0.047	-0.494	0.000	-0.158
CEOD	0.220	0.070	23.970	-1.330
	-0.829	-0.943	0.000	-0.183
INSO	-0.920	1.390	165.360	0.390
	-0.359	-0.163	0.000	-0.696
MO	-0.800	-1.980	189.640	0.720
	-0.421	-0.048	0.000	-0.470
PROF	1.660	0.210	135.810	1.260
	-0.097	-0.832	0.000	-0.207

FSZ	10.580	-1.810	255.070	-0.880
	0.000	-0.070	0.000	-0.380

***Correlation level of significance .01, ** Correlation level of significance .05 and * Correlation level of significance .1.

In the table 4.3 Cross section dependence (CD) test is used to assess the independence of panel units and guide model selection, as it accounts for varying slopes across cross-section units (Pesaran, 2007, 2015) The results in Table 3 reveal diverse relationships between variables (e.g., TE, PTE, SE, BSZ) and conditions (CD, CDw, CD*), with some variables like profitability (PROF) and firm size (FSZ) showing positive correlations, while others, such as Scale Efficiency (SE) and institutional ownership (INSO), display negative correlations. This suggests complex dynamics influenced by energy policies and market factors, underscoring the need for further analysis to understand the underlying factors driving these inconsistent effects.

4.4 Wester Lund test

Statistic	Value	Z-value	P-value
Gt	-56.338	-219.412	0.000
Ga	-1.445	2.137	0.984
Pt	-5.071	-2.541	0.006
Pa	-3.637	-3.717	0.000

***Correlation level of significance .01, ** Correlation level of significance .05 and * Correlation level of significance .1.

The table presents statistical results for four variables: Gt**,** Ga**,** Pt**,** and Pa (Westerlund & Edgerton, 2008)**.** Gt and Pa show strong statistically significant negative relationships, with very low P-values (0.000), indicating reliable results. Pt also has a significant negative relationship (P-value: 0.006), while Ga shows no significant effect, as evidenced by a high P-value of 0.984. Following this, fixed and random effects models are typically used to account for potential individual heterogeneity across cross-sectional in long-run analysis.

4.5: Hausman test

The Hausman test is used to determine the possibility that to use the Fixed-effect model or the Random-effect model. The probability values (0.0184) in this test are less than 5%, the Fixed-effect model is applied for the Technical-Efficiency (TE) mean.

4.5 Technical-Efficiency, pure Technical efficiency, and Scale Efficiency Table 4

Hausman correlated Test			
Effects Test	**Statistics**	**d.f**	**Pro-v**
Cross sections F square			
TE	108.48	13.00	0.00
PTE	42.718	9.001	0.00
SE	11.64089	9.00	0.2343

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1

According to Pure technical efficiency, Husaman tests use the fixed effect model, and the P-value (0.00) indicates that the prob-value is less than 5% percent, or 0.05. The probability value for the SE, or scale efficiency, is

(0.2343), indicating that the prob. value is greater than 5% or 0.05, according to the random effect model that we are using.

4.6: Regression model; 1

Table 4.6 the results show that the regression model 1 we are applying the fixed-effect model for the TE and PTE according to the Hausman test. A positive and insignificant relation exists between the (TE) mean technical efficiency and the (PTE) pure technical efficiency of the Board of Directors. The prob. (means probability-value) is TE (0.192), PTE (0.319 and the coefficient value is TE (0.008), PTE (0.009). The Firm's efficiency is insignificant and impacted by the board size (Hakimi et al., 2018). The latter results indicate only partial support for the hypothesis (H1) and mixed findings. As a result, the board of independent directors and the efficiency of the banking sectors in development is favorable and significant, according to the study, (Kusuma & Ayumardani, 2016). Our evidence also indicates that hypothesis H2 does not hold, as there is an insignificant statistical correlation between efficiency and independent board directors. When it comes to their work, women are more sincere than men. TE (-0.055) &PTE (0.021) are the coefficient values, and TE (0.028) & PTE (0.587) is the prob-value. The result indicates that the Female board has a significant relationship with efficiency

4.6 Table

	FIXED EFFECT MODEL			
Variable	**Coefficient**	**Prob (TE)**	**Coefficient**	**Prob(PTE)**
C	-0.412	0.150	0.015	0.181
BSZ	0.008	0.192	0.009	0.319
IND	0.011	0.149	0.051	0.278
FMD	-0.055	0.028	0.021	0.587
CEO_D	-0.001	0.972	-0.066	0.014
ISO	0.674	0.003	0.758	0.000
M.O	0.280	0.002	1.216	0.236
PFT	0.647	0.093	0.002	0.918
FSZ	0.073	0.051	1.982	0.853
R square	0.727		**R square**	0.4454
Adj- R square	0.715		**Adj- R-square**	0.341
F _statistic	35.835		**F_statistics**	4.2724
Prob_(F-statistic)	0		**Prob_(F-statistic)**	0

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

According to(Ahern & Dittmar, 2012) Female directors affect the positive worth of a company through over-monitoring or other methods, (support for hypothesis H3). There is a correlation between efficiency and CEO Duality, where the correlation coefficient is (0.972) and (0.014), accepted hypothesis H4. The prob-values are TE (-0.001) & PTE (-.066) and the coefficient values are (0.972) & (0.014). In ISO terms, institutional ownership and TE-PTE (technical efficiency& pure technical efficiency) are significantly related. An increase in institutional ownership will lead to a decline in technical efficiency.

The prob. value TE and PTE (0.003) & (0.000) and the coefficient is (-0.674) & (0.758). The H4 hypothesis is supported. Help reduce the conflicts or problems in the organizations according to (Hutchinson et al., 2015). A strong correlation exists between managerial ownership and technical efficiency. The coefficient is 0.280 and prob. The value is 0.002. According to previous study hypotheses, H5 is accepted. PROF means the profitability of the firm is insignificant but a positive relationship exists between the PTE & TE efficiency. Control variable Firm size is positively correlated with firm efficiency.

4.7. Random Effect Model SE (Scale efficiency)

In Table 4.7, the scale efficiency (SE) was calculated using the Random-effect model, the Hausman-test concern. The Hausman-test p-value 0.2343 e Random Effect model is the best fit for our efficiency investigation, we have determined. The dependent variable, scale efficiency, has a 57% variance that can be explained by all independent factors, according to the R-Square value of 0.57. The model is fit because the value of Prob > F is 0.000. The table shows that board size directly affects SE and it also implies that BSZ hurts firm efficiency; a p-value of 0.496 indicates insignificant findings. This means that when the board size increases, agency problems occur and choices about various policies become challenging to make and implement because of disagreements. Further, the large size of the board causes delays in policies and decisions, negatively impacting the company's overall financial position. The second variable, independent board (IND), has a not negative and significant connection with SE.

Table 4.7

Random Effect Mode2		
Variable	**Coefficient**	**P-Value(SE)**
C	0.574	0.496
BSZ	0.015	0.189
IND	-0.009	0.061
FMD	0.051	0.017
CEO_D	-0.021	0.059
ISO	-0.066	0.000
M.O	0.758	0.054
PFT	1.216	0.812
FSZ	0.012	0.072

R square	0.577
Adjusted R square	0.547
F-statistic	19.716
Pro(F-statistic)	0.000

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The BI coefficient is -0.009 and the prob-value is 0.061, indicating that as board independence rises, the firm's TE-VRS efficiency falls. Shows that insignificant monitoring procedures and limited involvement in the business operations of emerging banking corporations prevent independent boards from increasing the performance of the banking sectors. The p-value is (0.017) and the coefficient-value is (0.057), and the Female directors have been found to significantly contribute to the firm efficiency. This is because women tend to work efficiently within a

company, which reduces the chances of agency problems that can be faced by corporate governance. This has been supported by studies conducted by (Tran et al., 2022) and (Johnson et al., 1996).

Negative and statistically significant coefficients are observed on Duality in profit efficiency models that are related to the variables explaining the board's service. Similar results have also been reported in previous studies, such as those conducted by (Grove et al., 2011), and (Hunjra et al., 2020) for parallel results). This implies that the parallel appointment of the chairperson and CEO may make the agency issues more acute, which would lower the profit efficiency of the banks. While these findings appear to support our solidity hypothesis H3's empirical prediction, the effect of duality on efficiency is not unequivocal. ISO means an institution-owned negative link and a significant scale-efficiency relationship. The efficiency of the company increases as institutional ownership increases. The p-value is 0.000 and the coefficient value is -.066. As a consequence, it is likely that the hypothesis H5a. The MO means managerial-ownership positive coefficient value (0.785) and p-value 0.054. It means the scale efficiency between positive significant relationships. Investments can be managed effectively with a high level of return thanks to good managerial governance, as shown by (Suman et al., 2016). There is a weak correlation between profitability and SE efficiency. Although a positive correlation, it is not significant. When a firm's assets increase, its efficiency also increases, but this relationship is insignificant. The positive coefficient of the firm size is and the prob.-value is 0.055. Conversely, the abbreviation FSZ indicates a strong and significant association between TE efficiency and firm size. A firm's efficiency improves as it grows in size.

Table 4.8 MG robustness test

Variables	TE Coefficient	Std. err.	PTE Coefficient	Std. err.	SE Coefficient	Std. err.
Board size	0.001*	0.004	-0.021***	0.008	-0.010**	0.004
Independent director	0.019***	0.005	-0.012*	0.009	0.004*	0.005
Female Director	-0.013*	0.013	0.098***	0.026	0.042***	0.013
CEO Duality	-0.060***	0.021	0.110***	0.041	0.025*	0.021
Institutional ownership	0.721***	0.070	0.497***	0.134	0.609***	0.069
Managerial ownership	-0.097*	0.082	-0.142*	0.157	-0.120*	0.081
profitability	0.110*	0.297	0.208*	0.567	0.159*	0.292
Frim size	0.009*	0.007	0.030**	0.014	0.020***	0.007
_cons	0.078	0.069	0.122	0.133	0.100	0.068

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The mean group robustness analysis reveals the impact of various corporate governance factors on technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) in Table 4.8. Institutional ownership positively influences all three efficiencies, while Board size, Managerial ownership, and CEO duality show mixed effects. Independent directors improve TE but negatively impact PTE, and Female directors have a strong positive effect on PTE and SE. Firm size and Profitability positively affect PTE and SE, with Firm size particularly influencing both. These results highlight how governance factors shape organizational efficiency across different scales. These findings suggest that effective corporate governance policies, especially those promoting institutional ownership, independent directors, and firm growth, can significantly boost efficiency.

5. Discussion and conclusion

In this study, the structure of the corporate governance and three dependent efficiencies, such as TE, PTE, and SE, were thoroughly investigated to determine the impact of the corporate governance structure on the efficiency of the banking sector in emerging areas. This research looked at bank data from the Emerging banking sector from 2012 to 2022. The statistical outcomes were determined using regression DEA analysis, which is also a contribution of this study in the field of finance as literature contributes considerably less work on moderation analysis in an emerging economy. The theoretical contribution of this research is ensuring the support for agency theory. The banking industry's top priorities at this time were increasing efficiency and fostering a more competitive market. Increasing board independence is correlated with a decline in financial banking efficiency. Likely H2 that directors' overseas expertise, market knowledge, and networking skills can improve bank efficiency and asset quality and will only receive limited support and produce contradictory results. CEO and shareholder conflicts arise when corporate governance in the companies is not functioning effectively. Conflict in companies occurs when managers make decisions that lack value and have detrimental effects on the business, claim (Jenkinson & Mayer, 1992). The agency dilemma or conflicts between brokers and principles are caused by ownership interest (Berger et al., 2014). Our study does not produce entirely consistent results regarding the impact of having a greater number of parentages of ownership. The first efficiency regression's negative coefficient indicates that owners would not feel at ease with regional systems, according to (Hutchinson et al., 2015) and (A El-Masry & El-Ghouty, 2017). As a result, banks were unable to effectively monitor customers, resulting in increased profits and efficiency. However, all board attributes are considered and evaluated against cost-effectiveness, and the adverse effect on directors is minimal. The agency problem is the most important issue in corporate governance, finance, and administrative incentives (Claessens et al., 2002)(Jenkinson & Mayer, 1992) and (Jensen & Meckling, 2019) hypothesized that high levels of ownership Consternation may exacerbate the agency problem in organizations. According to the previous study, the company's management does not serve its shareholders' interests optimally or most effectively. According to (Johnson et al., 1996) the absence of top management policies reduces the effectiveness of businesses and hinders their ability to grow. If the board operates independently, the business will perform poorly and interact with its shareholders more effectively, increasing the likelihood of agency issues. The banking system plays an essential role in the country's economy. If the financial system is sound and efficient, the country's economy grows as a whole. According to (La Porta et al., 2000) and (John & Senbet, 1998) the banking system has a direct impact on the country's growth and company production. This study could help policymakers determine the causes of efficiency in different sectors and take corrective actions. According to agency theory, this inefficiency may be attributable to inefficient resource usage. This research is also beneficial to investors. They can choose efficient enterprises for investment while avoiding inefficient firms to prevent losses. Additionally, the study will recommend measures to improve bank governance practices in emerging economies, promoting long-term stability and sustainability of the banking sector.

Limitation and Future Direction

This work highlights the need to control previously overlooked variables in these investigations, as well as the mechanism by which EBs alter the CG. This study only measured banking efficiency through TE, PTE, and SE and focused on the level of CG in the emerging sector in 30 banks. Further research on comparative analysis

between other industries, such as MENA, Frontier rejoin, and BRICS might be conducted. Many other financial Efficiency measurements, including allocate efficiency and cost efficiency, can be used to assess a firm efficiency. However, It is recommended that future researchers apply the same model to other regions and sectors, both IBs and conventional, in different countries. Additionally, this study used data from Islamic nations to enable in-depth research to gather information from two or more banking sectors in the GCC and Asian regions and do a contrast analysis. As well as it will contribute to the empirical literature and serve as the contextual framework for future research.

Author Contributions

All authors made substantial contributions to the conception and design of the work. All authors have revised the paper critically and agreed on the final version.

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References

A El-Masry, A., & El-Ghouty, A. (2017). *Effect of ownership structure on firm stock return performance: Evidence from the Egyptian stock market*.

Adams, R. B., & Ferreira, D. (2007). A theory of friendly boards. *The Journal of Finance*, *62*(1), 217–250.

Aebi, V., Sabato, G., & Schmid, M. (2012). Risk management, corporate governance, and bank performance in the financial crisis. *Journal of Banking & Finance*, *36*(12), 3213–3226.

Ahern, K. R., & Dittmar, A. K. (2012). The changing of the boards: The impact on firm valuation of mandated female board representation. *The Quarterly Journal of Economics*, *127*(1), 137–197.

Apergis, N., & Polemis, M. L. (2016). Competition and efficiency in the MENA banking region: a non-structural DEA approach. *Applied Economics*, *48*(54), 5276–5291.

Aslam, E., Kalim, R., & Fizza, S. (2019). Do cash holding and corporate governance structure matter for the performance of firms? Evidence from KMI 30-and KSE 100-indexed firms in Pakistan. *Global Business Review*, *20*(2), 313–330.

Aslam, S., Ahmad, M., Amin, S., Usman, M., & Arif, S. (2018). The impact of corporate governance and intellectual capital on firm's performance and corporate social responsibility disclosure. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *12*(1), 283–308.

Banker, R. D. (1984). *Some models for estimating of technical and scale inefficiencies in Data Envelopment Analysis*.

Belas, J., Cipovová, E., & Demjan, V. (2014). CURRENT TRENDS IN AREA OF SATISFACTION OF BANK CLIENTS IN THE CZECH REPUBLIC AND SLOVAKIA. *Transformations in Business & Economics*, *13*(3).

Ben Selma Mokni, R., & Rachdi, H. (2014). Assessing the bank profitability in the MENA region: A comparative analysis between conventional and Islamic bank. *International Journal of Islamic and Middle Eastern Finance and Management*, *7*(3), 305–332.

Bennedsen, M., Kongsted, H. C., & Nielsen, K. M. (2008). The causal effect of board size in the performance of small and medium-sized firms. *Journal of Banking & Finance*, *32*(6), 1098–1109.

Berger, A. N., Imbierowicz, B., & Rauch, C. (2016). The roles of corporate governance in bank failures during the recent financial crisis. *Journal of Money, Credit and Banking*, *48*(4), 729–770.

Berger, A. N., Kick, T., & Schaeck, K. (2014). Executive board composition and bank risk taking. *Journal of Corporate Finance*, *28*, 48–65.

Block, J., & Fathollahi, R. (2023). Foundation ownership and firm growth. *Review of Managerial Science*, *17*(8), 2633–2654.

Bulan, L., Sanyal, P., & Yan, Z. (2009). Directors, outsiders and efficiency: An analysis of how board characteristics influence firm productivity. *Journal of Economics and Business*, *61*(6), 509–528.

Burr, W., & Pearne, N. (2013). Learning curve theory and innovation. *Circuit World*, *39*(4), 169–173.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, *2*(6), 429–444.

Claessens, S., Djankov, S., Fan, J. P. H., & Lang, L. H. P. (2002). Disentangling the incentive and entrenchment effects of large shareholdings. *The Journal of Finance*, *57*(6), 2741–2771.

Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. *Emerging Markets Review*, *15*, 1–33.

Davidavičienė, V. (2018). Research methodology: An introduction. *Modernizing the Academic Teaching and Research Environment: Methodologies and Cases in Business Research*, 1–23.

De Andres, P., Azofra, V., & Lopez, F. (2005). Corporate boards in OECD countries: Size, composition, functioning and effectiveness. *Corporate Governance: An International Review*, *13*(2), 197–210.

Dvorsky, J., Belas, J., Gavurova, B., & Brabenec, T. (2021). Business risk management in the context of small and medium-sized enterprises. *Economic Research-Ekonomska Istraživanja*, *34*(1), 1690–1708.

Elyasiani, E., & Jia, J. (2010). Distribution of institutional ownership and corporate firm performance. *Journal of Banking & Finance*, *34*(3), 606–620.

Emrouznejad, A., & Yang, G. (2018). A survey and analysis of the first 40 years of scholarly literature in DEA: 1978–2016. *Socio-Economic Planning Sciences*, *61*, 4–8.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society Series A: Statistics in Society*, *120*(3), 253–281.

Ghosh, S., & Ansari, J. (2018). Board characteristics and financial performance: Evidence from Indian cooperative banks. *Journal of Co-Operative Organization and Management*, *6*(2), 86–93.

Grmanová, E., & Ivanová, E. (2018). Efficiency of banks in Slovakia: Measuring by DEA models. *Journal of International Studies (2071-8330)*, *11*(1).

Grove, H., Patelli, L., Victoravich, L. M., & Xu, P. (2011). Corporate governance and performance in the wake of the financial crisis: Evidence from US commercial banks. *Corporate Governance: An International Review*, *19*(5), 418–436.

Hakimi, A., Rachdi, H., ben Selma Mokni, R., & Hssini, H. (2018). Do board characteristics affect bank performance? Evidence from the Bahrain Islamic banks. *Journal of Islamic Accounting and Business Research*, *9*(2), 251–272.

Hayat, S. (2011). Efficiency analysis of commercial banks in Pakistan–A non parametric approach. *Available at SSRN 1960063*.

Hunjra, A. I., Mehmood, R., & Tayachi, T. (2020). How do corporate social responsibility and corporate governance affect stock price crash risk? *Journal of Risk and Financial Management*, *13*(2), 30.

Hutchinson, M., Seamer, M., & Chapple, L. E. (2015). Institutional investors, risk/performance and corporate governance. *The International Journal of Accounting*, *50*(1), 31–52.

Jenkinson, T., & Mayer, C. (1992). The assessment: corporate governance and corporate control. *Oxford Review of Economic Policy*, *8*(3), 1–10.

Jensen, M. C., & Meckling, W. H. (2019). Theory of the firm: Managerial behavior, agency costs and ownership structure. In *Corporate governance* (pp. 77–132). Gower.

John, K., & Senbet, L. W. (1998). Corporate governance and board effectiveness. *Journal of Banking & Finance*, *22*(4), 371–403.

Johnson, J. L., Daily, C. M., & Ellstrand, A. E. (1996). Boards of directors: A review and research agenda. *Journal of Management*, *22*(3), 409–438.

Kallamu, B. S. (2016). Ownership structure, independent directors and firm performance. *Journal of Social and*

Administrative Sciences, *3*(1), 17–30.

Kang, E., Ding, D. K., & Charoenwong, C. (2010). Investor reaction to women directors. *Journal of Business Research*, *63*(8), 888–894.

Khan, F. U., & Khattak, B. K. (2016). AN EMPIRICAL INVESTIGATION OF COMMERCIAL BANKS'EFFICIENCY IN PAKISTAN: A NON PARAMETRIC DATA ENVELOPMENT APPROACH. *Gomal University Journal of Research*, *32*(1), 21–32.

Kusuma, H., & Ayumardani, A. (2016). The corporate governance efficiency and Islamic bank performance: an Indonesian evidence. *Polish Journal of Management Studies*, *13*(1), 111–120.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2000). Investor protection and corporate governance. *Journal of Financial Economics*, *58*(1–2), 3–27.

Latif, B., Voordeckers, W., & Lambrechts, F. (2023). Overcommitted to show up in the board? The moderating effect of ownership. *Review of Managerial Science*, 1–30.

Leblanc, R., & Gillies, J. (2005). *Inside the boardroom: How boards really work and the coming revolution in corporate governance*. John Wiley & Sons.

Mateev, M., Sahyouni, A., & Al Masaeid, T. (2022). Bank performance before and during the COVID-19 crisis: Does efficiency play a role? *Review of Managerial Science*, 1–54.

Naushad, M., & Malik, S. A. (2015). Corporate governance and bank performance: A study of selected banks in GCC region. *Asian Social Science*, *11*(9), 226.

Novickytė, L., & Droždz, J. (2018). Measuring the efficiency in the Lithuanian banking sector: The DEA application. *International Journal of Financial Studies*, *6*(2), 37.

Othman, F. M., Mohd-Zamil, N. A., Rasid, S. Z. A., Vakilbashi, A., & Mokhber, M. (2016). Data envelopment analysis: A tool of measuring efficiency in banking sector. *International Journal of Economics and Financial Issues*, *6*(3), 911–916.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312.

Pesaran, M. H. (2015). Testing weak cross-sectional dependence in large panels. *Econometric Reviews*, *34*(6–10), 1089–1117.

Phan, H. T. M., Daly, K., & Akhter, S. (2016). Bank efficiency in emerging Asian countries. *Research in International Business and Finance*, *38*, 517–530.

Ramdani, D., & Witteloostuijn, A. van. (2010). The impact of board independence and CEO duality on firm performance: A quantile regression analysis for Indonesia, Malaysia, South Korea and Thailand. *British Journal of Management*, *21*(3), 607–627.

Sathye, M. (2001). X-efficiency in Australian banking: An empirical investigation. *Journal of Banking & Finance*, *25*(3), 613–630.

Short, H., Keasey, K., Wright, M., & Hull, A. (1999). Corporate governance: From accountability to enterprise. *Accounting and Business Research*, *29*(4), 337–352.

Suman, S., Basit, A., & Hamza, S. M. (2016). The impacts of ownership structure on firm performance. *International Journal of Accounting & Business Management*, *4*(2), 262–271.

Tran, N. T. A., Jubb, C., & Rajendran, D. (2022). Female directors and firm performance following mergers and

acquisitions. *Human Resource Management Journal*.

Ullah, S., Majeed, A., & Popp, J. (2023). Determinants of bank's efficiency in an emerging economy: A data envelopment analysis approach. *Plos One*, *18*(3), e0281663.

Uribe-Bohorquez, M.-V., Martínez-Ferrero, J., & García-Sánchez, I.-M. (2018). Board independence and firm performance: The moderating effect of institutional context. *Journal of Business Research*, *88*, 28–43.

Wang, W.-K., Lu, W.-M., & Lin, Y.-L. (2012). Does corporate governance play an important role in BHC performance? Evidence from the US. *Economic Modelling*, *29*(3), 751–760.

Wanke, P., Tsionas, M. G., Chen, Z., & Antunes, J. J. M. (2020). Dynamic network DEA and SFA models for accounting and financial indicators with an analysis of super-efficiency in stochastic frontiers: An efficiency comparison in OECD banking. *International Review of Economics & Finance*, *69*, 456–468.

Westerlund, J., & Edgerton, D. L. (2008). A simple test for cointegration in dependent panels with structural breaks. *Oxford Bulletin of Economics and Statistics*, *70*(5), 665–704.

Yue, C., Dong, Y., Lu, Y., & Ma, D. (2018). Does Institutional Ownership Improve Firm Investment Efficiency? *Emerging Markets Finance and Trade, Forthcoming*.

(Davidavičienė, 2018)