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The Effect of Enterprise Risk Management (ERM) on the Soundness of Banking Companies in Indonesia

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ABSTRACT

This study examines whether Enterprise Risk Management (ERM) implementation is related to bank soundness in public banks in Indonesia. Using a sample of 32 public banks for 2017-2021, this study found that ERM implementation is positively and significantly related to bank soundness as measured using Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity (CAMELS) ratios. Using Panel data regression with CAMELS ratio as independent variable and ERM disclosure index as the main independent variable, the results of this study support the stakeholder theories, which state that risk governance can be used as a substantive supervisory tool in bank risk management. It is also a form of responsibility to stakeholders that impacted the level of bank risk taking. This study also found that some bank characteristics, namely financial leverage and loan to assets ratio, negatively and significantly influence bank soundness. Furthermore, as an additional test, this study also found that there is a positive and significant effect of ERM implementation on bank soundness before the Covid-19 pandemic period, but did not find a significant relationship between ERM implementation and bank soundness during the Covid-19 pandemic period. Lastly, through sub-index analysis, this study identified that risk organization, audit committee, and better quality of management discussion, have a positive and significant influence on bank soundness.

SARI PATI

Penelitian ini menguji apakah implementasi Enterprise Risk Management (ERM) berhubungan dengan kesehatan bank di bank-bank umum di Indonesia. Dengan menggunakan sampel 32 bank publik untuk tahun 2017-2021, penelitian ini menemukan bahwa implementasi ERM berhubungan positif dan signifikan terhadap kesehatan bank yang diukur dengan menggunakan rasio Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity (CAMELS). Menggunakan regresi panel, hasil penelitian ini mendukung argumen yang menggunakan teori stakeholder, yang menyatakan bahwa tata kelola risiko dapat dijadikan sebagai alat pengawasan yang substantif dalam manajemen risiko bank dan juga sebagai bentuk tanggung jawab kepada pemangku kepentingan terkait tingkat pengambilan risiko bank. Penelitian ini juga menemukan bahwa beberapa karakteristik bank, yaitu financial leverage dan loan to assets ratio memiliki pengaruh negatif dan signifikan terhadap kesehatan bank. Lebih lanjut, sebagai pengujian tambahan, penelitian ini juga menemukan bahwa terdapat pengaruh positif dan signifikan dari penerapan ERM terhadap kesehatan bank sebelum periode pandemi Covid-19, namun tidak menemukan hubungan signifikan antara penerapan ERM dan kesehatan bank selama periode pandemi Covid-19. Terakhir, melalui analisis sub-index, penelitian ini mengidentifikasi bahwa organisasi risiko, komite audit, dan kualitas diskusi manajemen yang lebih baik, memiliki pengaruh positif dan signifikan terhadap kesehatan bank.

INTRODUCTION

The financial crisis in 1997-1998 experienced by Asian countries, including Indonesia, followed by the financial crisis in 2008, showed weaknesses in risk governance as one of the causal factors of banking failure (Erkens et al., 2012; Levine, 2012; Nam & Lum, 2006). In the case of Indonesia, the lack of risk exposure disclosure by Indonesian banks during the 1997-1998 financial crisis also raised issues of information asymmetry and hindered Bank Indonesia to perform its supervisory function effectively (Pangestu, 2003). In response to the financial crisis, regulators and international bodies encouraged more structured and integrated risk management as a way to improve the control of risk management systems (Lundqvist, 2015). For example, Bank Indonesia issued Bank Indonesia Regulation (PBI) No. 5/8/PBI/2003 on the Implementation of Risk Management for Commercial Banks which requires banks to establish a risk management committee. Another body, the *Basel Committee on Banking Supervision* (BCBS) issued risk governance guidelines (BCBS, 2010, 2015) and emphasized that "risks should be identified, assessed, and monitored continuously across the enterprise and continuously across the enterprise and at the individual level" (BCBS, 2010, p. 11). It can be concluded that one of the determinants of banks in implementing risk governance comes from external pressures such as regulators and bodies that set standards in the banking industry.

Enterprise Risk Management (ERM) consists of two components: traditional risk management, which is the process of identifying, measuring, monitoring, and reporting risks but is done without structure or centralization, and risk governance (Lundqvist, 2015, p. 442). Furthermore, Aebi et al. (2012, p. 3213) describe risk governance as "corporate governance mechanisms related to risk management" and involves the establishment of a risk management committee and the appointment of a Chief Risk Officer (CRO) in charge of overseeing all risks in an organization. It is understood that risk governance supports the process of integrating risk (Lundqvist, 2015). Risk governance is a top-down process, with primary responsibility at the top level, which are the board of directors and the board of commissioners (Aebi et al. 2012, Nair et al. 2014). The board of directors and commissioners, as well as senior management (together with the CRO) are responsible for determining the company's risk appetite (BCBS, 2015). Risk appetite is top management's assessment of the expected impact on the bank's risk profile and judgment in taking on risky investments and activities (Stulz, 2015). By considering the interdependencies between risk positions and by aggregating risks into a single risk portfolio, companies can improve their understanding of overall risk exposure (Bohnert et al., 2018).

One of the main factors for banks to implement an enterprise risk management function is to meet the expectations of regulators, legislators, shareholders, customers, and society at large (McKinsey & Company, 2020). Financial institutions, including banks, are unique due to their activities in asset transformation such as opacity, leverage, regulation, and government intervention, which require different approaches to risk governance (Aljughaiman & Salama, 2019; Srivastav & Hagendorff, 2016). According to the Basel Committee on Banking Supervision (BCBS) regulations, material risks (financial and non-financial) faced by banks include credit, market, liquidity, and operational risks (BCBS, 2015). Despite the importance of risk governance and the risks faced by banks, there is limited empirical evidence on the effectiveness of risk governance on bank soundness and risk-taking behavior, especially in the context of emerging markets such as Indonesia.

While there have been extant studies on the topic of bank risk governance (e.g. Boateng, 2019;

Ellul & Yerramilli, 2013; Lingel & Sheedy, 2012; Pathan, 2009; Srivastav & Hagendorff, 2016), these studiesmainly focused on the impact of risk governance on certain types of risks, such as credit risk or tail risk, and not the whole risk.More recent studies are trying to investigate the bank risks holistically (e.g. Abid et al. 2021; Aljughaiman & Salama, 2019), but their numbers are still limited. Aljughaiman and Salama (2019) consider the impact of risk governance on five risk measures: market, credit, operational, liquidity, and insolvency risks. Meanwhile, Abid et al. (2021) used four risk measures: credit, liquidity, operational and bankruptcy risk. Therefore, this study aims to determine the relationship between Enterprise Risk Management and the soundness of banks using the CAMELS indicator.

The CAMELS ratio is a method developed by the Uniform Financial Institution Rating System (UFIRS) used by regulators in the United States to measure the soundness of banks with six indicators: capital adequacy, asset quality, management quality, earnings, liquidity, sensitivity to market risk (Koch & MacDonald, 2014). The model was first recommended by the BCBS in 1988 with the acronym CAMEL as a model for assessing bank soundness (Dash & Das, 2013). CAMEL indicators were used in previous studies specifically to analyze the impact of crises or exogenous shocks on bank performance (Alqahtani et al., 2017; Lee & Lee, 2019). In addition, CAMEL ratios are also referred to as comprehensive indicators because they cover various characteristics of bank performance (Liu & Huang, 2022; Zhao et al., 2022).

The banking sector in Indonesia is growing rapidly, as indicated by the increasing number of banks that have gone public, from 28 banks in 2008 to 47 banks in 2021 (Mai et al., 2023). In addition, the banking sector plays an important role in the Indonesian economy, contributing around 80% of total financial system assets (Bank Indonesia, 2016). In addition, research by Susanti et al. (2023) showed that banking performance before and after the Covid-19 pandemic from the aspects of capital, income and efficiency, and liquidity experienced significant changes, where the average CAR, ROE, ROA, and deposit ratios during the Covid-19 pandemic were smaller than before Covid-19. The study also concluded that the limited capital input from the public caused banks to experience problems of limited funds which ultimately disrupted their financial performance.

Based on the background of the Indonesian banking industry and the crisis that has been faced, this study focuses on analyzing the impact of ERM implementation on the soundness of Indonesian banks over a 5-year period, 2017-2021. This study contributes to the existing literature in two ways. First, by using the comprehensive CAMELS model to measure bank soundness from various characteristics, this study fills the research gap in research on ERM, especially in the context of Indonesian banking, which previously could only measure performance using single performance indicators such as profitability ratios and market ratios (Haryetti & Rokhmawati, 2021; Supriyadi & Setyorini, 2020). Second, this study also contributes to assessing and comparing ERM risk governance implementation against CAMELS before and during the Covid-19 pandemic. ERM implementation is measured based on the ERM qualitative index that has been specifically designed by Adam et al. (2021).

Literature Review and Hypothesis Development

Stakeholder Theory

Stakeholder theory states that in organizations there are broader groups, which are shareholders, managers, employees, creditors, suppliers, customers, government institutions and the wider community who have an interest in the business activities of a company (Freeman, 1984). Ciancanelli and Gonzalez (2000) argue that banking companies have more complex information asymmetry issues than non-banking companies due to the regulations imposed. Thus, banks have at

least three types of asymmetric information issues: between depositors, banks, and regulators; between owners, managers, and regulators; and between borrowers, managers, and regulators (Ciancanelli & Gonzalez, 2000).

Banks, in a process referred to as asset transformation, accept short-term customer deposits and convert them into non-current loans (Srivastav & Hagendorff, 2016). Since the loan screening process is done behind closed doors, it raises the issue of opacity of bank loans, which in turn leads to external stakeholders of the bank not having all relevant information to assess the true value of the bank's assets (Srivastav & Hagendorff, 2016). Since contracts with depositors are made *ex-ante* due to high information asymmetry (Pathan, 2009), bank managers may feel compelled to take on more risk, as these actions are not reflected in the bank's balance sheet (Srivastav & Hagendorff, 2016). Previous research suggests that risk governance, consistent with stakeholder theory, can act as a monitoring tool to protect bank stakeholders (Karyani et al., 2021).

Erin et al. (2020) argue that risk management and governance are considered legitimate functions that organizations must fulfill to create value for their stakeholders.The establishment of risk management committees and other committees responsible for risk management is intended to enable banks to interact more effectively and better communicate risk-related information to stakeholders (Al-Hadi et al., 2015; Barakat & Hussainey, 2013; Ferramosca et al., 2017).However, for some banks, it is possible that the implementation of risk management is only to fulfill symbolic purposes, and directors and boards fail to substantively implement the more effective aspects of ERM (Beasley et al., 2015).

Enterprise Risk Management

Enterprise Risk Management (ERM) is seen by some experts as a more disciplined, structured, and integrated risk management approach (by coordinating risk management activities across company divisions) than traditional risk management systems that are fragmented (Dickinson, 2001; Sobel & Reding, 2004; Hoyt & Liebenberg, 2011; Iswajuni *et al.*, 2018). One framework for implementing risk management is COSO-ERM (2017) which has five underlying components of ERM: governance and culture; strategy and goal setting; performance; review and revision; and information, communication, and reporting.

In the ERM process, the board of directors and the board of commissioners have the objectives of overseeing risks in the company, being responsible to stakeholders in reviewing ERM implementation, establishing a risk culture, operating structure, and risk appetite (COSO, 2017a, p. 28). The risk management process is assisted by committees under the board of commissioners that focus on strategy and long-term decisions and committees under the board of directors in charge of day-to-day operations including oversight (COSO, 2017a, p. 31). The audit committee works with internal auditors to ensure that the ERM framework is functioning effectively, and also works with external auditors to obtain independent assurance of the organization's risk management processes (COSO, 2017b, p. 16), while the risk committee is in charge of gathering information on how risks associated with the strategy are occurring throughout the company (COSO, 2017a, p. 31).

Enterprise Risk Management of Banking Industry

The banking industry is a heavily regulated industry. According to Dill (2020), there are several factors that cause the banking industry to be heavily regulated. First, banks play an essential role in the economy by extending credit and connecting long-term borrowers with short-term savers and ensuring the smooth functioning of the payment system. Second, the risks inherent in the banking business model cause policymakers to conduct

intensive supervision of banking firms. Third, the central bank has a safety net. Finally, the 2008 global financial crisis had a major impact on bank regulation and required banks to improve their governance and control functions.

Banks face various risks in conducting their operational activities, such as credit, market, liquidity, and operational risks (BCBS, 2015). Implementation of Enterprise Risk Management through effective risk governance requires the board of directors and board of commissioners to establish *risk appetite* from the top management team (TMT) level, which sets limits and risk tolerance levels and communicates them to all elements of the bank (Gontarek & Belghitar, 2018). In addition, risk management committees, internal audit, and external audit contribute to good risk management in banks (Abid et al., 2021; BCBS, 2015; Minto & Arndorfer, 2015).

Policy setting for the banking industry in Indonesia is currently guided by the Basel Accord standards set by the BCBS with the fundamental objective of strengthening the stability of the global banking system (IBI, 2015, p. 16). Now, the Basel II framework has been fully implemented in Indonesia since December 2012 (OJK, 2016). Basel II is the introduction of three pillars (IBI, 2015) which include regulating minimum capital requirements, requiring banks to measure risk profiles, and market discipline principles. While Basel III introduced liquidity ratios (LCR or Liquidity Coverage Ratio and NSFR or Net Stable Funding Ratio), leverage ratios, and increased bank capital requirements (through the addition of CCB or Capital Conservation Buffer and CCyB or Countercyclical Buffer ratios). In addition, OJK issued regulations and frameworks that elaborate on the rules regarding risk governance and disclosure of banking risk management, such as POJK No. 18/POJK.03/2016 on the Implementation of Risk Management for Commercial Banks and POJK No. 37/POJK.03/2019 on Transparency and Publication of Bank Reports.

CAMELS Rating

The CAMELS model is an international rating system used to assess the performance and health of banks. CAMEL was first established in 1979 by the Uniform Financial Institutions Rating System (UFIRS) to be implemented in United States banking institutions after being recommended by the US Federal Reserve (Christopoulos, 2011). The model was first recommended by BCBS in 1988 as a model to assess the financial condition of banks (Dash & Das, 2013). Then in 1997, the CAMEL model was updated with a sixth component to become CAMELS. CAMELS ratios consist of: capital adequacy, asset quality, management soundness, earnings and profitability, liquidity, and sensitivity to market risk.

The capital adequacy component is a calculation of the capital required to control the risks that the bank may face (Trung, 2021). The asset quality component measures which assets are uncollectible or whose actual value is less than that shown on the bank's balance sheet (Grier, 2007). The management soundness component refers to the overall management of the bank including human resource management, information systems, internal audit, internal control systems, and the bank's strategic plan and budget (Nguyen, 2020). The earnings and profitability component shows the bank's ability to create profits to grow, maintain competitiveness, and increase capital through retained earnings (Boateng, 2019). The liquidity component measures the bank's ability to meet its obligations quickly (Grier, 2007). Finally, the sensitivity to market risk component shows the extent to which changes in interest rates and foreign exchange rates can adversely affect a bank's earnings (Grier, 2007).

Hypothesis Development

Enterprise Risk Management Implementation and Bank Performance

Because the banking sector face various risks in conducting their operational activities (credit, market, liquidity, and operational risks) , they need an effective risk management governance, implemented form the top management team (TMT) level, and communicated to all level of employment at the bank (Gontarek & Belghitar, 2018). Furthermore, the existence of various elements such as the risk management committees, internal audit, and external audit also helps the effectiveness of ERM in banking industry (Abid et al., 2021; BCBS, 2015; Minto & Arndorfer, 2015).

Banks implement risk governance to enhance their standings and reputation toward the stakeholders (Zhang, 2021). However, the risk governance and overall ERM processes to stakeholders must be effective in managing risks for the implementation of risk governance to be substantive and not only symbolic (Hines & Peters, 2015). Furthermore, banks need to demonstrate accountability, responsibility, and transparency that are not limited to shareholders (Karyani et al., 2021). Macey and O'Hara (2003) argue that bank directors, boards, and management have a higher responsibility to ensure the health of the company and argue that banks can expand the scope of their fiduciary duties beyond shareholders to include creditors. Therefore, by implementing good risk governance mechanisms, banks can protect the interests of creditors and maintain bank stability (Srivastav & Hagendorff, 2016).

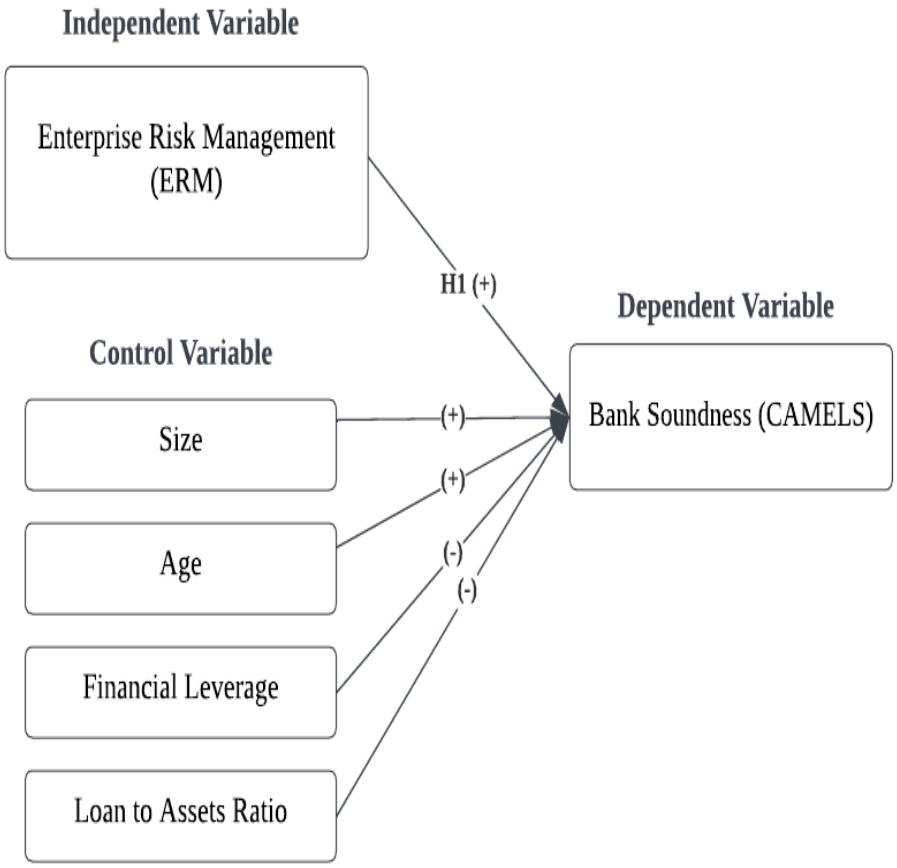
Previous research considering the effect of ERM implementation on bank performance found a positive relationship (Bata & Sofian, 2022; Horvey & Ankamah, 2020; Supriyadi & Setyorini, 2020), and explained that good risk management disclosures indicate banks' implementation of COSO recommendations such as risk oversight by the board of directors and board of commissioners and implementation of *risk appetite*. In addition, there are previous studies that found a positive influence of risk governance on the stability and negative influence towards risk-taking actions of banks. Using a self-constructed risk management index (RMI), Ellul and Yerramilli (2013) found that banks with high RMI scores before the financial crisis had lower risk and better performance during the 2007-2008 crisis.

Raouf and Ahmed (2022), using a risk governance index constructed based on five dimensions namely board of directors, risk management committee, audit committee, chief risk officer, and internal audit, found a positive and significant relationship between risk governance and bank stability ratio measured by Z-Score and asset-liability maturity ratio, but found no significant relationship with credit risk and capital adequacy ratio. In addition, research by Abid et al. (2021), using a sample of 185 banks in the Asian region in the period 2010-2017, found that risk governance can reduce bank risk-taking, and explained that risk mitigation mechanisms encourage banks to adopt conservative risk management.

Based on the arguments that have been explained based on *stakeholder* theory, the research hypothesis is made as follows:

H1. *ERM implementation have a positive effect on bank's soundness*

Research Framework



Picture 1. Research Framework

Source: Data processed, 2023

RESEARCH METHODS

Population and Sample

This research is a quantitative study used by processing data from the banking industry listed on the Indonesia Stock Exchange (IDX) in 2017-2021. The sample used in this study was selected through purposive sampling method, which means that the sampling was carried out deliberately to meet certain predetermined criteria. These predetermined criteria are that the sample are only from Banks listed in the Indonesian Stock Exchange with complete annual & financial report for the period of our research. The data used is secondary data, namely the annual reports of companies listed on the Indonesia Stock Exchange (IDX) during the 2017-2021 period, company websites, and the Capital IQ site. In addition, the study will use a type of panel data consisting of a combination of cross section and time series. The list of research sample acquisitions can be explained in the table 1:

Table 1. Acquisition of Research Sample

Sample Selection Criteria	Number of Banks	Number of Observations
Banks listed on the IDX in 2017 and still listed (not being delisted) in 2021	39	195
Banks that do not have complete financial data in 2017-2021	(7)	(35)
Total sample	(32)	160

Source: Data processed, 2023

Measurement and Operationalization of Research Variables

Dependent Variable

The dependent variable used in the study is bank soundness. The measurement of bank soundness refers to the research of Adam et al. (2021) which uses the CAMELS model to assess the 'health' of banks as a form of corporate financial performance. Assessment through the CAMELS model is based on a quantitative method of 18 ratios. Research by Adam et al. (2021) determined the existence of 11 positive ratios and 7 negative ratios. The classification of CAMELS ratios and how each ratio is calculated can be seen in Appendix A. Adam et al. (2021) set a maximum value of 1 and also assigned a negative or positive sign to reflect the impact of each of the 18 ratios (see Appendix A) on bank soundness. With 11 positive and 7 negative ratios, this allows the total sum of the 18 CAMELS ratios to be a maximum of 4 and a minimum of 0. The results are then divided by the positive minus negative ratios (11-7 =4) to get a score minimum of 0 (zero) and maximum of 1 (one). A value close to zero indicates a poor and unstable condition, while a value close to one indicates a good and stable condition (Al-Rjoub, 2020).

$$\sum_{k=1}^{18} CAMELS\ Rating = \frac{Quantitative\ CAMELS_k}{11-7}$$

Description:

$CAMELS$ Rating = The cumulative ratings of 18 ratios (11 positive and 7 negative)

Independent Variable

The research will use Enterprise Risk Management (ERM) as an independent variable measured based on the research of Adam et al. (2021) by measuring ERM implementation based on qualitative analysis (see Appendix B). The analysis adopts the ERM model that has been specifically designed by Adam et al. (2021) for the banking sector by disclosing five ERM themes, namely risk organization and governance, risk insight and strategy, risk processes and decisions, operating and regulatory environments and risk monitoring and reporting. The assessment through qualitative method is carried out content analysis of banking annual reports based on six key areas assessed based on the information provided in the bank's annual report and other publicly available information. The ERM qualitative index has been constructed from the following six key areas: (1) risk organization, (2) board effectiveness and involvement in risk management process, (3) audit committee oversight, (4) audit quality, (5) quality of internal audit, and (6) quality of management discussions in annual reports.

Based on Adam et al. (2021), the total ERM disclosure index is 35 items. However, in this study it was modified to see the implementation of ERM implemented by banks in Indonesia (See Appendix B). The added items include aspects of governance and disclosure in accordance with Indonesian regulations so that it can be distinguished between the implementation of risk management by one bank and another. Voluntary items are adjusted to the disclosure in the annual report of BUKU 4 banks. So that the final number of ERM disclosure index consists of 47 items (see Appendix B).

Weighted index analysis is performed so as to assign a single weight to an item to allow for the different relevance of each item (Prencipe, 2004). In the 47 ERM indices to be calculated (see Appendix B), each item is assigned a value of 1 if disclosed, and 0 otherwise. Then, the values for each qualitative item in each ERM field will be summed, and then divided by the maximum number of items in each field. Thus, the total values of the six main areas of ERM are divided by six, resulting in a continuous ERM score that ranges from 0 to 1. The higher the ERM Index score, the better the ERM implementation and vice versa. The ERM Index is calculated as follows:

$$ERMI = (\frac{RO}{18} + \frac{BE}{9} + \frac{AC}{4} + \frac{AQ}{6} + \frac{QIA}{6} + \frac{QMD}{4})/6)$$

Description:

$ERMI = ERM\ Index$

RO = Risk Organization

BE = Board Effectiveness and involvement in risk management process

AC = Audit Committee Oversight

AQ = Audit Quality

IA = Quality of Internal Audit

QMD = Quality of Management Discussions in annual reports

Control Variables

The use of control variables in this study includes company size, company age, financial leverage, and Loan to Assets Ratio. Table 2 explains the definition of the control variables used:

Table 2. Research control variables

Notation	Variable Name	Definition	*Expected Sign*	Reference
SIZE	Company size	Natural logarithm of the company's total assets	+	Saemargani & Mustikawati, 2015; Nasr et al., 2019; Afroj, 2022; Rahardjo & Wuryani, 2021
AGE	Company age	Logarithm of the number of years since listing on the IDX	+	Curran et al., 1993; Hunjra et al., 2020; Harb et al., 2021; Gupta & Mahakud, 2020
FLEV	Financial leverage	Total liabilities to Total equity	-	Clark et al., 2017; Lestari, 2021; Khan et al., 2021; Ismail and Ahmed, 2022
LAR	Loan to asset ratio	Total loans to total assets	-	Afroj, 2022; Mehzabin et al., 2022

Source: Data processed, 2023

Research Model

The research data is a panel data regression model to determine the effect of Enterprise Risk Management (ERM) on bank soundness. The research model is formulated as follows:

$$CAMELS_{it} = \beta_0 + \beta_1 ERM_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 FLEV_{it} + \beta_5 LAR_{it} + \Sigma YEAR_i + \Sigma ID_t \, \varepsilon_{it}$$

$CAMELS$ = Bank performance calculated through CAMELS ratio
ERM = Enterprise Risk Management
SIZE = Company size
AGE = Company age
FLEV = Financial Leverage
LAR = Loan to Assets Ratio
ΣYEAR = Year Fixed Effect
ΣID = Firm Fixed Effect
i = firm identification (cross-section)
t = year (time series)
ε = Error

Panel Data Regression test

Multicollinearity test results is showing the VIF score between 1.17 for FLEV and 3.11 for SIZE, indicating no multicollinearity issue. Breusch_Pagan test are conducted for the heteroskedasticity test, the result is Chi^2 with the coefficient value of 1.74 and Prob>Chi^2 0.188, the insiginifant results suggesting no heteroskedasticity problem. However, robust standard error are used as a precaution for potential heteroskedasticity

problem. Wooldridge autocorrelation test gives the result of 3.066 and Prob>F 0.09, significant at the 10% level, which indicate a weak autocorrelation issue. We are using firm clustering (firm fixed effect) as a remedy for autocorrelation issue.

To determine the panel regression model to be used between fixed and random effect, Chow, Hausman, and Breusch-Pagan Lagrangian Multiplier tests were conducted. The results of the three tests determine that the random effects model is a suitable model to be used in this study.

RESULTS AND DISCUSSION

Descriptive Statistical Test and Pearson Correlation

Table 3. Descriptive Statistics Test Results

Variables	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
CAMELS	0,371	0,150	0,000	1,000	0,622	5,095
ERM	0,806	0,098	0,546	0,980	-0,446	2,361
SIZE	17,697	1,859	13,407	21,269	0,135	2,081
AGE	1,058	0,343	0,000	1,591	-0,623	2,802
FLEV	5,752	2,901	0,490	17,070	1,531	6,389
LAR	0,603	0,112	0,190	0,810	-1,008	4,227

Notes: Table 3 is the result after *winsorized*. *, **, *** are significant at the 10%, 5%, and 1% levels, respectively.

Bank soundness variables (CAMELS) are measured through a quantitative method of 18 ratios. From Table 4.2, it can be seen that the average value of CAMELS is 0.371. The standard deviation of the CAMELS value is 0.150 with the lowest and largest values of 0.000 and 1.000, respectively. The lowest CAMELS value was obtained by PT Bank KB Bukopin Tbk in 2017. Meanwhile, the largest CAMELS value was obtained by PT Bank Jago Tbk in 2021.

Then, the average ERM variable is obtained at 0.546. While the standard deviation of the ERM variable is 0.098 obtained from the lowest value range of 0.546 owned by PT Bank Jago Tbk in 2017 and the highest value of 0.980 owned by PT Bank Danamon Indonesia Tbk in 2020. The high average ERM reflects the general compliance of banks in Indonesia with the mandatory risk management disclosures stipulated in POJK No. 18/POJK.03/2016.

Table 4. Pearson Correlation Test Results

	Variables	1	2	3	4	5	6
1.	CAMELS	1,000					
2.	ERM	0,236***	1,000				
3.	SIZE	0,028	0,770***	1,000			
4.	AGE	-0,060	0,568***	0,683***	1,000		
5.	FLEV	-0,308***	0,121	0,254***	0,086	1,000	
6.	LAR	-0,509***	-0,116	-0,241***	-0,113	-0,307	1,000

Notes: All continuous variables is winsorized at the 1% level to mitigate the effect of outlier**.** *, **, *** significant at 10%, 5%, and 1% levels, respectively.

Table 4 provides an overview of the linear relationship between each variable through the Pearson correlation test results. It can be seen that the main research variable CAMELS is significantly correlated with ERM (positive correlation) and FLEV (negative correlation), which are significant at 5% and 1% significance levels respectively. These results suggest that disclosure practices by banks relating to risk management have a positive and significant correlation with bank soundness. Other variables that have a significant correlation, namely financial leverage (FLEV) and Loan to Assets Ratio (LAR), show a negative correlation with CAMELS. These results are also in line with the researchers' initial prediction that financial leverage (FLEV) has a negative and significant relationship with bank soundness. Other control variables, namely company size (SIZE) and company age (AGE) do not have a significant correlation with bank soundness. From the Pearson correlation test results, it can also be seen that there is a positive and significant relationship between the independent variable ERM and the control variables of company size (SIZE) and company age (AGE). Thus, the relationship between ERM with the control variables of company size (SIZE) and company age (AGE) is unidirectional and significant with bank soundness. When the company is bigger and older, ERM implementation also increases.

Hypothesis Test

Table 5. Hypothesis Test Results

			Coefficient	
Variables	**Expected Sign**	**Main Model**	**2017-2019 (Before Covid-19)**	**2020-2021 (During Covid-19)**
ERM	+	0,595* (0,176)	0,376*** (0,166)	0,442 (0,283)
SIZE	+	-0,008 (0,012)	0,018 (0,014)	0,013 (0,015)

		Coefficient		
Variables	**Expected Sign**	**Main Model**	**2017-2019 (Before Covid-19)**	**2020-2021 (During Covid-19)**
AGE	+	-0,090 (0,059)	-0,081* (0,057)	-0,234** (0,106)
FLEV	-	-0,0011* (0,111)	-0,015** (0,007)	-0,014 (0,102)
LAR	-	-0,020*** (0,025)	-0,749*** (0,155)	-0,396*** (0,102)
CONSTANT		0,234 (0,147)	0,371** (0,148)	0,357 (0,198)
Year FE		Yes	Yes	Yes
Cluster		Yes	Yes	Yes
Obs. (N)		160	96	64
R^2		42,77%	40,14%	39,90%
Prob > chi2		0,000***	0,000***	0,000***

Notes: All continuous variables is winsorized at the 1% level to mitigate the effect of outlier**.** *, **, *** are significant at the 10%, 5%, and 1% levels, respectively. *Robust standard errors* are presented in parentheses.

Hypothesis testing was conducted to determine the results of the research hypothesis. Regression was conducted using a random effects model. It can be seen in Table 5 that the overall model regression results support our hypothesis 1 and show that Enterprise Risk Management (ERM) has a positive and significant influence at the 1% level on bank soundness (CAMELS) with a coefficient of 0.595. Furthermore, company size (SIZE) has no influence on CAMELS with a coefficient of 0.008. Likewise, the AGE variable was found to have no effect on CAMELS and had a coefficient of -0.090. Financial leverage (FLEV) has a negative and significant effect at the 5% significance level on CAMELS with a coefficient of -0.011. Finally, Loan to Assets Ratio (LAR) has a negative and significant effect on CAMELS at the 1% level with a coefficient of -0.539.

Discussion of Main Research Results

Table 5 displays the regression results to analyze the hypothesis of the study, namely the relationship between ERM implementation and bank soundness (CAMELS). Based on the regression conducted with the random effects method, ERM implementation has a positive and significant relationship with the bank soundness ratio, namely CAMELS. This result is in line with the statement of Abid et al. (2021) which states that risk governance is needed to mitigate inherent risks in bank operations. In addition, the results are also in accordance with the substantive approach, and indicate that risk governance can be used as a substantive supervisory tool in bank risk management so that it is likely to have a certain impact on the level of bank risk taking and bank soundness (Lundqvist, 2015; Zhang et al. 2021). Consistent with stakeholder theory, banks have more responsibility to their stakeholders such as depositors and creditors, so banks are more likely to consider their interests and implement effective risk governance that can improve bank soundness.

The results also support the findings of previous research, Aljughaiman and Salama (2019),

which showed a negative relationship between risk governance and the bank's overall risk level (as measured by credit, market, liquidity, insolvency, and operational risks). Risk governance can help banks align the bank's risk appetite with its strategic objectives and business plans, and ensure that the bank operates within its risk capacity (Gontarek & Belghitar, 2018).

From the subsample analysis, the effect of ERM implementation on CAMELS is different between the pre-Covid-19 (Non-Covid-19) and during Covid-19 period. While the result is not in line with previous research from Aebi et al. (2012) which found evidence that banks that have implemented risk governance, performed better during the 2007-2008 financial crisis than banks with a CRO who reports to the CEO.

The different results from before and during the Covid-19 period can be explained that the purpose of risk governance is not to reduce risk itself, but to support appropriate risk taking and increase the probability that the company will achieve its business objectives (Magee et al., 2019; Stulz, 2015). This result can also be seen in terms of stakeholder's theory, where in times of crisis, the protection of stakeholders such as depositors, creditors, employee and communities affected by the Covid-19 pandemic are viewed as needed to be protected more, even at the expense of loosening the risk governance.

The results showed that company size (SIZE) has no significant effect on bank soundness (CAMELS), which contradicts previous findings by Afroj (2022) and Rahardjo and Wuryani (2021). Large companies, although reflecting stability, do not always generate optimal profits as large costs can reduce company performance. Company age (AGE) also does not have a significant influence on bank soundness, in contrast to the study by Hunjra et al. (2020), who found a positive impact of company age on bank performance. However, financial leverage (FLEV) and Loan to Assets Ratio (LAR) are proven to have a significant negative effect on bank soundness. An increase in *leverage* tends to increase corporate risk and may negatively impact bank soundness, while LAR reflects credit risk, with an increase in borrower default potentially leading to bankruptcy. Therefore, close supervision in the loan disbursement process is essential to reduce credit risk that can be detrimental to bank soundness.

Discussion of Additional Test Results

Sub-Index Component Analysis

Table 6. Additional Test Results - ERM Sub-Index

Variables	Exp. Sign	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
RO	+	0,182** (0,059)					
BE	+		0,084 (0,085)				
AC	+			0,158*** (0,058)			
AQ	+				-0,132 (0,100)		

Variables	Exp. Sign	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
QIA	+					0,124 (0,111)	
QMD	+						0,139* (0,082)
SIZE	+	0,024 (0,012)	0,029** (0,012)	0,028** (0,585)	0,027** (0,012)	0,032*** (0,012)	0,017 (0,013)
AGE	+	-0,087 (0,068)	-0,072 (0,071)	-0,077 (0,067)	-0,080 (0,068)	-0,079*** (0,068)	-0,077 (0,066)
FLEV	-	-0,013** (0,006)	-0,013* (0,006)	-0,013** (0,006)	-0,012* (0,006)	-0,012** (0,006)	-0,005** (0,006)
LAR	-	-0,514*** (0,114)	-0,499*** (0,127)	-0,475*** (0,124)	-0,517*** (0,129)	-0,528*** (0,136)	-0,542*** (0,140)
CONSTANT		0,275* (0,155)	0,234 (0,167)	0,159 (0,161)	0,220 (0,154)	0,168 (0,174)	0,441** (0,059)
Year FE		Yes	Yes	Yes	Yes	Yes	Yes
Cluster		Yes	Yes	Yes	Yes	Yes	Yes
Obs. (N)		160	160	160	160	160	160
R^2		39,16%	35,22%	36,88%	34,99%	35,55%	40,41%
Prob (F-statistic)		0,000***	0,000***	0,000***	0,000***	0,000***	0,000***

Notes: *, **, *** are significant at the 10%, 5%, and 1% levels, respectively. *Robust standard errors* are presented in parentheses.

The regression results show that the Risk Organization (RO), Audit Committee Supervision (ACS), and Quality of Management Discussion (QMD) variables have a positive and significant influence on bank soundness as measured by CAMELS. This suggests that good risk organization, audit committee supervision, and risk management disclosure can improve the performance and stability of banks in Indonesia. This result supports several previous studies, such as Bohnert (2018), Meirene & Karyani (2017), Nguyen (2021), Sun & Liu (2014).

The regression results also show that the variables of Board Effectiveness (BE), Audit Quality (AQ), and Quality of Internal Audit (QIA) have no significant influence on bank soundness. This could be due to the lack of variability or symbolic compliance of these variables. For example, all public banks have received unqualified opinions from external auditors, so there is no difference in audit quality between these banks. Likewise, all banks have complied with OJK regulations regarding the number and meetings of directors and commissioners, but are not necessarily effective in carrying out their duties and responsibilities.

CONCLUSIONS, IMPLICATIONS, AND LIMITATIONS

This study provides evidence on the relationship between ERM implementation and

bank soundness. ERM implementation contributes to more effective risk oversight and strengthening of the overall risk management process, and this can be reflected in bank soundness. The random effects regression results show that ERM is positively and significantly associated with bank soundness as measured by 18 CAMELS ratios. The results suggest that better risk management implementation tends to have better bank soundness. The period in this study coincides with the Covid-19 pandemic period (2020-2021). Results show that banks have a positive relationship before the pandemic, but non-significant during the pandemic, which means that banks' risk governance fulfils a symbolic role towards their stakeholders during times of crisis. Then, the sub-index analysis of ERM shows that the components of risk organization, audit committee, and quality of management discussion have a positive and significant impact on bank performance. While the test results on the effect of control variables show that financial leverage and Loan to Assets Ratio (LAR) each have a negative and significant effect on bank soundness.

There are several managerial implications of this study. First, for banks, this study is expected to provide a new understanding of the substantive impact of ERM implementation on bank soundness. In addition, for external parties, this research is also expected to help investors, both shareholders and bondholders, in making investment decisions and making an assessment of the quality of ERM implementation as one of the bases for choosing the right investment. Then for academics, this research is expected to broaden insights into the effect of ERM implementation on bank soundness and the factors that encourage a bank to implement and improve the quality of risk governance. Moreover, ERM also seems to have limitations on limiting negative effect from unprecedented adverse economic condition induced by COVID-19 pandemic. During the pandemic, the number one priority would be to protect the stakeholders' (depositors, creditors, employees, communities, government) interests by providing necessary funding that would normally not be given during the normal, non-Covid-19 period.

This study has several limitations. First, while the usage of comprehensive CAMELS rating is intended to capture the wholistic nature of bank soundness, the downside is that we cannot examine the impact of each ratio separately. Second, the rating system includes measures with opposite impact toward bank soundness (positive and negative), which may affect the final rating. Future research may try to explore and examine both sides of the bank soundness measures in more in-depth analysis. Future research can improve this study in several aspects. First, further analysis of the role of ERM on bank performance can be extended to private banks and other industries in the financial sector, such as insurance companies, finance companies, and other financial companies. Second, future research can consider other governance aspects that can capture the quality of ERM implementation and its effect on bank soundness (as described in El-Chaarani et al., 2023). Finally, future research can use other bank soundness indicators that reflect each component of the CAMELS ratio based on the ratios regulated in Basel III, namely ratios governing liquidity risk (Net Stable Funding Ratio, Liquidity Coverage Ratio) and other ratios described in Bank Indonesia Circular Letter No. 6/23/DPNP/2004. Along with the development of Basel standards, future research can also consider measuring bank soundness based on ratios that may be added in the future.

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APPENDIX

Appendix A. CAMELS Model

No.	Ratio	Description	Formula	Category	Impact on Bank Soundness
1	**CAR**	Capital adequacy ratio	Risk weighted asset/Qualifying capital	Capital adequacy	+
2	**RPLL**	Total related party loans to total loans	Related party loans/Total loans	Asset Quality	-
3	**NPL**	Non-performing loan	Total non-performing loans/Total gross loans	Asset Quality	-
4	**COR**	Cost of risk	Loan provision expense/Gross loans	Asset Quality, Earnings and Profitability	-
5	**LLR**	Loan loss reserve ratio	Cumulative loan provision/Total non-performing loans	Asset Quality	+
6	**HIE**	Highest industry exposure to gross Loans	Highest industry exposure/Gross loans	Asset Quality	-
7	**LRR**	Loan recovery ratio	Loan Recovery/Total-non performing loans	Asset Quality	+
8	**TETOE**	Training expenses to total operating expense	Total training expenses/Total operating expenses	Management Soundness	+
9	**PPE**	Fines and penalties paid to gross revenue	Fines and penalties paid/Gross revenue	Management Soundness	-

Appendix A. CAMELS Model (Continued)

10	**FPPR**	Profit per employee	Total profit/Total number of employees	Management Soundness	+
11	**ERR**	Earnings retention ratio	Earnings retained/Total earnings available for distribution	Earnings and Profitability	+
12	**MSR**	Market share of revenue	Firm gross revenue/Industry gross revenue	Earnings and Profitability	+
13	**LR**	Liquidity ratio	Total liquid assets/Total deposit	Liquidity	+
14	**LDR**	Loan-to-deposit ratio	Total loans/Total deposit	Liquidity	-
15	**EILR**	Exposure to industry liquidity risk	Inter-bank exposure/Total Assets	Liquidity	-
16	**DRG**	One month duration gap to total assets	(Short term maturity of assets - short term maturity of liability)/Total Assets	Liquidity	+
17	**FXG**	Foreign currency gap to total assets	(Foreign currency assets - foreign currency liabilities)/Total assets	Sensitivity to market risk	+
18	**RPG**	Interest repricing gap to total assets	(Rate sensitive asset - rate sensitive liabilities)/Total assets	Sensitivity to market risk	+

Source: Adam *et al.* (2021)

Appendix B. ERM Index

No.	Description	Reference
Risk organisation		
1	There is a formal risk management framework	Adam et al. (2021)
2	Risk management philosophy clearly explained	Adam et al. (2021)
3	There is an independent and well-staffed Risk Management Department	Adam et al. (2021)
4*	Compliance to regulations regarding risk management are included	POJK No. 18/POJK.03/2016 Pasal 2 ayat 2b
5*	There is a risk awareness program	Surat Edaran OJK No. 34/SEOJK.03/2016 Bagian 4c
6	There is a risk management structure	Adam et al. (2021)
7	Clearly explained terms of reference for risk management committees	Adam et al. (2021)
7.1*	Explanation for risk management committees' structure	Surat Edaran OJK No. 34/SEOJK.03/2016 Lampiran 1 Bagian A.3.b
7.2*	Explanation for risk management committees' membership	Surat Edaran OJK No. 34/SEOJK.03/2016 Lampiran 1 Bagian A.3.b
7.3*	Duties and responsibilities of risk management committees' clearly stated	Surat Edaran OJK No. 34/SEOJK.03/2016 Lampiran 1 Bagian A.3.b
7.4*	Explanation for risk management committees' meeting	Surat Edaran OJK No. 34/SEOJK.03/2016 Lampiran 1 Bagian A.3.b
7.5*	Explanation for risk management committees' work plan	Merupakan item voluntary berdasarkan laporan tahunan Bank Mandiri pada tahun 2021
8	The existence of ALCO and its terms of reference is clearly disclosed	Adam et al. (2021)
8.1*	Explanation for ALCO's structure	Surat Edaran Otoritas Jasa Keuangan Nomor 34/SEOJK.03/2016 Lampiran 1 Bagian C.3.b.3.ii
8.2*	Explanation for ALCO's membership	Surat Edaran Otoritas Jasa Keuangan Nomor 34/SEOJK.03/2016 Lampiran 1 Bagian C.3.b.3.ii
8.3*	Duties and responsibilities of ALCO's clearly stated	Surat Edaran Otoritas Jasa Keuangan Nomor 34/SEOJK.03/2016 Lampiran 1 Bagian C.3.b.3.ii
8.4*	Explanation for ALCO's meeting	Surat Edaran Otoritas Jasa Keuangan Nomor 34/SEOJK.03/2016 Lampiran 1 Bagian C.3.b.3.ii
8.5*	Explanation for ALCO's work plan	Merupakan item voluntary berdasarkan laporan tahunan Bank Mandiri pada tahun 2021
9	Major risk management tools and strategies clearly explained	Adam et al. (2021)

Appendix B. ERM Index (Continued)

Board effectiveness and involvement in risk management process		
10	Board responsibility and participation in risk	Adam et al. (2021)

	management clearly stated	
11	Risk management structure clearly shows senior risk officers responsible for coordination of risk management activities	Adam et al. (2021)
12	Publishes board evaluation / assessment at least annually	Adam et al. (2021)
13	The non-executive directors more than executive directors	Adam et al. (2021)
14	There are at least two independent directors among the non-executive directors	Adam et al. (2021)
15	Total stock holdings of directors less than 10 %	Adam et al. (2021)
16	Do the board and all board committees meet at least once in a quarter?	Adam et al. (2021)
17*	BOD meet at least once in a month	POJK Nomor 33 /POJK.04/2014 Pasal 16 ayat 1
18*	BOC meet at least once in two months	POJK Nomor 33 /POJK.04/2014 Pasal 31 ayat 1
19*	BOD and BOC meet at least in four months	POJK Nomor 33 /POJK.04/2014 Pasal 16 ayat 3
20	All board members punctual at board meetings	Adam et al. (2021)
Audit committee oversight		
21*	The audit committee meet at least once in three months	Adam et al. (2021), POJK Nomor 55/POJK.04/2015 Pasal 13
22*	Explanation of audit committee activities	POJK Nomor 55 /POJK.04/2015 Pasal 18
23	The audit committee chairperson a non-director	Adam et al. (2021)
Audit quality		
24	The audit opinion is a clean opinion	Adam et al. (2021)
25	The auditor is one of the big four (PwC, KPMG, E&Y, and Deloitte)	Adam et al. (2021)
26*	Information about auditor fees are disclosed	ASEAN Corporate Governance Standard
27	The auditor's current tenure is less than 10 years	Adam et al. (2021)
28	Audit report does not indicate non-compliance with certain laws and regulations	Adam et al. (2021)

Appendix B. ERM Index (Continued)

29	The date accounts were approved by the directors and the audit report date are not more than 14 days apart	Adam et al. (2021)
Internal audit		
30	Roles of the internal audit department clearly explained	Adam et al. (2021)
31	Extracts of the internal audit charter disclosed	Adam et al. (2021)
32*	Update/renewal on internal audit charter	POJK No.1/POJK.03/2019 Pasal 10 ayat 5
33	Head of internal audit is senior enough to wield the power and authority required	Adam et al. (2021)
34	Work of internal audit relied upon by external auditor	Adam et al. (2021)
35	Work of internal audit reviewed and reported on by audit committee	Adam et al. (2021)
Quality of management discussion in financial reports and timeliness of financial reporting		
36	Management comments in financial report covers all significant aspects of operations and includes key ratios and performance measures	Adam et al. (2021)
37*	Additional reports provided aside the regulatory required annual report (sustainability report)	Adam et al. (2021), POJK No. 51/POJK.03/2017
38	Investor conferences are held to provide more information and answer investors questions	Adam et al. (2021)
39	Financial reports are published within 90 days after the reporting data	Adam et al. (2021)

Source: Data modified based on Adam et al. (2021)

Note: For each item a value of 1 is assigned if disclosed, and 0 if not disclosed. * This is a modification of the ERM Index by the researcher based on Adam et al. (2021).

Appendix C. Research Sample List

No.	Bank Name	Ticker
1.	PT Bank Raya Indonesia Tbk	IDX:AGRO
2.	PT Bank IBK Indonesia Tbk	IDX:AGRS
3.	PT Bank Jago Tbk	IDX:ARTO

Appendix C. Research Sample List (Continued)

4.	PT Bank MNC Internasional Tbk	IDX:BABP
5.	PT Bank Central Asia Tbk	IDX:BBCA
6.	PT Bank KB Bukopin Tbk	IDX:BBKP
7.	PT Bank Mestika Dharma Tbk	IDX:BBMD

8.	PT Bank Negara Indonesia (Persero) Tbk	IDX:BBNI
9.	PT Bank Rakyat Indonesia (Persero) Tbk	IDX:BBRI
10.	PT Bank Tabungan Negara (Persero) Tbk	IDX:BBTN
11.	PT Bank Neo Commerce Tbk	IDX:BBYB
12.	PT Bank Danamon Indonesia Tbk	IDX:BDMN
13.	PT. Bank Pembangunan Daerah Banten, Tbk	IDX:BEKS
14.	PT Bank Ganesha Tbk	IDX:BGTG
15.	PT Bank Ina Perdana Tbk	IDX:BINA
16.	PT Bank Pembangunan Daerah Jawa Barat dan Banten Tbk	IDX:BJBR
17.	PT Bank Pembangunan Daerah Jawa Timur Tbk	IDX:BJTM
18.	PT Bank QNB Indonesia Tbk	IDX:BKSW
19.	PT Bank Maspion Indonesia Tbk	IDX:BMAS
20.	PT Bank Mandiri (Persero) Tbk	IDX:BMRI
21.	PT Bank CIMB Niaga Tbk	IDX:BNGA
22.	PT Bank Maybank Indonesia Tbk	IDX:BNII
23.	PT Bank BTPN Tbk	IDX:BTPN
24.	PT Bank Oke Indonesia Tbk	IDX:DNAR

Appendix C. Research Sample List (Continued)

25.	PT Bank Artha Graha Internasional Tbk	IDX:INPC
26.	PT Bank Mayapada Internasional Tbk	IDX:MAYA
27.	PT Bank China Construction Bank Indonesia Tbk	IDX:MCOR
28.	PT Bank Mega Tbk	IDX:MEGA
29.	PT Bank OCBC NISP Tbk	IDX:NISP
30.	PT Bank Nationalnobu Tbk	IDX:NOBU
31.	PT. Bank Pan Indonesia Tbk	IDX:PNBN
32.	PT Bank Panin Dubai Syariah Tbk	IDX:PNBS

Source: Data processed, 2023