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Non-Monotonic Relationship between Corporate Governance and Banks' Operating Performance—The Moderating Role of CEO Duality: Evidence from Selected Countries

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Abstract: This study examines the non-monotonic (U-shaped, inverted U-shaped or curvilinear) relationship between the corporate governance (CG) and bank performance of commercial banks operating across four countries whose CG framework is based on the OECD principals of CG. Using a dataset of 4230 bank-years observation from 2012–2021, the study shows that governance–performance relations may be non-monotonic but not U-shaped using a two-line approach and the Robin Hood algorithm. In addition, this study, using feasible generalized least squares (FGLS), empirically shows that the interaction effect of CEO duality on governance–performance relations in financial institutions is curvilinear and significantly moderates and reverses these impacts. The findings reveal that, in financial institutions with CEO duality, there is a far more modest association between CG and performance, which has an inverted-U shape and is curvilinear. The findings are consistent with arguments advanced by resource dependence and stewardship theory that, although duality might increase bank performance through joint leadership, it can benefit the bank in the presence of unity of command.

Keywords: corporate governance; CEO duality; inverted U-shape; two-line method; non-monotonic; curvilinear



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1. Introduction

“Effective corporate governance (CG) is crucial to the effective operation of the banking sector and the economy as a whole,” states the Basel Committee on Banking Supervision (BCBS), the world’s leading authority on banking regulation and supervision, in its 2015 guidelines for banks [1]. The BCBS confirms the existence of a governance framework comprising a board of directors and senior management [2]. The notion at the base of the BCBS is that excellent CG improves monitoring efficacy. Furthermore, the Committee thinks that effective CG is essential for the continuation of a sound financial system and, as a result, it improves the economic conditions of a country.

Moreover, the significance of banks in the economic system, the structure of the banking industry, the difficulties associated with their CG, and the available means for addressing these issues are all distinctive. The complexity of the banking industry increases information asymmetry and diminishes the capacity of stakeholders to supervise the functions of bank executives. Banks are indispensable to the financing system and play a substantial role in the operation of economic systems. They are also highly leveraged, primarily because of consumer deposits. Banks must adhere to stronger laws than other businesses since they are accountable for protecting depositors’ rights, ensuring the payment system functions properly, and reducing systemic risk.

There are several challenges with CG regulation in this area. Although regulation might be viewed as a different CG instrument, it typically reduces the effectiveness of

other CG issue-solving mechanisms. This is the case when regulation places restrictions on bank ownership, limits bank operations, employs coefficients that reduce industry competition, or establishes deposit insurance that limits depositor monitoring. Additionally, the regulator's primary objective is to reduce systemic risk, which could conflict with shareholders' main goal of increasing share value.

According to agency theory, an inherent conflict of interest exists between the firm's managers and owners [3]. Therefore, in a world of partial contracts, a corporate governance system is essential to ensure that management looks out for shareholders' best interests [4]. If successful in safeguarding shareholders' wealth, corporate governance practices should be associated with a more effective use of company resources and higher returns on investment. Therefore, an increase in corporate governance scores should improve corporate performance. Although there is substantial theoretical evidence that the presence of governance practices has a positive effect on performance, researchers have been unable to provide consistent evidence of this connection (hereafter referred to as the CG–performance relation). Previous studies on this topic focused on a monotonic or linear relationship. Prior research has investigated the influence of corporate governance principles on firm performance, but empirical results are inconsistent [5–7].

According to agency theory, CEO duality signifies an increase in “internal control”, where a powerful CEO who also serves as the chairman lessens board monitoring. This might imply a negative correlation with bank performance. The number of countries mandating or promoting the dissociation of the board chair and the chief executive officer has increased recently, from 36% in 2015 to 76% out of 50 OECD jurisdictions in 2021. Only 32% of nations with one-tier board composition require the board chair and CEO to be separate, but 44% of jurisdictions encourage the separation through code guidelines or incentive mechanisms. This increase has continued since 2015 when just 11% of one-tier jurisdictions enforced separation and 25% promoted it in law. Twelve countries mandate the separation of the two posts in “comply or explain” codes, while fifteen jurisdictions advocate it [8].

Although past studies on CG, CEO duality, and banks' operating performance are vast, the results are conflicting. In addition to the varied outcomes, little is known about how the CEO's authority affects and how well CG works to improve performance, even if earlier research has focused more on various CG dimensions and bank performance. Studies have shown that CEOs have authority over the bank's operations and performance because they approve most choices. Other research has found that chief executives can influence how directors are recruited, jeopardizing independence and board functioning. Thus, this study aims to examine the non-monotonic relationship between CG and bank performance to determine whether it is U-shaped or Inverted U-shaped. Additionally, the interaction effect of CEO duality on CG and bank performance relationship is analyzed using sample data from four countries i.e., the US, Australia, Japan, and India, (all countries are members of OECD except India) whose CG framework is based on the OECD principals of corporate governance [9–11]. This study investigates the effect of CG on banks' operating performance using the feasible generalized least squares (FGLS) model. Our analysis starts with a sample of 423 commercial banks from 2012 to 2021. As a result, our study broadens earlier research that concentrated on commercial banks to a global setting. Second, we test the non-monotonic relationship between CG and bank performance hypothesis using the two-line method.

This study generally sees a non-monotonic or inverted U-shaped relationship between CG and bank performance. Even though an increase in CG score is significantly related to a bank's operating performance and suggests improved governance, the non-monotonic connection demonstrates that, when the governance score exceeds 50% and 75%, banks' operating performance begins to decline. All curvilinear models of banks' operating performance support the moderator role of CEO duality. The inverted-U shape or curvilinear relationship between CG and banks' operating performance is therefore demonstrated to be moderated by CEO duality.

2. Theoretical Framework and Hypotheses Development

An effective corporate governance mechanism is crucial in the banking sector due to the large asymmetries in information, opaqueness, and intricacies typical of this sector [12]. Due to the uniqueness of the banking sector, managers have to deal with the challenging issues that arise while dealing with diverse risks [13]. Managers may therefore be compelled to make decisions that are not always in the shareholders' best interests [14]. Governance should be such that it encourages risk-taking up to acceptable levels in such a manner that the possibility of bankruptcy is minimized [15–17]. By establishing these governance systems, it becomes more likely that financial reporting is transparent, which raises earnings because it is simpler to forecast future cash flows [18]. As a result, banks will find it simpler to plan capital allocation, make investments, and comply with regulatory requirements. Abobakr [19], in their study on 25 Egyptian banks, argued that a large board size and CEO duality are positively correlated with bank profitability, using ROE and ROA as profitability measures.

Claessens and Yurtoglu [20] argued that better CG is advantageous for the organization, but much more so for the stakeholders. It ensures better ownership structures, improved labor policies, better resource allocation, more efficient managerial processes, and other efficiency enhancements. The Basel Committee on Banking Supervision endorses good CG practices for banking institutions. It offers recommendations for improving CG in board practices, compensation, internal control, senior management, risk management, disclosure and transparency, and complex or opaque corporate structures [2].

Previously, several studies have attempted to examine the connection between CG and performance. The majority of the studies conducted are concentrated on identifying the CG variables that have a major impact on performance. Board characteristics, such as ownership characteristics, board meetings, board activity, board independence, and board size, such as the promoter, are the most frequent variables utilized by such studies as the representations of CG practices in firms [21–23].

In addition to facilitating interaction between stakeholders (the company's owners, executives, and investors), good corporate governance provides a framework for ensuring that all users, even those with competing needs, have access to the resources they need. CG provides frameworks through which firm objectives are created and methods for achieving those objectives, as well as a method for determining if performance targets are met. Corporations with strong governance are believed to disclose the division of decision and control powers between the business and its investors transparently, making them more investor-friendly than firms with poor governance.

Important indicators of governance excellence include CEO duality and board composition [24–27]. The bank CEO is empowered to make important decisions regarding senior executives [28]. Combining the positions of CEO and Chairman may be considered compensation for exceptional performance and retention strategy. CEO power is enhanced by the presence of duality, which establishes the CEO as the top executive [29]. The CEO holds significant authority both inside and outside the bank. In contrast to previous research, they find no conclusive link between corporate governance and financial performance.

There are compelling arguments for and against duality. Duality is supported by the "benefits of unity of command" concept [30]. Two organizational theories, stewardship [31] and resource dependence theory [32], support this view. According to this story, the CEO and chairman's functions are artificially independent. It causes internal confusion, particularly during times of crisis when leadership is duplicated [33]. Consolidation of power enhances administrative coordination [34]. Fewer conflicts between management and the board may arise from the impact of strong CEO chairmen over director appointments in terms of boardroom dynamics. In this approach, duality can lead to improved coordination and responsive risk management [35]. Using empirical data, Byrd et al. [36] investigated 1980s governance structures for 130 US firms, including duality. Their research showed that companies with a non-dual focus were significantly more likely to fail than duality-focused ones. According to Berger et al. [37] and Simpson and Gleason [38], US BHCs that separate

these two crucial duties have a greater likelihood of bank failure. A similar CEO power index was also created by Mollah and Liljeblom [39] to look for a positive impact on banks' operating performance and quality amid the debt crisis.

On the other hand, there is substantial literature that argues against duality. Monitoring the CEO is one of the board of directors' key responsibilities [40]. The chairman of the financial institution is expected to spend a lot of time addressing the challenges the bank faces and promoting thoughtful debate on important strategic topics. Good governance is demonstrated by the separation of chairman and CEO responsibilities, which lowers agency costs and improves monitoring efficiency [41–43]. Analyzing managerial operations for signs of excessive risk-taking is a crucial governance obligation if the bank boards' functions are to advise and monitor [44,45].

Based on our analysis of the current research, this study identified four significant gaps. First, previous research that looked at the linear relationship between corporate governance (CG) and financial performance (i.e., positive, negative, or mixed) used the assumption that all levels of governance have an equal impact on the performance of the organization. Second, studies exclude banking institutions from their datasets because of the various regulatory frameworks that oversee the banking industry and the fundamentally distinct capital structures, cash flow and accrual procedures, and activities of the banking sector [46–50]. Third, the majority of research has not used a comprehensive CGI that includes all aspects of corporate governance, but rather has analyzed firm performance using only board size [25,26] and ownership characteristics as explanatory factors. Fourth, compared to studies looking at non-banking industries, fewer empirical studies have been conducted on the connection between corporate governance, CEO duality, and bank performance. The relevant literature is shown in Table 1.

Table 1. Literature Review.

Author(s)	Dependent Variables	Governance (Control) and Dummy Variables	Data	Methods	Results
Onal and Asthon [51]	ROA, ROE, and NIM	Board size, Board independence, Board Structure, Gender diversity, Nationality diversity, CEO Duality, and Foreign Ownership	The data comprise 211 banks from an estimated total of 2241 banks, including major banks, functioning in EU member and candidate states from 2000 to 2015.	Fixed Effect Model	Significant Negative Impact
Khan and Wang [52]	ROA	Bank size and financial leverage	The data consist of 17 commercial banks (CBs) in China from 2008 to 2019.	GMM	Significant and Positive
Boachie [53]	ROA	Audit committee size, Non-executive director, CEO duality, Board size, and Board ownership	The data include 23 Ghanaian banks that were active between 2006 and 2018.	Multiple regression method	Significant and Positive
Khan and Zahid [54]	ROA, ROE, and Tobin's Q	CGI, Board Size, Board education, Board independence, Board activity and ownership structure	The data include 79 Islamic banks from 19 countries, totaling 553 entities with year-to-year observations from 2010 to 2016.	Panel random effects regression	Significant and Positive
Ajili and Bouri [55]	ROA, ROE, and Tobin's Q	Board of directors, Audit committee and Shariah Supervisory Board indices	A sample consists 44 IBs operating in the GCC from 2010 to 2014.	Multiple regression models	Insignificant

Table 1. Cont.

Author(s)	Dependent Variables	Governance (Control) and Dummy Variables	Data	Methods	Results
Gangi et al. [56]	ENV Score and Z-Score	Board size, Board independence, Board diversity, CEO power and CEO compensation	The data include a sample of 142 banks from 35 countries from 2011 to 2015.	Heckman's two-stage model	Significant and Positive
Bachiller and Garcia-Lacalle [57]	ROA	Total assets, no. of employees, and no. of branches	The data contain 45 SBs that were operating in Spain in 2009.	Structural Equation Model (SEM)- PLS	Insignificant
Tarchouna et al. [58]	Non-performing Loans	Board size, Board independence, CEO duality, and ownership structure	The sample comprise 184 US commercial banks from the years 2000 to 2013.	PCA and GMM dynamic panel data methods	Small banks are characterized by a sound CG system as opposed to medium and large banks

Source: Author's compilation.

This study proposes that the relationship between corporate governance and bank operational performance is non-monotonic (inverted U-shape) and curvilinear due to the simultaneous operation of two opposing processes. The goal is to determine if there is a non-monotonic relationship between corporate governance and performance, as well as the interaction effect of CEO duality. Based on these studies, we propose the next two hypotheses:

H1. *There is a non-monotonic relationship between corporate governance and bank performance.*

H2. *The non-monotonic relationship between corporate governance and bank performance is moderated by CEO duality.*

3. Data and Methodology

3.1. Sample

The data on corporate governance score, CEO duality, and banks' operating performance, i.e., net interest margin (NIM), return on assets (ROA), and efficiency ratio (ER), were obtained from the Bloomberg database. Our study obtained data on corporate governance, CEO duality, and operating performance (NIM, ROA, and ER) from commercial banks in four countries. All are advanced countries with strong legal and institutional frameworks. A corporate governance framework exists in the sample nations based on the OECD principals of corporate governance for all publicly listed companies, including financial and non-financial, and has recently been amended. Three of these four countries have a common law (US, Australia, and India), and Japan has a civil law system. Only Japan allows multiple options among the sample countries with a hybrid system of having a one- or two-tier board.

Commercial banks of substantial importance from all four countries are represented in the sample. Only 48% of all listed banks in the four nations were included in the sample. However, these 423 banks account for around 81% of banking assets, 78% of equity, 85% of loans, and 82% of deposits in the year 2022. Commercial banks in India and Australia, which make up a lesser proportion of the sample banks, control at least half of the banking industry's deposits, assets, equity, and loans. The details of the sample selection procedure are summarized in Table 2. Our study used FGLS panel data analysis on the data using R software, which covered 423 banks over 10 years (2012–2021) for post-crisis and was adjusted for any latent heteroskedasticity and serial autocorrelation [59]. As a result, 4230 observations from a panel data sample were used to estimate regression models. According to a multicollinear test, none of the main effects' variance inflation factors rose above the desirable level of five. Tables 3 and 4 report the descriptive statistics and correlation matrix, respectively.

Table 2. Country-wise sample data.

Variable	US	INDIA	JAPAN	AUSTRALIA	ALL
OBS.	2790/279	250/25	740/74	450/45	4230
NIM	72.512	54.837	7.369	28.837	55.425
ROA	58.882	41.786	10.944	44.252	47.929
ER	54.434	32.631	72.786	18.868	52.572
CG	75.973	38.193	21.635	94.087	66.161
CEO_Duality	32.294	24	59.054	0	33.050
TBQ	46.158	37.226	9.822	55.312	40.247
LEV	17.592	32.253	25.131	85.651	27.017
Earnings	0.415	28.724	44.407	6.895	10.474
GDP	49.792	55.9	55.006	55.214	51.642
Inflation Rate	1.885	5.877	0.54	1.867	1.884

Table 3. Descriptive statistics.

Variable	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
NIM	4230	55.425	63.966	100.000	0.000	30.020
ROA	4230	47.929	51.761	100.000	0.000	28.808
ER	4230	52.572	53.066	100.000	0.000	26.239
CG	4230	66.161	76.661	100.000	0.000	28.418
CEO_DUALITY	4230	33.050	0.000	100.000	0.000	47.045
TBQ	4230	40.247	37.151	100.000	0.000	28.304
LEV	4230	27.017	17.544	100.000	0.000	27.451
EARNINGS	4230	10.474	0.113	100.000	0.000	23.760
GDP	4230	51.642	55.275	100.000	0.000	32.187
INFLATION RATE	4230	1.884	1.622	10.018	−0.233	1.590

Table 4. Pearson’s correlation matrix.

Variables	NIM	ROA	TBQ	CEO_DUALITY	CG	ER	GDP	INFLATION_RATE	EARNINGS	LEV
NIM	1									
ROA	0.361648	1								
TBQ	0.405129	0.21931	1							
CEO_DUALITY	−0.1383	−0.10169	−0.11084	1						
CG	0.488476	0.303733	0.27445	−0.24567	1					
ER	−0.1104	−0.30266	−0.25837	0.142959	−0.32763	1				
GDP	−0.13587	0.05574	−0.01357	−0.04946	0.093529	−0.10619	1			
INFLATION_RATE	0.207586	0.276484	0.144352	−0.09624	0.072858	−0.28504	0.173376	1		
EARNINGS	−0.2353	−0.18439	−0.29771	0.095477	−0.15565	0.029692	0.09473	−0.11571	1	
LEV	−0.39236	−0.14756	0.107295	−0.17817	0.200804	−0.382	−0.02664	−0.0447	0.162474	1

3.2. Variables

The net interest margin (NIM), which is calculated as Interest Income to Average Interest Earning Assets minus Interest Expense to Average Interest-Bearing Liabilities as the traditional proxy for NIM, was the method through which this study measured bank performance. Many other studies, such as [60–64], used this measure or a comparable one as the dependent variable in research on corporate governance and, more broadly, in studies of the efficiency of CG practices at banking and other financial institutions. The net interest

margin (NIM) is a performance indicator that compares a bank's investment success to its debt. A negative number implies that the banks did not make the best selection possible because interest expenses exceeded investment profits. As a result, a negative NIM may indicate poor management decisions by the bank, resulting in increased operational costs.

To test the robustness of the model, our study employed two additional measures of bank performance: return on assets (ROA) and efficiency ratio (ER). Return on assets indicates the efficiency with which management generates profits from its assets. It is calculated by dividing the net income by the average total assets. The efficiency ratio (also known as cost to income ratio) is a commonly employed efficiency metric in the financial industry. The efficiency ratio compares the cost to revenues.

Recent research on the impact of CG focused on the single dimensions related to executive gender, size of the board [65], and ownership structure [66]. These dimensions do not fully capture the overall quality of corporate governance, and using some individual governance dimensions may result in a serial correlation [67]. To redress this shortcoming, numerous studies used the comprehensive corporate governance index (CGI) to represent the effect of the individual dimensions [67,68]. The present study used the Bloomberg CG score to eliminate the above shortcoming.

Our study used a set of control measures. The first three were bank-specific variables: Tobin's Q, leverage, and earnings. The last two measures were to control for the country's differences in the macroeconomic environment and the country's economic development, i.e., GDP and inflation rate [69–71].

3.3. Model for the Non-Monotonic Relationship between CG and Operating Performance

This study estimated three models for each dependent variable (net interest margin, return on assets, and efficiency ratio). The first model, known as the baseline, included CG and the squared value of CG. This study added CEO duality to the second model. In the third model, by including two interaction terms, CG and CEO duality, and the squared value of the variables CG and CEO duality as a moderator, the study provided a test for the hypothesis that the relationship between CG and banks' operating performance has an inverted U-shape. By adding the interaction terms "CG×CEO duality" and "CG²×CEO duality," the study tested for the moderating effect of CEO duality on the curvilinear relationship between corporate governance and bank performance. The general form of this regression is:

$$\text{Performance}_{it} = \alpha + \beta_1 \text{CG}_{it} + \beta_2 \text{TBQ}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{Earnings}_{it} + \beta_5 \text{GDP}_{it} + \beta_6 \text{Inflation_Rate}_{it} + I((\text{CG}^2))_{it} + \mu$$

where Corporate Governance (CG) simply functions as an independent variable and CG² is the squared term for CG. Of course, though, the relationship (form and strength) between CG and banks' operating performance may rely on one or more moderators. For a single moderator, CEO duality, the regression equation becomes:

$$\text{Performance}_{it} = \alpha + \beta_1 \text{CG}_{it} + \beta_2 \text{TBQ}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{Earnings}_{it} + \beta_5 \text{GDP}_{it} + \beta_6 \text{Inflation_Rate}_{it} + \beta_7 \text{CEO_Duality}_{it} + \beta_8 \text{CG} \times \text{CEO_Duality}_{it} + \beta_9 I((\text{CG}^2) \times \text{CEO_Duality})_{it} + \mu$$

The question of whether CEO duality moderates the relationship between CG and the operating performance of the bank is slightly more challenging. Examining the coefficient of $I((\text{CG}^2) \times \text{CEO-Duality})$ will reveal if the curvilinear component of the CG and operating performance connection is modified by the presence of CEO duality, i.e., whether the relationship's shape is modified. However, this does not answer the question of whether the strength of the relationship between CG and operating performance is changed by CEO duality; to perform this analysis, the coefficients must be examined together. An F-test between regression models (the full model and one without the CG×CEO duality and CG²×CEO duality variables) can be used to reach this conclusion.

4. Two-Line Approach and the Robin Hood Algorithm

The two-line test runs two interrupted regressions, one that includes the breakpoint in the first segment and then one that includes it in the second. This is performed to increase power when the predictor hypothesized to have a U-shaped effect is discrete. The first (blue) line shown in Figure 1a–c is the first line in the first interrupted regression, and the second (red) line is the second line in the second interrupted regression. The two-line test was used to test if the effect of corporate governance is U-shaped (or inverted U-shaped) on banks' operating performance.

Here, we explain in detail how the two-line test was run.

1. Our study refers to the predictor hypothesized to have a U-shaped effect as CG2, and the dependent variable as NIM.
2. To test if the effect of CG2 is U-shaped (or inverted U-shaped) on performance, the two-line test procedure conducted the following:
3. Run a quadratic regression of the form $\text{Performance} = a\text{CG} + b\text{CG}^2$
4. The results were $a = 0.022$ and $b = -0$. With these values, one obtains the implied slope ($a + 2b\text{CG}^2$) at the lowest observed value of CG ($\text{CG}_{\min} = 0$). If that slope is negative at that point, the two-line test considers a U shape; if it is positive, an inverted-U shape. Here the quadratic implies a slope of 0.022 at the lowest CG value of $\text{CG} = 0$, which was positive; thus, it tested for an inverted-U shape.
5. Estimated a spline (smoothed scatterplot) model, $\text{Performance} = f(\text{CG})$. See the gray dashed line in Figure 1a–c.
6. Among the middle 80% of CG values (between the 10th and 90th percentile), the most extreme fitted Performance value was identified: $\text{performancemax} = 73.369$, which corresponds to $\text{CG} = 6346.164$.
7. All CG values associated with a fitted performance within a standard error of performance max were identified: CGflat.
8. The median CG value in CGflat was identified as 6411.041.
9. An interrupted regression was estimated with that midpoint value as the breakpoint (with heteroskedasticity-robust standard errors (using 'HC3' by default, switching to 'HC1' if a NA is produced)).
10. The resulting z-values (b/se) for the two slopes were $z_1 = 51.77$ and $z_2 = 42.544$.
11. Using these z-values, we computed the following ratio, $z_1/(z_1 + z_2) = 0.549$, which is the percentile of the CG2 value within CGflat used as the breakpoint for the final interrupted regression, whose results are depicted in Figure 1, $\text{CGc} = 6363.672$.

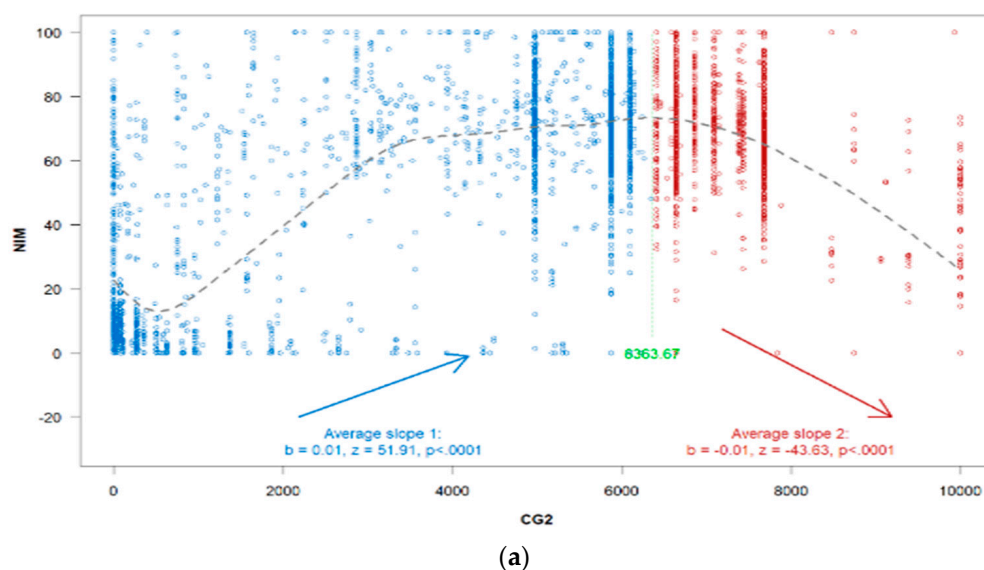


Figure 1. Cont.

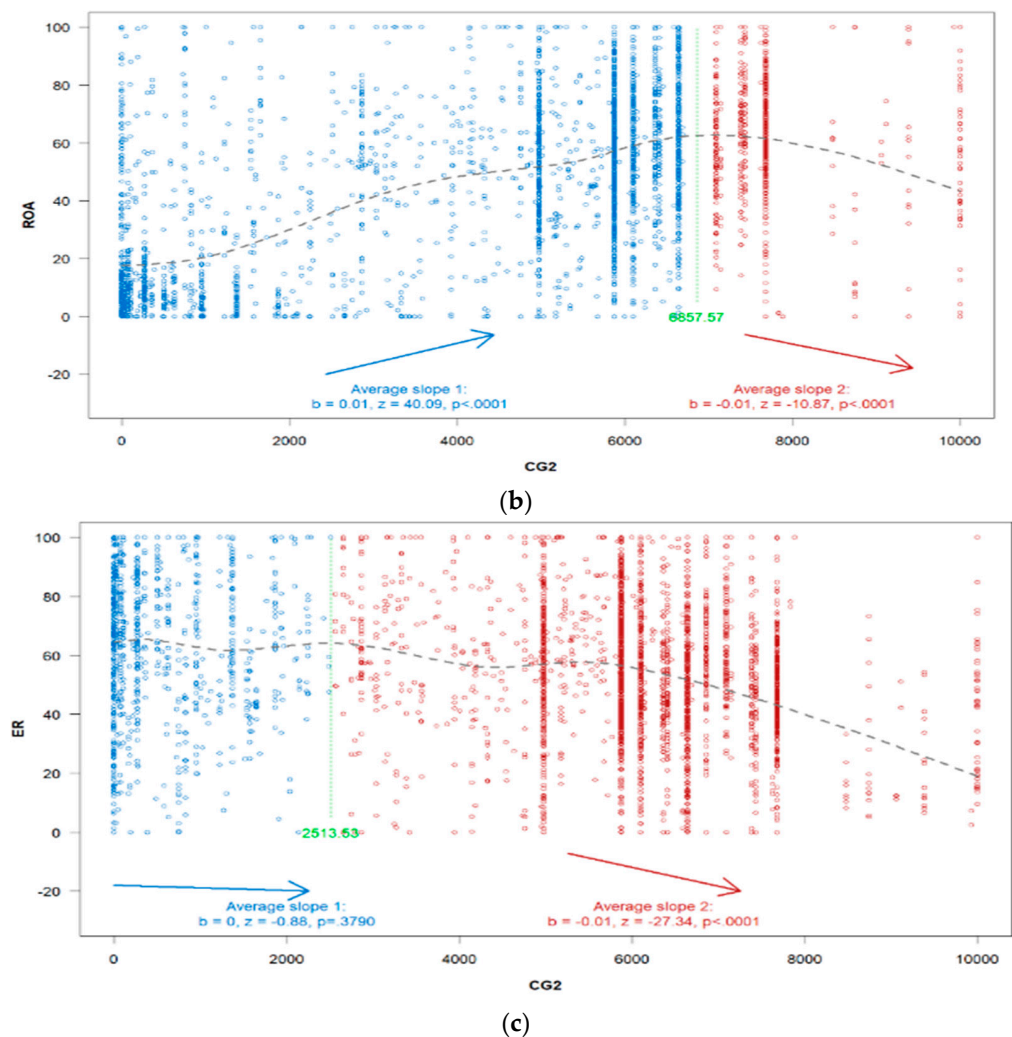


Figure 1. (a) Non-monotonic relationship between CG(Sq) and NIM. (b) Non-monotonic relationship between CG(Sq) and ROA. (c) Non-monotonic relationship between CG(Sq) and ER.

Across all three measures of performance (NIM, ROA, and ER), the two-line test found a significant inverted u-shaped relationship between NIM and ROA with CG2 but insignificant between ER and CG2. However, there was a significant curvilinear relationship between ER and CG2. Hence, a curvilinear relationship exists between ER but not the inverted u-shaped relationship [72].

5. Results

In Table 5, which shows the relationship between CG and performance, this study found that CG has a significant influence on operating performance at low governance scores but has a minimal effect at a particular level. This is easily represented with a quadratic effect in Figure 1. Our study results confirm a non-monotonic curvilinear relationship and a hypothesized inverted U-shaped relationship between CG and the banks' operating performance measures. It contradicts the findings of Kumar et al. [73], who reported there is no curvilinear relationship between governance and financial performance. However, it is consistent with the findings of Nollet et al. (2016), who claimed there is a curvilinear relationship between governance and financial performance. As per previous studies, the improvement in CG is positively related to operating performance, although the increase in performance shows a diminishing marginal growth [74,75].

Table 5. Model without CEO duality and interaction term.

	Dependent Variable		
	NIM (1)	ROA (2)	ER (3)
CG	1.233 *** (0.047)	0.417 *** (0.040)	0.466 *** (0.047)
TBQ	0.130 *** (0.010)	0.507 *** (0.012)	−0.334 *** (0.012)
LEV	−0.490 *** (0.011)	−0.214 *** (0.011)	−0.237 *** (0.012)
Earnings	−0.290 *** (0.015)	−0.066 *** (0.011)	−0.121 *** (0.016)
GDP	−0.142 *** (0.009)	−0.003 (0.009)	−0.019 * (0.010)
Inflation_Rate	2.546 *** (0.220)	3.272 *** (0.206)	−3.425 *** (0.237)
I((CG2))	−0.008 *** (0.0004)	−0.002 *** (0.0004)	−0.006 *** (0.0005)
Constant	27.266 *** (1.385)	10.845 *** (1.075)	82.184 *** (1.278)
Observations	4230	4230	4230
R2	0.658	0.597	0.476
F Statistic (df = 7; 4222) 1160.100 *** 893.557 *** 547.413 ***			

Note: * $p < 0.1$; *** $p < 0.01$.

6. The Interaction Effect of CEO Duality

Table 6 reports the result with CEO duality without including the interaction term and Table 7 reports the results of the moderation effect of CEO duality in the relationship between CG and operating performance. To evaluate the interaction effects of CEO duality, the study added the moderating variable CEO duality and the interaction term shown in Figure 2. H2 proposed that CEO duality has an interaction effect on the curvilinear effect on the relationship between the stated variables. The results indicate positive coefficients with significance ($p < 0.05$) of the additional interaction term. The adjusted R^2 of models I, II, and III without moderation effects in Table 5 is less than that of the models I, II, and III with interaction effects in Table 7. This improvement in adjusted R^2 value ranges from 4.2 to 2.10 percent and is significant at the 1% level. The existence of CEO duality as a moderator in all curvilinear models of banks' operating performance is validated. Therefore, it is proved that CEO duality moderates the inverted-U shape or curvilinear relationship between corporate governance and banks' operating performance. It indicates that these studies support the stewardship theory perspective because when CEOs act as good stewards, they are intrinsically motivated and use their full authority to benefit their principals.

Our study showed, for instance, that banks without CEO duality have a considerable advantage in raising performance from low to medium levels but just a minor benefit in raising performance from medium to high levels. Similar to the visual observation of curvilinear interactions, much can be observed from Figure 2. However, for financial institutions with CEO duality, there is a far better association between CG and operating performance, which is an almost inverted-U shape. Thus, the nature of the CG–operating performance relationship (form and strength) changes depending on the presence of CEO duality.

Table 6. Model with CEO duality and without the interaction term.

	Dependent Variable		
	NIM (1)	ROA (2)	ER (3)
CG	0.956 *** (0.044)	0.415 *** (0.040)	0.485 *** (0.047)
TBQ	0.184 *** (0.011)	0.505 *** (0.012)	−0.333 *** (0.012)
LEV	−0.465 *** (0.012)	−0.216 *** (0.011)	−0.234 *** (0.012)
Earnings	−0.256 *** (0.014)	−0.066 *** (0.011)	−0.122 *** (0.015)
GDP	−0.158 *** (0.009)	−0.003 (0.009)	−0.020 * (0.010)
Inflation_Rate	2.957 *** (0.181)	3.257 *** (0.208)	−3.354 *** (0.238)
I((CG2))	−0.006 *** (0.0004)	−0.002 *** (0.0004)	−0.006 *** (0.0005)
CEO_Duality	−0.050 *** (0.006)	−0.004 (0.006)	0.017 ** (0.007)
Constant	33.220 *** (1.267)	11.164 *** (1.169)	80.770 *** (1.350)
Observations	4230	4230	4230
R2	0.639	0.594	0.482
F Statistic (df = 8; 4221) 934.856 *** 771.953 *** 490.385 ***			

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 7. Model with CEO duality and the interaction term.

	Dependent Variable		
	NIM (1)	ROA (2)	ER (3)
CG	1.325 *** (0.072)	0.476 *** (0.057)	0.815 *** (0.065)
TBQ	0.131 *** (0.010)	0.506 *** (0.012)	−0.327 *** (0.012)
LEV	−0.483 *** (0.011)	−0.197 *** (0.011)	−0.214 *** (0.013)
Earnings	−0.265 *** (0.015)	−0.056 *** (0.011)	−0.100 *** (0.015)
GDP	−0.137 *** (0.009)	0.001 (0.009)	−0.007 (0.010)
Inflation_Rate	2.261 *** (0.215)	3.195 *** (0.214)	−3.471 *** (0.229)
I((CG2))	−0.009 *** (0.001)	−0.003 *** (0.001)	−0.009 *** (0.001)
CEO_Duality	−0.043 * (0.025)	−0.013 (0.017)	0.142 *** (0.020)
I((CG2) * CEO_Duality)	0.0001 *** (0.00001)	0.00004 *** (0.00001)	0.0001 *** (0.00001)

Table 7. Cont.

	Dependent Variable		
CG:CEO_Duality	−0.004 *** (0.001)	−0.003 *** (0.001)	−0.008 *** (0.001)
Constant	30.031 *** (2.342)	10.865 *** (1.608)	72.256 *** (1.892)
Observations	4230	4230	4230
R2	0.681	0.608	0.503
F Statistic (df = 10; 4219) 899.145 *** 653.295 *** 426.860 ***			

Note: * $p < 0.1$; *** $p < 0.01$.

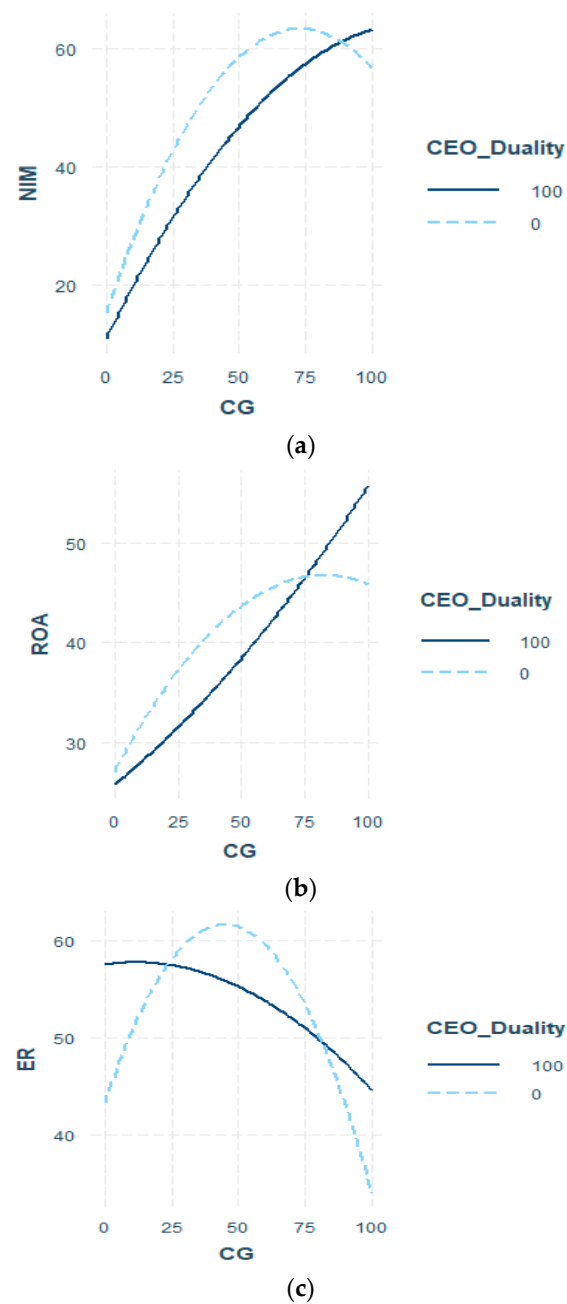


Figure 2. (a) Interaction effect of CEO duality on NIM and CG. (b) Interaction effect of CEO duality on ROA and CG. (c) Interaction effect of CEO duality on ER and CG.

7. Discussion and Conclusions

This study investigated a non-monotonic relationship between corporate governance and the operating performance of commercial banks and the interaction effect of CEO duality on CG and banks' operating performance using a two-line test and the feasible generalized least squares (FGLS) method in R software. The two-line test showed the non-monotonic relationship between CG and performance. The regression results show an inverted U-shaped relationship between CG and bank performance and the significant interaction effect of the CEO duality on CG and bank performance relationship. The following research contributions resulted from these findings: In the first place, CG and bank performance have a significant inverted U-shaped non-monotonic relationship, similar to the earlier research by Nolle et al. [76]. Second, when the interaction term is not included in the model, our study found that the curvilinear relationship of corporate governance has a significant negative impact on banks' operating performance. In addition, the inclusion of the interaction term in the model mitigates these adverse effects to the extent that they eventually disappear and become positive. So, the relationship between CG and bank performance is moderated by CEO duality. Simply put, a strong CEO improves the board's ability to provide valuable resources to the bank, such as advice that would increase the bank's competitive advantage, which positively affects performance. Consequently, incorporating CEO duality into bank board structures should improve monitoring and advisory functions, enhance governance, and increase returns, as other research has shown. In conclusion, CEO duality in banks effectively assumes the responsibility of enhancing bank performance. Our findings conclude that CEO duality contributes to addressing the shortcomings of other CG mechanisms when applied to financial institutions. A powerful CEO is beneficial not only to shareholders and other stakeholders but also for the development of financial institutions.

This study will enrich the study of the U-shaped or inverted U-shaped relationship between corporate governance and banks' operational performance with the interaction effect of CEO duality from a theoretical and empirical perspective. In specific contexts, both dual and non-dual CEO roles may be problematic. Because agency theory and stewardship theory provide seemingly contradicting perspectives on board preferences, research that may assist in incorporating these theories becomes necessary. As stated earlier, a single theoretical framework cannot adequately explain the relationship between corporate governance and banks' operating performance. In terms of theoretical contributions, this study used agency theory, resource dependence theory, and the TMGT effect to explain how CEO duality and non-duality affect the non-monotonic relationship between corporate governance and banks' operating performance. In addition, the issue of the form of the U shape or inverted-U shape is expanded upon by applying the two-line approach.

This study will also help in making decisions regarding the separation of two posts. The clear implication is that good corporate governance and a powerful CEO enhance bank performance, such that the integration of agency theory and resource dependence theory arguments enhance the monitoring effectiveness of the board to increase corporate governance performance. Future studies will benefit from examining the influence of non-financial institutions and networks on the effect of duality on corporate performance.

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