CEO POWER AND BANK RISK-TAKING: NEW EVIDENCE FROM AN EMERGING ECONOMY

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**Abstract**

This study examines the impact of CEO power on bank risk-taking for all publicly listed commercial banks in Vietnam from 2011 to 2021. Using generalized least square (GLS) random effect (RE) estimation, this study finds that the presence of powerful CEOs (CEOs with large ownership and CEOs who are also the chairman of bank boards) reduce bank risk-taking. Regarding other bank governance factors, large bank boards are also inversely related to bank risk-taking. In contrast, board independence is positively associated with bank risk. These results are robust to different proxies for bank risk-taking and different estimation techniques.

**JEL Classification:** G21; G28.

**Keywords:** CEO power, Bank risk-taking, Bank governance, Commercial banks.

# Introduction

 The banking industry plays a vital role in economic development, especially for bank-based Asian economies such as Vietnam. Understanding what factors drive bank performance and risks has long attracted significant attention in the literature, as commercial banks often take excessive risks to generate larger cash flows, which subsequently might increase the probability of bank failures. For example, the 1997 Asian financial crisis exposed weaknesses in the corporate governance practices of commercial banks in Asian countries. Previous studies (e.g. Demsetz and Strahan, 1997; Anderson and Fraser, 2000; Boyd et al., 1993; Lu and Boateng, 2018) show that weak bank boards, large gaps between the board and CEO responsibilities, and cross-ownership are among the main factors that increase bank risk.

Our study focuses on CEO power as the CEO is the highest title on the executive team responsible for the vision, strategy, coordination, and oversight of the bank’s operations. The related literature has two different views. The first view indicates that if the CEO is too powerful, especially in the context of weak bank boards, fraud in financial statements is more likely because managers, in particular CEOs, are individualist, opportunist and self-interested (Pathan, 2009; Victoravich et al., 2011). The second view shows that if CEOs are also the board’s chairman, they tend to work harder and add more value to the company (Anderson and Galinsky, 2006).

While most previous studies focus on developed countries and arrive at contradicting conclusions, no study has empirically examined the extent to which multiple dimensions of CEO power and bank risk-taking are related in the context of the Vietnamese banking system. The Vietnamese government has only initiated consolidation and reform activities in the banking system since 2005. Among newly developed laws and regulations, policymakers consider a legal framework for corporate governance as one of the top priorities to maintain the stability of the Vietnamese banking industry. Our study, therefore, provides timely and imperative implications and helps inform policymakers and regulators who are concerned with the stability and resilience of the banking system in Vietnam.

Using a sample of all 19 publicly traded commercial banks in Vietnam from 2011 to 2021, as well as market and hybrid measures to determine a bank's risks, we provide comprehensive evidence on the impact of CEO power on bank risk-taking. Consistent with prior research in the international context (e.g. Anderson and Fraser, 2000; Chen et al., 2006; Altunbas et al., 2020), we document that CEO power, including CEO duality and CEO ownership, is generally associated with decreased bank risk-taking. Furthermore, we discover that a larger bank board, as well as other bank characteristics such as bank size and bank capital, result in lower bank risk-taking. In contrast, board independence is positively associated with bank risk. The findings are also consistent with previous research (Baysinger and Hoskisson, 1990; Boyd, 1994; Andres and Vallelado, 2008) for developed countries.

The study adds to the literature by being the first to provide a new perspective on how CEO power influences bank risk-taking behavior in Vietnam, where most consolidation and reform activities in the banking system have only taken place since 2005. Furthermore, the Vietnamese stock market has only flourished since 2007; thus, commercial banks may still not follow international standards of information disclosure. This provides an ideal context to examine how corporate governance affects bank risk-taking behaviors where the legal framework is still pretty much at its dawn. Our study, therefore, joins the debate on corporate governance in banking (see Srivastav and Hagendorff, 2016).

Second, whereas most previous studies on bank risks used only a few risk proxies (primarily non-performing loans or loan loss provision), this study uses both market and hybrid measures to determine bank risk-taking in order to provide comprehensive evidence on the effects of CEO power on bank risk-taking in Vietnam.

Third, the banking industry's sensitivity and confidentiality make it difficult to study the impact of corporate governance and bank risks, particularly in the context of the Vietnamese banking industry, where much is left unknown about bank risk-taking behaviors. We collect data by hand to create measures of CEO power and shed light on its relationship with bank risk-taking in Vietnam.

Our study provides important and timely implications for regulators and bank supervisors alike. While the CEO position requires a certain level of power in order to execute leadership (Finkelstein and Hambrick, 1996) effectively, executives and boards of directors should be aware that having too much power can lead to an over-emphasis on upside opportunities while ignoring potential pitfalls. Commercial banks, for example, with CEOs who own fewer bank shares, are more likely to pursue unnecessarily risky strategies due to the disparity between the CEOs' interests and shareholders’ benefits. Commercial banks, therefore, can effectively monitor bank risks by developing CEO capacity and dedication and adjusting bank board features to align CEOs’ benefits with the wealth maximizing objectives for shareholders. In addition, our study also informs regulators and policymakers who are concerned with bank risk-taking behaviors and the overall stability of the banking system.

 The remainder of the paper is structured as follows. Section 2 presents a critical literature review and hypotheses development. Section 3 describes the data and econometric methods. Section 4 provides the empirical results. Section 5 shows the robustness of the results. Section 6 concludes the paper.

# Related literature and hypotheses development

CEOs are key in making corporate decisions such as capital structure (Brickley et al., 1988; Jokipii and Milne, 2011; De Jonghe and Öztekin, 2015), business strategy (Caroll, 1984, Eisenhardt and Schoonhoven, 1990), and human recruitments. Their power and characteristics have the potential to influence corporate risk-taking behaviors (McPherson, Smith-Lovin, and Cook, 2001).

According to Daily and Dalton (1994), CEO power is a complicating factor because some sources of power can be perceived as both positive and negative. CEOs hold a position of unparalleled power within commercial banks. The most widely used proxy for CEO power is structural power, specifically the dual leadership system (known as CEO duality). When an individual serves as both CEO and chairman of the board of directors, the term "CEO duality" is used (Hermalin and Weisbach, 1998). Due to its totality and dominance, the CEO's duality can be detrimental to an organization's performance (Daily and Johnson, 1997). As a result, if the CEO enjoys taking risks, the bank may suffer losses or face significant default risks. Lewellyn and Muller-Kahle (2012) find that powerful CEOs are also associated with excessively risky credit policies. Adams et al. (2005) show that firms with more powerful CEOs pursue riskier policies by overriding board decisions.

Others, on the other hand, have argued that such duality provides the firm with a unified vision and direction (Anderson and Anthony, 1986). Once the CEO is also the chairman of the board, they can be more willing to work for the banks. Based on the consistency of commercial banks' hierarchical systems, the CEO is encouraged to prioritize bank stability over short-term benefits (Victoravich et al., 2011). As a result, CEO duality tends to reduce risk-taking behaviors. Pathan (2009), for example, shows how powerful CEOs in bank holding companies can influence board decisions, reducing risk-taking. Victoravich et al. (2011) contend that high CEO equity compensation has a negative impact on bank risk-taking. Therefore, the hypothesis is proposed as follows:

***Hypothesis 1 (H­­1):*** *CEO duality is positively/negatively related to bank risk-taking.*

 CEO ownership power is determined by the amount of equity held by CEOs (Tosi et al., 2000). Shareholder power can help to balance managerial influence with the board (Useem et al., 1993; Hartzell and Starks, 2003). As a result, Jensen and Meckling (1976) propose linking the interests of shareholders and managers through share ownership in order for managers to act in the best interests of shareholders.

 Stock ownership is a type of incentive that encourages managers to operate more efficiently (Brickley, Lease and Smith, 1988). Previous empirical studies (e.g., Adams et al., 2009; Elsila et al., 2003) show that the management capital ownership ratio is positively related to bank performance. In other words, once executives, particularly CEOs, are motivated by stock ownership, they will be motivated to increase the bank's value (Lilienfeld-Toal and Ruenzi, 2014).

 Increased stock ownership, however, does not always result in mutual interests between shareholders and executives. CEOs have a tendency to seize company assets (Fama and Jensen, 1983) or to make decisions that benefit them in the short term but harm the bank in the long run (Victoravich et al., 2011). According to Bhagat and Bolton (2013), CEOs with significant ownership reduce bank performance due to lower risk tolerance. Therefore, the greater the amount of CEO stock ownership is, the greater their power is, and thus their proclivity for risky behavior also increases. As a result of these findings, we formulate the second hypothesis:

***Hypothesis 2 (H2)****: CEO ownership is positively/negatively related to bank risk-taking.*

# 3. Data and econometric methods

## 3.1. Sample and data

The sample includes 17 commercial banks listed on the Ho Chi Minh Stock Exchange and 2 commercial banks listed on the Hanoi Stock Exchange from 2011 to 2021. The CEO power index and strong board index corporate governance data are manually collected from annual reports and management reports. Daily commercial bank stock prices can be downloaded from the websites of Vietstock[[2]](#footnote-2) and CafeF[[3]](#footnote-3). These databases are the primary data sources for research on Vietnamese markets. Accounting data such as total assets, total liabilities, and market equity are obtained from the FiinPro[[4]](#footnote-4) platform to calculate bank capital, bank charter value, and bank ratios such as return on average total assets (ROA) and return on average total equity (ROE). In addition, we obtain market indices (VN-index and HNX-index) data from Trading Economics' website (tradingeconomics.com).

## 3.2. Construction of variables

### 3.2.1. Measures of CEO power

 We measure CEO power in our study using structural power and ownership power. Following the literature (e.g., Weisbach, 1998; Adams et al., 2005), CEO structural power is measured by CEO duality, CEODUAL, with a value of one if the CEO is also the chair of the board and zero otherwise. Hermalin and Weisbach (1998) explain that when the CEO holds the chair position, CEO power increases because the board of directors' influence over CEO decisions is limited. In terms of ownership power, CEO shareholding can also increase CEO power. However, because of this convergence of interests, linking the CEO's personal interests with those of shareholders can align both CEO and shareholder incentives, making the CEO more motivated to improve bank performance (Fama and Jensen, 1983). The CEO ownership variable in this study is determined by the amount of CEO stockholding as a percentage of the total bank outstanding. This data is manually collected from bank annual reports.

### 3.2.2. Measures of bank risk

 Following the previous studies (e.g., Anderson and Fraser, 2000; Chen et al., 2006; Pathan, 2009), bank risk is proxied by total risk, systematic risk, and idiosyncratic risk. In addition, following Pathan (2009), we also employ two additional risk-taking measures (Z-scores and asset return risk) to examine the impact of CEO power on bank risk-taking. Total risk (TLR) is determined as the standard deviation of daily stock return () for each fiscal year from 2011 to 2021. The daily stock return of commercial banks is defined as follows:

 (1)

where is the daily stock price of bank at day . Total risk reflects the overall fluctuation of bank stock return and the market views of commercial banks' assets, liabilities, and off-balance-sheet activities. This type of risk is closely monitored by both regulators and bank managers.

 Idiosyncratic risk (unsystematic risk) enables bank managers to assess the stock price volatility that is unique to the commercial bank, as well as the quality of its loans, bank investment, bank deposit amount and bank capital. Following Anderson and Fraser (2000), idiosyncratic risk (IDIOR) is calculated by taking the standard deviation of the residuals of a single index market model as follows:

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| --- | --- |
|  |  (2) |

where is the stock return of bank at day , is the return of market index, either VN-index or HNX-index. Finally, systematic risk (SYSR) is determined as the difference between total risk and idiosyncratic risk.

 In addition to three risk-taking proxies, the insolvency risk of a bank is employed by using Z-scores to check the robustness of the results (e.g. Pathan, 2009). Z-scores calculate the distance to bankruptcy, which occurs when equity is insufficient to offset losses (Boyd et al., 1993):

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|  |  (3) |

where is the average stock return of bank at year , calculated as the average daily stock price for each fiscal year. is the average equity of bank at year , is the average total asset of bank at year , and is the total risk of bank at year . Because Z-score measures the distance from default, the interpretation of the sign for the Z-score will be the inverse of that of other risk-taking measures. Thus, a high Z-score indicates a low bank risk-taking level, whereas higher TLR, SYSR, IDIOR would signal higher risk-taking behavior.

 This study also uses the asset return risk (ARR) to determine bank risk-taking, as this proxy can provide insights into commercial banks' risky assets. An increase in risky assets indicates that banks are in a riskier situation. As a  bank's equity finance acts as a junior claim on bank cash flows and protects fixed claimants from default losses in the event of moderate declines in commercial banks' total market value, we follow Flannery and Rangan (2008) to estimate bank total risk exposure using equity volatility as follows:

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|  | (4) |

where is the standard deviation of daily equity return in each fiscal year, *E* is the market value of the bank equity at the end of the fiscal year, *A* is the market value of total assets (equals the sum of equity (*E*) plus the book value of total debt) at the end of the fiscal year. The market value of equity (is calculated as the stock price at the end of the fiscal year multiplied by the total number of outstanding shares. is annualized by multiplying with the square root of 250 (the approximate number of trading days in a year).

### 3.2.3. Measures of strong board and bank-specific characteristics

 We control for a number of board and bank-specific characteristics. Board size (BS) is defined as the total number of members on the board of directors (Golden and Zajac, 2001). Even though there is no optimal board size for all businesses, the size of the board appears to impact the risk-taking of commercial banks (Pathan, 2009).

 Independent directors on the board are believed to have a critical monitoring role in resolving, or at least lessening, agency conflicts between management and shareholders (Eisenhardt, 1989). In this context, board independence might be viewed as a safeguard against excessive risk-taking. Board independence ( is measured by the percentage of independent members within the board.

 Previous research identifies the effects of bank size ( on bank risk-taking. It is clear that large banks are internally diversified, which provides one method of mitigating bank idiosyncratic risk (Konishi and Yasuda, 2004; Stiroh, 2006). In contrast, the positive relationship between systematic risk and bank size is documented due to large banks lending to different sectors and holding less equity capital than smaller banks (Demsetz and Strahan, 1997).

 Commercial banks with a low leverage ratio and a conservative capital structure finance their assets with more equity than debts. We also bank capital structure (, defined as a ratio of equity to total assets, as equity capital acts as a cushion against losses and reduces a bank’s probability of default (Saunders et al. 1990; Demsetz and Strahan, 1997; Anderson and Fraser, 2000).

 Finally, following the banking literature, we control for bank charter value ( as sum of market value of common equity (price per share times number of shares) plus the book value of liabilities divided by the book value of assets. Anderson and Fraser (2000) show that a bank’s charter value encourages CEO to take on additional risk.

[Insert Table 1 here]

## 3.3. Empirical model and estimation methods

 Following Pathan (2009), we run the model as follows:

 (5)

where RISK represents the measures of bank risk-taking, YEAR is the time dummy. The estimation method used for the above regression model is the Generalized least square Random effect (GLS RE) technique following the procedure of Baltagi and Wu (1999). As described by Pathan (2009), this technique is robust to first-order autoregressive AR(1) disturbances in unbalanced panel data. Since this data set considers the unobservable and constant heterogeneity, that is, the specific features of each bank, GLS is adopted as it can be robust to cross-sectional correlation and heteroskedasticity across the panel.

 As Hausman specification tests suggest the use of random effect estimation for this model, we decide to use the random effect estimation. Furthermore, for consistent and efficient estimations, the variable values must vary significantly within the panel (19 commercial banks). When the dependent category's main variables do not change over time, such as the CEO duality and board independence, the fixed effect estimation is imprecise (Wooldridge, 2002, p. 286).

## 3.4. Descriptive statistics

 Table 2 contains the descriptive statistics of the variables. In terms of CEO power, the average index value of CEO dual leadership structure (CEODUAL) is 0.11, indicating that CEO duality is relatively low across the sample of Vietnamese commercial banks, compared to 0.46 in Victoravich et al. (2011) for U.S. commercial banks. The mean of CEO shareholdings (CEOOWN) is 0.65%, lower than Pathan's (2009) average of 4.41% and 2.27% reported by Adams and Mehran (2008). Despite the fact that the maximum value of shareholdings is nearly 7%, most CEOs do not have large ownership values.

 The average total risk (TLR) is 4.94, followed by 3.70 Z-scores (Z) and 1.99 idiosyncratic risk (IDIOR). The idiosyncratic risk index is higher than the systematic risk index, implying that Vietnamese commercial banks acquire more non-systematic risks than market risks. This trend is also reported in the studies of Anderson and Fraser (2000), Chen et al. (2006a), and Pathan (2009). Asset return risk (ARR) is recorded with the lowest mean value among five risk-taking measures.

The board structure variables show that the mean board size (BS) is 7.63, with a minimum of 5 and a maximum of 15. Board independence has a mean value of 12.12%, varying from 0% of independent directors in board to a maximum of 40%. We present the Pearson pairwise correlation matrix among regression variables in the Appendix.

[Insert Table 2 here]

# Regression results and discussion

 The regression results of GLS RE estimation are demonstrated in Table 4. It is clear that CEODUAL is significantly negatively correlated to all bank risk-taking measures. In terms of economic significance, if the CEO also serves as chairman, the total bank risk (TLR) decreases by approximately 17.34 percentage points [1\*(-0.277)/ln(4.94) = -0.1734]. Our findings are consistent with Pathan (2009), Victoravich et al. (2011) and Fernandes et al. (2021b).

In contrast to the second hypothesis that CEOOWN has a positive impact on bank risk-taking, CEO shareholdings (CEOOWN) have a negative impact on all risk-taking proxies except idiosyncratic risk. This means that the greater the percentage of shareholdings owned by CEOs, the less risky projects will be pursued. For example, increasing CEO ownership by one percent reduces total bank total risk (TLR) by nearly 5.7 percentage points [1\*(-0.0907)/ ln(4.94) = -0.0567]. The findings are consistent with Chen et al. (2006b), Lewellyn and Muller-Kahle (2012b) and Altunbaş et al. (2020), who demonstrate that bank risk preferences coincide with CEO ownership.

[Insert Table 3 here]

 As expected, the coefficient on board size (BS) is negatively correlated to most risk-taking proxies and statistically significant. Notably, while the number of directors on the BOD greatly influences idiosyncratic risk, the coefficient of Z-scores shows no impact of this risk on board size. Unlike board size, board independence (BINDEP) positively impacts most bank risk-taking proxies.

 Regarding other bank characteristics, while bank size (LNTA) and bank capital structure (CAP) significantly reduce bank risks, bank charter value (CV) encourages bank risk-taking behavior. Specifically, consistent with Furlong and Kwan (2005) and Pathan (2009), bank size is negatively associated with idiosyncratic risk (IDIOR), total risk (TLR) and asset return risk (ARR) and positively correlated with Z-score (Z). We also document similar findings for bank capital structure (CAP). On the contrary, bank charter value (CV) is positively associated with most risk measures.

# Robustness tests

***5.1. Controlling for the effects of outside directors***

We further use outside directors (OUTDIR) as an alternative to board independence that is widely adopted in corporate governance studies (e.g. Weisbach, 1988; Lim and McCann, 2013; Tang, 2017). Outside directors must have three characteristics: they are not the company’s employees, they provide strategic and operational advice based on their expert experience, and they ensure that executives act in the best interests of shareholders (Larcker and Tayan, 2020). Outside directors tend to have no material relationship with the banks other than serving on the board.

[Insert Table 4 here]

Overall, the regression model results remain robust when OUTDIR is used instead of BINDEP. CEO power measures are negatively and significantly associated with bank risk-taking, controlling for the effect of outside directors. It is noteworthy that OUTDIR has a negative relationship with the majority of bank risk-taking proxies, including total risk, and systematic risk while improving Z-score. This is explained by the fact that when more outside directors are involved in management, risk tolerance decreases because they are more conservative in order to avoid any lawsuits arising from the default (Pathan, 2009).

### 5.2. Three-stage least squares (3SLS)

 Endogeneity is a major concern in the relationships between board characteristics and bank risk-taking (Hermalin and Weisbach, 1998; Adams, Almeida and Ferreira, 2005; Pathan, 2009; Fernandes et al., 2021b). According to Fernandes et al. (2021), there is a potential bidirectional causality between board factors and bank risk proxies. We follow the literature (Linck et al., 2008; Pathan, 2009; Fernandes *et al.*, 2021b) to specify the following equations:

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|  | (6) |
|  | (7) |

where BOARDOWN is measured by the total percentage of ownership value of the whole BOD (except the CEO in case of CEO duality), the three equations (5), (6) and (7) are the employed system of simultaneous equations for the 3SLS estimation method. The findings are reported in Table 5 and remain consistent. For instance, the coefficient on CEODUAL is negative and statistically significant for total bank risk. In contrast, Pathan (2009) discovered that CEO duality no longer has a statistically significant relationship with bank risk.

[Insert Table 5 here]

***5.3. Two-step system generalized method of moments (GMM)***

 In addition to the 3SLS estimation, the two-step system GMM is used to provide additional robust evidence for the model, following Arellano and Bover (1995) and Blundell and Bond (1998). Eq. (5) is re-estimated using a two-step system generalized method of moments with different bank risk-taking measures as instruments for all levelled equations. This estimation method allows for unobserved heterogeneity and simultaneity among the variables (if any). The Sargan, Hansen, and Arellano-Bond statistics were used to assess the validity of all instruments in the two-step system GMM. Table 6 shows that the interpretation is quantitatively consistent with regression results reported using GLS RE and 3SLS. CEO duality, in particular, has statistically significant negative coefficients for most risk-taking proxies. The impacts of CEOOWN on bank risk-taking dramatically decline and are only significant for systematic and idiosyncratic risk. We also document consistent results for board structure and other control variables.

***[Insert Table 6 here]***

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### 5.4. Glejser’s (1969) heteroskedasticity tests

 Following Adams et al. (2005) and Pathan (2009), Glejser (1969) heteroskedasticity tests are employed to re-examine the impacts of CEO power on bank risk-taking. To conduct Glejser heteroskedasticity test, absolute residuals are obtained from the pooled ordinary least square (OLS) regressions for return on assets (ROA) and return on equity (ROE). ROA is calculated by dividing net income after tax by total assets, whereas ROE is calculated by dividing net income after tax by total shareholder equity. The absolute value of such residuals are used as alternatives for bank risk proxies. As shown in Table 7, the coefficients of CEOOWN are consistent with the main findings. However, it is noticeable that CEODUAL has no effect on either of these variables. In short, the heteroskedasticity tests of Glejser (1969) provide robust evidence for the significant impact of CEO ownership on bank risks.

[Insert Table 7 here]

# Conclusion

 This study examines whether CEO power (measured by CEO duality and CEO ownership) is related to bank risk-taking in Vietnam. Employing various bank risk-taking measures and estimation techniques, we show that CEO duality negatively affects bank risk-taking proxies. This is explained by the fact that when CEOs also serve as board chairs, decisions made by the CEO and the board are consistent with the BOD’s primary mission of effectively monitoring management and remuneration (Baysinger and Hoskisson, 1990). Furthermore, the greater the number of shares obtained by CEOs, the less bank risk-taking is reported as powerful CEOs can exert influence over board decisions in a way that reduces bank risk-taking (Pathan, 2009). The findings are consistent with Houston and James (1995), Pathan (2009), and Victoravich et al. (2011) for developed countries.

 Furthermore, a larger board size results in less bank risk-taking. When a commercial bank's BOD includes many directors, such directors will make the best decisions for the bank's stability based on their knowledge and experiences in the banking industry. This finding is also consistent with previous research (e.g. Cheng, 2008; Pathan, 2009; Nakano and Nguyen, 2012; Chen et al., 2013; Switzer and Wang, 2013). On the other hand, independent directors are associated with more bank risks because they are outsiders providing their expert views on the situation of commercial banks and thus tend to pursue riskier but higher value projects.

The study suggests that Vietnamese commercial banks could improve their risk management by developing policies centered on governance mechanisms, specifically the CEO within the BOD. The findings highlight the importance of CEO power in bank risk management. This knowledge is helpful for supervisory agencies, stakeholders, and, most importantly, Vietnam commercial banks when forming their BODs or hiring a new CEO.

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Table 1. Definition of variables

|  |  |
| --- | --- |
| **Variables** | **Definition** |
| *Panel A: Bank risk variables* |
| Total risk  | Standard deviation of the daily bank stock returns in each year |
| Systematic risk | The difference between total risk and idiosyncratic risk |
| Idiosyncratic risk | Standard deviation of the residual in Eq. (2) |
| Insolvency risk | Z–scores as demonstrated in Eq. (3) |
| Assets return risk | Equity volatility as demonstrated in Eq. (4) |
| *Panel B: CEO power variables* |
| CEO duality | A dummy variable equals one if CEO chairs the board and zero otherwise |
| CEO ownership | The percentage of CEO ownerships  |
| *Panel C: Strong board and Bank characteristics* |
| Board size | The number of directors in board |
| Board independence | The total number of independent directors in percentage |
| Bank size | The natural logarithm of total bank asset at the end of each fiscal year |
| Bank capital structure  | The division of total equity for total assets in percentage |
| Charter value | Keeley’s Q (Keeley, 1990) which is determined by dividing the book value of total assets for market value of equity and book value of liabilities. |

Table 2: Descriptive statistics

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | Mean | SD | Min | 1st Quartile | Median | 3rd Quartile | Max | Skew | Kurt |
| *CEO variables* |
| CEODUAL | 0.11 | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 2.42 | 6.84 |
| CEOOWN (%) | 0.65 | 1.54 | 0.00 | 0.00 | 0.02 | 0.23 | 7.00 | 2.87 | 10.68 |
| *Bank risk-taking measures* |
| TLR (%) | 4.94 | 27.61 | 1.01 | 1.72 | 2.33 | 2.85 | 318.19 | 11.27 | 128.45 |
| SYSR (%) | 0.56 | 0.91 | 0.00 | 0.10 | 0.23 | 0.61 | 5.68 | 3.27 | 14.53 |
| IDIOR (%) | 1.99 | 0.91 | 0.84 | 1.44 | 1.86 | 2.29 | 8.60 | 3.25 | 22.84 |
| Z | 3.70 | 1.96 | 0.10 | 2.45 | 3.23 | 4.57 | 12.41 | 1.30 | 5.60 |
| ARR (%) | 0.48 | 0.94 | 0.01 | 0.09 | 0.22 | 0.39 | 7.22 | 4.93 | 30.74 |
| *Strong board and bank characteristic variables* |
| BS (No.) | 7.63 | 1.80 | 5.00 | 6.00 | 8.00 | 9.00 | 15.00 | 0.35 | 3.21 |
| BINDEP (%) | 12.12 | 7.72 | 0.00 | 9.09 | 12.50 | 16.67 | 40.00 | -0.06 | 2.92 |
| LNTA | 32.72 | 2.25 | 3.52 | 32.24 | 32.77 | 33.53 | 35.11 | -10.51 | 137.47 |
| CAP (%) | 10.80 | 5.48 | 2.15 | 7.03 | 10.36 | 13.16 | 26.95 | 0.88 | 3.53 |
| CV | 1.04 | 0.05 | 0.95 | 1.00 | 1.02 | 1.06 | 1.23 | 1.19 | 4.57 |

Table 3. GLS RE regression results of bank risk-taking using board independence

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | TLR | SYSR | IDIOR | Z | ARR |
| CEODUAL | -0.277\*\*\* | -0.875\*\*\* | -0.171\*\*  | 0.335\*\*\* | -0.824\*\*\* |
|  | (-3.80) | (-3.58) | (-2.78) | (4.86) | (-4.19) |
| CEOOWN | -0.0907\*  | -0.205\* | -0.0582 | 0.117\*\*\* | -0.202\*\* |
|  | (-2.03) | (-2.01) | (-1.66) | (3.91) | (-2.64) |
| BS | -0.252\* | 0.872\* | -0.382\*\*\* | 0.181 | -0.776\* |
|  | (-2.12) | (-2.17) | (-3.29) | (1.55) | (-2.55) |
| BINDEP | 0.354\* | -1.923 | 0.776\*\* | 0.588 | 1.689\* |
|  | (0.72) | (-1.19) | (1.73) | (1.25) | (1.46) |
| LNTA | -0.0590\*\*  | 0.0353 | -0.0240\*\* | 0.236\*\*\* | -0.132\*\*\* |
|  | (-1.70) | (0.89) | (-2.85) | (33.63) | (-6.12) |
| CAP | -0.338\* | 2.505 | 1.343 | 12.51\*\*\* | -8.859\*\* |
|  | (-0.3) | (0.59) | (-1.23) | (9.92) | (-2.86) |
| CV | -0.15 | 1.488\* | 2.030\* | -10.79\*\*\* | 5.491\* |
|  | (-0.14) | (0.38) | (1.98) | (-8.61) | (1.97) |
| Constant | -0.633\*\*  | -6.586\* | -0.411 | 2.273\* | -3.657\* |
|   |  (-0.61)  | (-2.03) | (-0.46) | (1.91) | (-1.55) |
| Time | Yes | Yes | Yes | Yes | Yes |
| Within R2 | 0.6903 | 0.4728 | 0.4985 | 0.9119 | 0.6826 |
| Between R2 | 0.7218 | 0.5177 | 0.5983 | 0.8275 | 0.677 |
| Overall R2 | 0.6718 | 0.4045 | 0.5003 | 0.8784 | 0.6742 |
| Chi2 – statistics | 140.97 | 58.67 | 72.07 | 583.81 | 144.91 |
| *Note: Statistical significance at 10%, 5%, and 1% levels are indicated by superscripts \*, \*\*, \*\*\*, respectively.* |

Table 4. GLS RE regression results of bank risk-taking using outside directors

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | TLR | SYSR | IDIOR | Z | ARR |
| CEODUAL | -0.258\*\*\* | -1.318\*\*\* | -0.145\* | 0.332\*\*\* | -0.673\*\*\* |
|  | (-4.23) | (-5.28) | (-2.27) | (5.68) | (-3.66) |
| CEOOWN | -0.120\*\*\* |  -0.441\*\*\*  | -0.0508 | 0.151\*\*\* | -0.195\* |
|  | (-3.72) | (-4.83) | (-1.33) | (6.92) | (-2.39) |
| BS | -0.0578 | -1.901\*\*\* | -0.426\*\*\* | 0.283\* | -0.7 |
|  | (-0.39) | (-4.57) | (-3.34) | (2.11) | (-1.93) |
| BINDEP | -1.478\*\* | -9.832\*\*\* | 0.162 | 2.649\*\*\* | -2.493 |
|  | (-2.65) | (-6.12) | (0.31) | (5.16) | (-1.85) |
| LNTA | -0.110\*\* | 0.0218 | -0.0245\*\* | 0.231\*\*\* | -0.119\*\*\* |
|  | (-2.93) | (0.72) | (-2.93) | (33.38) | (-5.25) |
| CAP | 0.749 | 3.955 | 0.888 | 11.47 | -6.021\*\*\* |
|  | (0.63) | (0.93) | (0.78) | (10.58) | (-1.86) |
| CV | -0.417 | -0.000663 | -1.988 | -9.814\*\*\* | 2.737 |
|  | (-0.38) | (-0.00) | (-1.91) | (-8.52) | (0.97) |
| Constant | 2.033 | -1.126 | -0.46 | 0.253 | 0.110 |
|   | (1.67) | (-0.39) | (-0.48) | (0.21) | (0.04) |
| Time | Yes | Yes | Yes | Yes | Yes |
| Within R2 | 0.6808 | 0.4951 | 0.477 | 0.9086 | 0.668 |
| Between R2 | 0.7863 | 0.6817 | 0.6281 | 0.8769 | 0.7388 |
| Overall R2 | 0.6949 | 0.5232 | 0.5071 | 0.9005 | 0.668 |
| Chi2 – statistics | 147.12 | 75.86 | 67.7 | 601.86 | 142.91 |
| *Note: Statistical significance at 10%, 5%, and 1% levels are indicated by superscripts \*, \*\*, \*\*\*, respectively.* |

**Table 5. Three-stage least squares regression results of total risk**

|  |  |  |  |
| --- | --- | --- | --- |
| Explanatory variables | TLR | BS | BINDEP |
| TLR | – | -8.726\*\* | 1.975\*\* |
|  |  | (-3.16)  | (3.27) |
| CEODUAL | -0.294\*\*\* | – | 0.0171 |
|  | (-3.30)  |  | (1.15) |
| CEOOWN | – | -7.330\* | – |
|  |  | (-1.34) |  |
| BS | -0.615\*\*\* | – | 0.0149\*\*\* |
|  | (-3.86) |  | (4.88) |
| BINDEP | 4.390\* | 2.708\*\* | – |
|  | (2.46) | (2.64) |  |
| BOARDOWN | \_ | -0.00420\* | 0.0282\*\*\* |
|  |   | (-2.32) | (3.86) |
| LNTA | -0.195\* | 0.143\*\*\* | 0.381\*\*\* |
|  | (-2.41) | (3.34) | (4.34) |
| CAP | 1.322 | 0.359 | – |
|  | (0.98) | (0.64) |  |
| CV | -0.944 | – | -1.168 |
|  | (-0.62) |  | (-1.23) |
| Constant | -7.083\*\* | -2.904 | 1.130\*\*\* |
|   | (-2.97) | (-1.49) | (4.43) |
| Time | Yes | Yes | Yes |
| Adjusted R-squared | 0.5099 | 0.0786 | 0.446 |
| Chi2 - statistics | 154.74 | 44.14 | 120.23 |
| *Note: Statistical significance at 10%, 5%, and 1% levels are indicated by superscripts \*, \*\*, \*\*\*, respectively.* |

Table 6. Two-step system generalized method of moments (GMM) regression results of bank risk-taking

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables  | TLR | SYSR | IDIOR | Z | ARR |
| CEODUAL | -0.0848\*\* | -0.0209\*\*\* | -0.0122\*  | 4.565\* | -0.0110\*\*\* |
|  | (-2.62) | (-4.19) | (-2.16) | (2.34)  | (-4.06) |
| CEOOWN | -2.530 | -1.398\* | -0.919\*\* | 198.2  | -0.0385 |
|  | (-0.94) | (-2.49) | (-2.60) | (1.31) | (-0.14)  |
| BS | 0.128 | -0.0716\*\* | 0.0173 | 9.119\*  | 0.00723 |
|  | (1.56) | (-3.25) | (1.14)  | (2.18)  | (0.75) |
| BINDEP | 0.245\* | 0.0553 | 0.0746\*\*\* | -12.65\* | 0.0351\*\*\* |
|  | (2.03) | (1.79)  | (4.32)  | (-2.05)  | (3.70) |
| LNTA | -0.983\*\*\* | -0.943\*\*\* | -0.342 | -0.637  | -0.925\*\*\* |
|  | (-26.72) | (-4.73)  | (-1.56) | (-0.06)  | (-5.03)  |
| CAP | -0.998 | -0.164  | -0.0521 | 70.51\*\*\*  | -0.0197 |
|  | (-1.31) | (-0.98) | (-0.86)  | (4.23)  | (-0.88)  |
| CV | 1.653\*\* | 0.140  | 0.0719  | -83.62\*\* | 0.0467\*\* |
|  | (2.59) | (0.87)  | (1.83)  | (-3.00)  | (3.21) |
| Constant | 1.942\*\*\* | -0.321  | -0.0119  | 106.0\*\* | -0.0329 |
|  | (3.52) | (-1.80)  | (-0.34)  | (2.85)  | (-1.05) |
| Time | Yes | Yes | Yes | Yes | Yes |
| Chi2– statistics | 25049.08 | 4899.69 | 13313.43 | 2009.66 | 1367.37 |
| *Π1* | 0.11 | 0.025 | 0 | 0.048 | 0.115 |
| *Π2* | 0.319 | 0.441 | 0.692 | 0.558 | 0.286 |
| J – statistics | 0.985 | 0.921 | 0.542 | 0.788 | 0.537 |
| *Note: Statistical significance at 10%, 5%, and 1% levels are indicated by superscripts \*, \*\*, \*\*\*, respectively.* |

**Table 7. Glejser (1969) heteroskedasticity test result for bank risk-taking**

|  |  |  |
| --- | --- | --- |
| Variables  | Absolute value of ROE residuals | Absolute value of ROA residuals |
| CEODUAL | -0.00603  | 0.000814  |
|  | (-0.55)  | (1.02) |
| CEOOWN | -0.0144\*\* | -0.0931\*\* |
|  | (-3.09)  | (-2.72) |
| BS |  -0.0357\*  | -0.00168 |
|  | (-2.01)  | (-1.29)  |
| BINDEP | 0.0766 | 0.0109\*  |
|  | (1.13)  | (2.20) |
| LNTA | 0.811 | -0.196\* |
|  | (0.62) | (-2.04) |
| CAP | 0.0453  | 0.0237\*  |
|  | (0.31)  | (2.22)  |
| CV | -0.0435  | -0.00611  |
|  | (-0.31)  | (-0.56) |
| Constant | 0.214  | 0.214 |
|   | (1.53)  | (1.70) |
| Adjusted R-squared | 0.2797 | 0.262 |
| Π: F – statistics | 2.85 | 2.67 |
| AVIF (max.) | 2.08 (3.96) | 2.08 (3.96) |
| *Note: Statistical significance at 10%, 5%, and 1% levels are indicated by superscripts \*, \*\*, \*\*\*, respectively.* |

**APPENDIX**

**Table A1: Correlation Matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| (1) | TLR | 1 |  |  |  |  |  |  |  |  |  |  |  |
| (2) | SYSR | 0.001 | 1 |  |  |  |  |  |  |  |  |  |  |
| (3) | IDIOR | **0.219** | 0.004 | 1 |  |  |  |  |  |  |  |  |  |
| (4) | Z | **-0.194** | **-0.36** | **-0.036** | 1 |  |  |  |  |  |  |  |  |
| (5) | ARR | **0.412** | **0.463** | **0.071** | **0.464** | 1 |  |  |  |  |  |  |  |
| (6) | CEODUAL | **0.198** | -0.017 | -0.033 | 0.041 | 0 | 1 |  |  |  |  |  |  |
| (7) | CEOOWN | 0.117 | -0.095 | 0.083 | -0.011 | 0.054 | 0.161 | 1 |  |  |  |  |  |
| (8) | BS | -0.171 | -0.033 | **-0.36** | **0.238** | **-0.207** | -0.049 | **-0.528** | 1 |  |  |  |  |
| (9) | BINDEP | 0.104 | -0.048 | **0.281** | -0.121 | 0.152 | 0.005 | **0.342** | **-0.254** | 1 |  |  |  |
| (10) | LNTA | **-0.479** | 0.012 | **-0.241** | 0.142 | **-0.394** | -0.148 | -0.185 | **0.26** | -0.122 | 1 |  |  |
| (11) | CAP | **0.244** | -0.065 | 0.143 | **0.249** | 0.085 | 0.102 | 0.061 | -0.055 | 0.096 | -0.163 | 1 |  |
| (12) | CV | 0.167 | -0.071 | 0.086 | 0.024 | 0.051 | 0.067 | 0.068 | -0.057 | 0.108 | -0.032 | **0.609** | 1 |
| *Note: Bold texts indicate statistically significant at 5% level or better.* |

1. \* Corresponding author. [↑](#footnote-ref-1)
2. The data is available here: https://finance.vietstock.vn [↑](#footnote-ref-2)
3. The data is available here: https://s.cafef.vn/du-lieu.chn [↑](#footnote-ref-3)
4. The data platform is provided by StoxPlus. [↑](#footnote-ref-4)