



Bank Financial Distress Prediction Model With Logit Regression

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ABSTRACT: The bank's financial distress probability prediction model functions as an early warning system for bankruptcy is needed before a bank is declared legal bankruptcy. The purpose of this research is to make a prediction model for the probability of bank financial distress and to obtain empirical evidence for the components of the Risk-Based Bank Rating, namely Risk Profile, Good Corporate Governance, Earning, and Capital which affect the probability of bank financial distress with logit regression. The study used quantitative methods on 301 samples from 43 BUKU 1 and BUKU 2 Conventional Commercial Banks from 2013 to 2019. The results of this study are the components of the Risk-Based Bank Rating which affect the probability of the Bank's financial distress, namely Gross NPL, LDR, GWM, and BOPO, and the prediction model of the bank's financial distress probability which is formed from the ratios of the sub-variable Risk-Based Bank Rating in the study can predict the probability of the Bank's financial distress. The theoretical benefit of this research for other researchers is to provide an overview of the Risk-Based Bank Rating variable that can predict the probability of bank financial distress so that in further testing, a new, more accurate, and more complete model for predicting the probability of bank financial distress is found. It is hoped that the results of the research can provide practical benefits for bank management, bank customers, investors, and creditors, as well as regulators as a tool to predict the probability of bank financial distress to maintain the security of business transactions related to the bank.

KEYWORDS: Logit Regression, Bank Financial Distress, Risk-Based Bank Rating, RGEC, BUKU, Bank Soundness, Early Warning System, and Basel.

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I. INTRODUCTION

Many studies have been conducted to predict a company's financial distress. Beaver (1966) conducted a study using the univariate method using six financial ratios to predict the failure of a business against 79 failed companies and 79 companies that did not fail and defined failure as the inability of a company to pay its obligations when due[1]. Altman (1968) conducted research using Multiple Discriminant Analysis (MDA) on five financial ratios against 33 healthy companies and 33 bankrupt companies and found the Z-Score formula[2]. Gordon (1971) examined the failures of large companies in America. Failure and reorganization were preceded by financial distress[3]. Springate(1978) found a Springate method called S-Score, using the step-wise multiple discriminate analysis methods[4]. Ohlson (1980) uses logit analysis to discriminate against bankrupt and non-bankrupt companies and creates O-Score using logistic regression method on nine variables to predict bankruptcy in order to improve the Z-Score that has been found by Altman[5]. Hofer (1980) argues that no matter how strong a country's economy is, no company is immune to internal difficulties, stagnation, or a decline in performance[6]. Zmijewski(1984) found the X-Score model using a sample of 75 bankrupt companies and 73 healthy companies from 1972 to 1978[7]. Thomson (1991) used a logit regression model to predict bank failures in the United States using the CAMEL ratio [8]. Shumway (2001) uses three financial ratios (1) Total liabilities/ total assets, (2) Relative size based on market value, and (3) Stock return over the year before bankruptcy relative to market return to compare the results of bankruptcy predictions with the Model Discriminant Analysis, new logit, hazard, and BMW (Bengley, Minf and Watts)[9]. Platt & Platt (2002) views financial distress as an event that precedes bankruptcy[10]. Rose & Kolari (1985)[11], Pantalone & Platt (1987)[12], and Blums& Macalester (2004) [13]use a logistic model as a statistical technique in modeling bank bankruptcy. Some researchers use survival models such as Whalen (1991)[14], Henebry (1996)[15], and Laitinen (2005)[16]. Senbet (2010) conducted a survey that highlighted the resolution mechanism not only in the private domain but also in the public domain because many

large companies had to be rescued by the government from the global financial crisis that had a systemic impact[17]. Sun et al. (2014) summarizes, analyzes, and evaluates the FDP (Financial Distress Prediction) literature in terms of four aspects, namely: definition of financial distress in the new century, FDP modeling, sampling approach for FDP, and presenting the approach to FDP which is intended to help researchers because there is a lot of literature on the topic of FDP[18]. Oz &Yelkenci (2017) create a financial distress prediction model using the components of accrual income and operating cash flow using logistic regression panel testing and neural network methods[19]. Waqas et al. (2018) conducted a study to identify predictors of financial distress in Pakistani companies[20].

Some researchers use logit regression in predicting bank financial distress with the CAMEL ratio, including Gasbarro et al. (2002)[21], Rahman et al. (2004)[22], Gonsel (2005)[23], Susanto&Njit (2012)[24], Nugroho (2012)[25], Kowanda et al. (2015)[26], Laksito&Nanang (2016)[27], Handayani (2016)[28], Sumani&Setiawan(2018)[29], EL-Ansary& Saleh (2018)[30], L.Sintha(2018)[31], Widyanty&Oktasari (2020)[32], and Ramadhani (2019)[33].

Assessment using the CAMELS method provides an overview of the level of effective bank soundness, but the CAMELS method has the weakness of not providing a conclusion that leads to an integrated assessment, each factor provides an assessment that seems to be independent. Meanwhile, the RGEC method emphasizes the quality of management. With good quality management, this will raise the income factor as well as the capital factor, both directly and indirectly.

Research on bank soundness in Indonesia using RGEC results are not all consistent. There is a research gap between several researchers. Harahap(2016) [34] researched the NPL, LDR, GCG, ROA, NIM, and CAR variables with the results of ROA and NIM which can be used to predict bank financial distress conditions. Hakim (2017) [35]conducted research such as Harahap (2016)[34] but changed the ROA variable to *BOPO* and obtained the results of *BOPO* and GCG research affecting the health of the bank. Sistiyanini&Supriyono (2017)[36] examined the same variables studied by Hakim(2017)[35] but with the addition of the *PDN* variable with the results of NPL, *PDN*, LDR, GCG, ROA, NIM, and CAR did not affect the bank financial distress. Fadhila (2019)[37] examined the same variables as Harahap (2016)[34] with the results of research that LDR, NIM, ROA, and CAR have a significant effect on the soundness level of a bank. The differences in the four results of the study are influenced by several factors, namely: (1) differences in the variables studied, (2) differences in the criteria for health and financial distress for each variable in each study, and (3) differences in the years of the study.

Based on these previous studies, this research is a novelty to predict the probability of financial distress in Indonesian banks using the RBBR variable by adding the *GWM* variable because there is still a lack of research using the *GWM* variable. The difference between this study and previous research is the type of sample, namely *BUKU 1* and *BUKU 2* Conventional Commercial Banks.

II. LITERATURE REVIEW

This section presents the basics of forming a prediction model for bank financial distress, the research hypothesis that are formed, and conceptual framework.

II.1. Theoretical Review Financial Distress

The grand theory of financial distress used for the basis of this research is research conducted by Gordon (1971)[3], Senbet(2010)[17], Oz & Yelkenci (2017)[19], and Waqas et al. (2018)[20], while Good Corporate Governance uses Love & Klapper (2002)[38]. According to Gordon (1971)[3] failure and reorganization were preceded by financial distress. According to Senbet (2010)[17] to resolve financial distress in a company, three alternatives are commonly used by company managers, namely debt restructuring, asset sales, and capital injection. Oz &Yelkenci (2017)[19] create a financial distress prediction model using the components of accrual income and operating cash flow using logistic regression panel testing and neural network methods. Waqas et al. (2018)[20] found that profitability ratios that can predict financial distress are net income to total assets retained earnings to total assets and earnings before interest and taxes on total assets; the leverage ratio that can predict financial distress is debt to total assets and interest coverage ratio; while the cash flow ratio that affects financial distress is the ratio of operating cash flow to income. According to Love & Klapper (2002)[38] Good Corporate Governance is highly correlated with operating performance. Some companies can compensate for ineffective and enforcement law with Good Corporate Governance and provide protection to credible investors.

In general, financial distress is a condition in which a company does not have enough funds to settle its financial obligations. Financial distress can be caused by external or internal conditions in the company. Various problems that occur outside the company, both at home and abroad, which are directly or indirectly related to the company can disrupt business activities, for example, war, disease outbreaks, natural disasters, economic embargoes, changes in rules, changes in government policies, change people's tastes and lifestyles, etc. which in the end can lead to a decrease in sales volume, a decrease in selling prices, an increase in various costs such as

raw materials, transportation prices, labor wages, bank interest rates, thus causing company losses. Apart from losses, financial distress can also be caused by company cash flow problems, for example, delays in collecting receivables, errors in funding sources, and delays in injecting loan funds when needed for production. Meanwhile, internal company conditions that can cause financial distress include inefficient activities, corruption, rework due to work errors due to the low quality of human resources or materials, management policies that are not following regulations, and so on. If this condition is allowed to continue without any concrete action from the owners and management of the company to overcome it, then financial distress is an early symptom of a company going bankrupt and the bankruptcy will end with company liquidation. So that financial distress does not develop into bankruptcy, it is necessary to establish an early bankruptcy warning system that can be used to predict whether a company is in financial distress or not.

This research follows Oz & Yelkenci (2017)[19] in using the logistic regression method to create a bank financial distress probability prediction model and the results are analyzed whether it is supported by the financial distress theory put forward Gordon (1971)[3], Senbet (2010)[17], Waqas et al. (2018)[20], and Love & Klapper (2002)[38] or not.

Basel

Risk-Based Bank Rating rules refer to Basel. Basel is a world banking regulatory standard issued by the Basel Committee on Banking Supervision (BCBS). In Indonesia Basel Implementation [39] in the form of the Basel II framework [40] (Pillar 1, Pillar 2, and Pillar 3) has been fully implemented since December 2012. Then Indonesia has also implemented the Basel III Framework in terms of liquidity and capital standards, as well as in stages several other standards by the deadline set by BCBS.

Basel started from the background of concerns over the Latin American debt crisis (Brazil, Argentina, Mexico) in the early 1980s which could increase the risk of international banking, so it was born Basel I[41]: Basel Capital Accord - International Convergence of Capital Measurement and Capital The standard contains a minimum capitalization of a banking institution of 8% and in calculating capital, it uses the concept of "forward-looking", which takes into account the credit risk contained in the banking asset portfolio (RWA). In 1996, the Basel I Amendments were issued: Amendment to the Capital Accord to Incorporate Market Risk[42] which contains (1) Adding the calculation of Market Risk that can arise from forex, debt securities, equity, commodities, and options; (2) the calculation of market risk using the Standard Method and the International Model; (3) adding Tier 3 in the definition of capital. In 1997 it was published Basel I: Core Principles for Effective Banking Supervision (Basle Core Principles) [43] which constituted 25 basic principles references to conduct banking supervision effectively and endorsed it to be applied nationwide. This basic principle was later increased in 2012 to 29 principles.

In 1997 - 1998, there was a financial crisis that occurred in South East Asia and South Asia, resulting in changes in the banking industry and financial markets and this became the background for the publication of Basel II. On 2004 was published Basel II[40]: "International Convergence of Capital Measurement and Capital Standards: A Revised Framework". The content of this standard is to determine the 3 pillars of banking, namely: (1) Pillar I is the Minimum Capital Requirement, which consists of Basel 1 (credit risk and market risk) plus operational risk (2) Pillar II is the Supervisory Review Process, namely banks must be able to assess the risk of the activities carried out, and the supervisor must be able to evaluate the adequacy of the assessment carried out by the bank, and (3) Pillar III is a Market Discipline, where banks must disclose various information to encourage market mechanisms so that they can support the bank's supervisory function. Then in 2009, it was published Basel 2.5[44]: "Revised to the Basel II Market Risk Framework" which increases the RWA calculation for market risk using the internal VAR and Stressed VAR models as well as the Incremental Risk Charge or risks due to the migration of securities ratings.

"Basel III: Global Regulatory Framework for More Resilient Banks and Banking Systems" [45] was published as a response to the financial crisis of 2007 - 2009 which contains strengthening of the global capital framework and introduction of global liquidity standards. Strengthening the global capital framework consists of (1) Increasing the quality, consistency, and transparency of capital; (2) Develop risk coverage; (3) Additional risk-based capital requirements with a leverage ratio; (4) Reducing procyclicality and increasing countercyclical buffer; (5) Addressing systemic risk and linkages between financial institutions. Meanwhile, the contents of the introduction to global liquidity standards are (1) Liquidity Coverage Ratio (LCR); (2) Net Stable Funding Ratio (NSFR); and (3) Monitoring Tools. Another Basel III regulation issued in 2010 is Basel III International Framework for Liquidity Risk Measurement, Standards, and Monitoring[46]. After 2010, Basel III still issued other regulations until 2017, Basel III issued regulations related to post-crisis reform, namely Basel III: "Finalizing Post-Crisis Reforms" [47] and after that Basel III is still making changes regulations to adapt to the latest banking conditions.

Bank Indonesia (BI) and OJK (Otoritas Jasa Keuangan)/the Financial Services Authority

Bank Indonesia is the Central Bank which was established in 1953 with the function of bank supervision and as the monetary authority. In 2011 the government established *OJK (Otoritas Jasa Keuangan)/the Financial Services Authority* which functions for integrated regulation and supervision of all activities in the financial services sector. With the establishment of the *OJK*, there was a duties separation between BI and OJK, namely BI as the monetary authority and *OJK* as regulator and supervisor of the financial services sector. Banking sector supervision shifted to *OJK* from December 31, 2013.

Banking Performance Assessment Criteria

The criteria for determining a Bank experiencing financial distress or health are outlined in BI Regulation Number 15/2/PBI/2013 [48] dated May 20, 2013, namely Banks that are considered to have potential difficulties that endanger the continuity of its business if it meets one or more of the following criteria:

1. Capital Adequacy Ratio (*KPMM/Kewajiban Penyediaan Modal Minimum*) is equal to or greater than 8% (eight percent) but less than the *KPMM* ratio by the Bank's risk profile that must be met by the Bank;
2. The core capital ratio (Tier 1) is less than a certain percentage stipulated by BI;
3. The Rupiah Reserve Requirements ratio (*GWM/Giro Wajib Minimum*) is equal to or greater than 5% (five percent) but less than the ratio stipulated for Rupiah Reserve Requirements that must be fulfilled by Banks, and based on BI's assessment, the Bank has fundamental liquidity problems;
4. The ratio of Non-Performing Loans on a net is more than 5% (five percent) of total loans;
5. Bank soundness level with a composite rating of 4 (four) or 5 (five);
6. Bank soundness level with a composite rating of 3 (three) and Good Corporate Governance (GCG) with rank 4 (four)

BUKU (Group of Business Activities)

According to BI Regulation Number 14/26/PBI/2012[49] dated December 27, 2012, which was later amended to *OJK* Regulation Number 6/POJK.03/2016 [50] dated January 26, 2016, *BUKU* stands for *Bank Umum berdasarkan Kelompok Usaha* or Commercial Bank based on Business Activities, namely the grouping of Banks based on Business Activities adjusted to their Core Capital.

Table 1. Grouping of Bank Business Activities Based on Core Capital

Group	Core Capital Value
<i>BUKU</i> 1	< Rp 1 trillion
<i>BUKU</i> 2	Rp 1 trillion - < Rp 5 trillion
<i>BUKU</i> 3	Rp 5 trillion - < Rp 30 trillion
<i>BUKU</i> 4	≥ Rp 30 trillion

Source: BI [49] and *OJK* Regulation [50]

Commercial Bank Soundness Rating

The assessment system for the commercial banks's soundness is established by the government through BI Regulation Number 6/10/PBI/2004 dated April 12, 2004 [51]. According to this regulation, the health component of commercial banks consists of (1) Capital, (2) Asset quality, (3) Management, (4) Earnings, (5) Liquidity, and (6) Sensitivity to market risk or abbreviated as CAMELS. This regulation was later updated on January 5, 2011, to BI Regulation Number 13/1/PBI/2011[52] namely the assessment of bank soundness using a risk approach (Risk-Based Bank Rating) which consists of RGEC: (1) Risk profile, (2) Good Corporate Governance (GCG), (3) Earnings, and (4) Capital. This regulation was later updated on January 26, 2016, to *OJK* Regulation Number 4/POJK.03/2016[53].

The basis for implementing BI Regulation Number 13/1/PBI/2011 [52] is BI Circular Letter Number 13/24/DPNP [54] dated October 25, 2011 and the basis for implementing *OJK* Regulation Number 4/POJK.03/2016[53] is *OJK* Circular Letter Number 14/SEOJK.03/2017 [55] dated March 17, 2017.

Table 2. Financial Ratios in Risk-Based Bank Rating

No.	RBBR Components	Financial Ratios	Sources
1	Risk Profile		
	a. Credit Risk	1. NPL Gross	Non-Performing Loan (categories sub-standard, doubtful, and loss) and Total Loan
		2. NPL Net	Non-Performing Loan (categories sub-standard, doubtful, and loss), Allowance for Impairment Losses, and Total Loan

b.	Market Risk	1. <i>PDN</i> 2. <i>IRRBB</i>	Net Assets and Liabilities in Foreign Currencies, Receivables and Liabilities of Commitments and Contingencies in Foreign Currencies, and Capital Fixed Interest Rate Liabilities > 1 year and Fixed Interest Rate Assets > 1 year
c.	Liquidity Risk	1. <i>LDR</i> 2. <i>AL/DPK</i> 3. <i>AL/NCD</i>	Total Credit and Third Party and Total Third-Party Funds Liquid Assets and Total Third-Party Funds Liquid Assets and Part of Third-Party Funds (30% of Saving, 30% of Demand Deposits, and 10% of Time Deposits)
d.	Operational Risk	4. <i>LCR</i> Nothing	High Quality Liquid Asset (HQLA) and Net Cash Outflow (NCO) Characteristics and complexity of the business, human resources, information technology, and supporting resources, fraud, and external events
e.	Legal Risk	Nothing	(1) The litigation factor, (2) The engagement weakness factor, (3) The absence/law change factor
f.	Reputation Risk	Nothing	(1) The influence of the bank fund's owner reputation, (2) Violation of business ethics, (3) Complexity of products and bank business cooperation, (4) Frequency, materiality, and exposure of bank negative news, and (5) Frequency and materiality of customer complaints
g.	Strategic Risk	Nothing	(1) The alignment of the strategy with the conditions of the business environment, (2) High-risk and low-risk strategies, (3) Bank's business position, (4) Achievement of the Bank's Business Plan <i>(RBB/RencanaBisnis Bank)</i>
h.	Compliance Risk	<i>GWM</i>	A certain percentage of Third-Party Funds in Rupiah (Starting December 31, 2013 = 8%, December 1, 2015 = 7.5%, March 16, 2016 = 6.5%, and July 1, 2019 = 6%)
2	Good Corporate Governance	Nothing	The bank's GCG index based on the assessment aspect which refers to the indicators issued by BI
3	Earnings	1. <i>ROA</i> 2. <i>NIM</i> 3. <i>BOPO</i> 4. <i>OHC</i> 5. Non-Core Earnings	Profit and Average Total Assets Interest Income Net and Average Total Earning Assets Operating Expenses and Operating Income Overhead Cost and Average Total Earning Assets Non-Core Earnings Net to Average Total Earning Assets Non-Core Earnings, Non-Core Expenses, and Average Total Earning Assets
4	Capital		
a.	Capital Adequacy	1. <i>CAR</i> 2. Tier 1 Capital Ratio 3. Tier 1 Leverage Ratio 4. Non-Performing Assets and Capital Ratio	Capital and Risk Weighted Assets Core Capital (Tier 1) and Risk Weighted Assets Core Capital (Tier 1) and Total Exposure Non-Performing Assets and Capital
b.	Capital Access	1. <i>ROE</i> 2. <i>Retention Rate</i>	Earning After Tax and Average Equity Retained Earnings, Dividend, and Core Capital (Tier 1)

Source: Data collected from Attachment of BI Circular Letter [56] and BI Regulation [57] and [58]
Financial ratios that will be used in this research are:

1. Risk profile

The assessment of risk profile factors is an assessment of Inherent Risk and the quality of Risk Management implementation in the Bank's operational activities[55].

a. Credit Risk

Credit risk is defined as a risk caused by the failure of the debtor and/or other parties to fulfill obligations to the Bank[59].

Credit risk is measured in Non-Performing Loans (NPL), namely non-performing loans that are sub-standard (collectability 3), doubtful (collectability 4), and loss (collectability 5).

1) NPL Gross

NPL Gross is calculated using the following formula:

$$\text{NPL Gross} = \frac{\text{Non-Performing Loan}}{\text{Total Loan}} \times 100\% \dots\dots\dots 1$$

2) NPL Net

NPL Net is calculated using the following formula:

$$\text{NPL Net} = \frac{\text{Non-Performing Loan - Allowance for Impairment}}{\text{Losses of Non-Performing Loan}} \times 100\% \dots\dots\dots 2$$

NPL is a financial ratio used to measure a bank's ability to maintain the risk of credit failure, in this case in the form of repayment of credit by the debtor which refers to the Credit Agreement that has been agreed upon between the bank and the debtor, consisting of installment payments and credit settlement terms or nominal. Because NPL reflects credit risk, the measurement is that the smaller the NPL means the smaller the credit risk faced by the bank. And conversely, the greater the NPL value, the greater the credit risk faced by banks.

Previous research concluded that NPL ratio can predict bank financial distress [24], [26], [60], [61], [62], [29], [63], [32], and [33].

In this study the hypothesis used for the NPL variable are:

H_{1a}: NPL Gross can predict the probability of a Bank's financial distress.

H_{1b}: NPL Net can predict the probability of a Bank's financial distress.

b. Liquidity Risk

Loan to Deposit Ratio (LDR) is the ratio for credit extended to third parties in Rupiah and foreign currency (not including credit to other banks) to third party funds which include demand deposits, savings, and deposits in Rupiah and foreign currencies (excluding funds interbank).

$$\text{LDR} = \frac{\text{Total Credit to Third Party}}{\text{Total Third Party Funds}} \times 100\% \dots\dots\dots 3$$

LDR is a financial ratio used to measure how strong the Third Party Funds (*DPK* or *Dana Pihak Ketiga*) managed by the bank are to be channeled into credit to be distributed the non-bank third party. LDR is included in the liquidity risk factor because it is a measuring tool for outgoing funds, namely credit given to non-bank third parties against incoming funds, namely Third Party Funds. If the LDR exceeds the maximum limit, it indicates that there is a negative cash flow, namely the cash outflow is greater than the cash inflow.

Previous research concluded that LDR ratio can predict bank financial distress [24], [25], [26], [60], [62], [33], [37], and [32].

The research hypothesis for the LDR variable is:

H_{1c}: LDR can predict the probability of a Bank's financial distress.

c. Compliance Risk

Compliance risk occurs because the Bank does not comply with and/or does not implement laws and regulations and provisions that have been established through standards that apply regularly general[55]. Rupiah Reserve Requirements (*GWM/Giro Wajib Minimum*) is the minimum fund value that must be maintained by banks based on the value determined by BI. *GWM* is a monetary instrument with a function as a regulator of money circulating in society and directly affects the inflation index. Because the statutory reserve is a compliance risk, if the regulation is not fulfilled, there will be a written warning and a penalty for paying the obligation.

$$\text{GWM} = \frac{\text{The daily amount of bank checking account balance recorded at BI every day within 1 reporting period}}{\text{The daily average of bank deposits in 1 reporting period in the previous 2 reporting periods}} \times 100\% \dots\dots\dots 4$$

GWM functions to regulate liquidity adequacy. To increase bank liquidity, the government reduces the reserve requirement value and vice versa, to reduce bank liquidity or reduce credit distribution, the statutory reserve requirement is increased.

Previous research found that *GWM* can predict bank financial distress [24] and [29]. This research hypothesis will use the same thing, namely:

H_{1d}: GWM can predict the probability of the Bank's financial distress.

2. **GCG (Good Corporate Governance)**

Good Corporate Governance is a mechanism to regulate and manage a business, as well as to increase corporate prosperity. GCG is implemented to improve the Bank's performance, protect the interests of stakeholders, and increasing compliance with applicable laws and regulations as well as generally accepted ethical values in the banking industry. The GCG Factor Rating is determined in 5 (five) ratings, namely Rank 1- "Very Good", Rank 2 -"Good", Rank 3 -"Fairly Good", Rank 4 -"Not Good", and Rank 5 -"Bad".

The rules regarding GCG (Good Corporate Governance) are contained in BI Regulation Number 8/4/PBI/2006 [64] issued on January 30, 2006, which was then followed by BI Regulation Number 13/1/PBI/2011 [52] dated January 5, 2011, and *OJK* Regulation Number 4/*POJK*.03/2016 [53] dated January 26, 2016.

Previous research concluded that GCG can predict bank financial distress [35], [62], [65], and [63].

The research hypothesis for the GCG variable is:

H2: GCG rating can predict the probability of the Bank's financial distress.

3. Earnings

Earnings is the bank's ability to generate profits.

a. Return on Assets (ROA)

Return on Asset (ROA) is the profitability ratio used to measure the bank's strength in generating profit from the use of its assets. ROA is directly proportional to the profit generated, the higher the profit generated, the higher the ROA value.

$$\text{ROA} = \frac{\text{Profit}}{\text{Average Total Assets}} \times 100\% \dots\dots\dots 5$$

ROA shows the effectiveness of the company in generating profits from the use of assets owned. ROA is directly proportional to the profit generated, that is, the higher the profit generated, the higher the ROA value.

Previous research concluded that ROA can predict bank financial distress [27], [34], [28], [65], [60], [62], [63], and [37].

The research hypothesis for the ROA variable is:

H3a: ROA can predict the probability of a Bank's financial distress.

b. Net Interest Margin (NIM)

NIM is a ratio to measure the effectiveness of interest income on the average productive assets of a bank. The NIM value is directly proportional to interest income, that is, the higher the NIM, the better the value.

$$\text{NIM} = \frac{\text{Interest Income Net}}{\text{Average Total Earning Assets}} \times 100\% \dots\dots\dots 6$$

Previous research concluded that that NIM can predict bank financial distress [28], [34], [60], [62], [65], and [37].

The research hypothesis for the NIM variable is:

H3b: NIM can predict the probability of the Bank's financial distress.

c. Operating Expenses to Operating Income (*BOPO/ Beban Operasional to Pendapatan Operasional*)

BOPO is a tool for measuring efficiency by comparing operating expenses to operating income. The lower the *BOPO*, the more efficient bank operations are. Evaluation of bank operational efficiency can be done by comparing the *BOPO* ratio with the previous year, if it is smaller, the bank's operations are more efficient.

$$\text{BOPO} = \frac{\text{Operating Expenses}}{\text{Operating Income}} \times 100\% \dots\dots\dots 7$$

Previous research concluded that *BOPO* can predict bank financial distress [26],[60], [35], [30], and [32]. Based on the previous research, the hypothesis of this research used for the *BOPO* variable is:

H3c: BOPO can predict the probability of the Bank's financial distress.

4. Capital

CAR (Capital Adequacy Ratio) in Indonesian banking is(*KPMM/KewajibanPenyediaan Modal Minimum*), referred to as the minimum capital adequacy requirement. CAR is a ratio to measure the ability of bank capital to cover risky assets. The higher the CAR value, the stronger the bank's capital will be to cover risks if there is a problem with risky assets. The function of providing minimum capital for a bank is to serve as a reserve in the event of a loss due to risky assets.

$$\text{CAR} = \frac{\text{Capital}}{\text{Risk Weighted Assets}} \times 100\% \dots\dots\dots 8$$

Previous research concluded that CAR can predict bank financial distress [60], [65], [62], [37], and [63].

In this study, the hypothesis for the CAR variable is:

H4: CAR can predict the probability of the Bank's financial distress.

II.2. Effect of Risk-Based Bank Rating on Probability of Financial Distress

The research hypothesis of the Risk-Based Bank Rating component consisting of Risk Profile, Good Corporate Governance, Earnings, and Capital is built by NPL Gross, NPL Net, LDR, *GWM*, GCG Rating, ROA, NIM, *BOPO*, and CAR (variable independent) formed into the conceptual framework of this research.

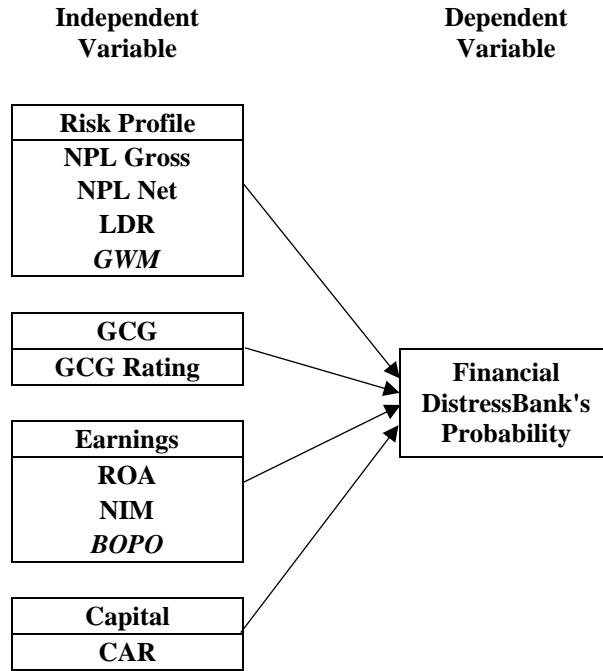


Figure 1. Conceptual Framework
Source: Literature Review

III. RESEARCH METHODS

This study uses quantitative methods with logit regression to find empirical evidence of the effect of NPL Gross, NPL Net, LDR, *GWM*, GCG Ranking, ROA, NIM, *BOPO*, and CAR on the probability of bank financial distress and the level of accuracy of the prediction model for the prediction of bank financial distress probability from Risk-Based Bank Rating ratios in predicting the probability of Bank financial distress. The object of research is the financial statements of Conventional Commercial Banks *BUKU 1* and *BUKU 2* from 2013 to 2019 which are published in the *OJK* directory and the directory of all sample banks, collected with documentation. The population of the study was 82 banks, using purposive sampling, the reduction was carried out so that the number of banks selected to be the sample of this study was 43 banks, with the criteria (1) Not having a merger program; (2) Did not experience an increase to *BUKU 3* during 2013-2019; (3) Does not change into a Sharia Commercial Bank; and (4) Having complete data for the years 2013-2019. The number of samples of this research is 301. Operational variable for this research are presented below:

Table 3. Operational Variable

RBBR Components	Variable	Measurement	Scale
	Dependent Variable		
	Financial Distress	Dummy variable Y, where Y = 1 for financial distress bank and Y = 0 for healthy bank	Nominal
	Independent Variable		
Risk Profile	NPL Gross	$\frac{\text{Non-Performing Loan}}{\text{Total Loan}} \times 100\%$	Ratio
	NPL Net	$\frac{\text{Non-Performing Loan (-) Allowance for Impairment}}{\text{Losses of Non-Performing Loan}} \times 100\%$	Ratio
	LDR	$\frac{\text{Total Credit to Third Party}}{\text{Total Third Party Funds}} \times 100\%$	Ratio
	<i>GWM</i>	$\frac{\text{The daily amount of bank checking account balance recorded at BI every day within 1 reporting period}}{\text{The daily amount of bank checking account balance recorded at BI every day within 1 reporting period}} \times 100\%$	Ratio

Bank Financial Distress Prediction Model With Logit Regression

GCG	GCG Rating	1 = “Very Good”, 2 = “Good”, 3 = “Fairly Good”, 4 = “Not Good”, 5 = “Bad”	Index
Earnings	ROA	$\frac{\text{Profit}}{\text{Average Total Assets}} \times 100\%$	Ratio
	NIM	$\frac{\text{Interest Income Net}}{\text{Average Total Earning Assets}} \times 100\%$	Ratio
	BOPO	$\frac{\text{Operating Expenses}}{\text{Operating Income}} \times 100\%$	Ratio
Capital	CAR	$\frac{\text{Capital}}{\text{Risk Weighted Assets}} \times 100\%$	Ratio

Source: Literature Review

The definition of a bank experiencing financial distress in this study is if the bank experiences at least one of the following Financial Distress conditions:

Table 4. Financial Distress Definition

No.	Variable	Financial Distress	Healthy	Basic Rules
1	NPL Gross	> 5%	≤ 5%	BI Circular Letter13/24/DPNP[54]
2	NPL Net	> 5%	≤ 5%	BI Circular Letter13/24/DPNP[54]
3	LDR	> 92%	≤ 92%	BI Regulation 15/7/PBI/2013[66]
4	Primary <i>GWM</i>			
	a. Year 2013 and 2014	< 8%	≥ 8%	BI Regulation15/15/PBI/2013 [67]
	b. Year 2015	< 7,5%	≥ 7,5%	BI Regulation17/21/PBI/2015[68]
	c. Year 2016	< 6,5%	≥ 6,5%	BI Regulation18/3/PBI/2016[69]
	d. Year 2019	< 6%	≥ 6%	Board of Governors Regulation21/14/PADG/2019 [70]
5	GCG Rating	4 - 5	1 - 3	BI Circular Letter15/15/DPNP[71]
6	ROA	< 0,5%	≥ 0,5%	BI Circular Letter 13/24/DPNP[54]
7	NIM	< 1,5%	≥ 1,5%	BI Circular Letter6/23/DPNP[72]
8	BOPO	> 94%	≤ 94%	BI Circular Letter13/24/DPNP[54]
9	CAR	< 8%	≥ 8%	BI Circular Letter14/37/DPNP[73]

Source: Literature Review

The regression model used to test the research hypothesis is:

$$\ln \frac{P}{P-1} = \beta_0 + \beta_1 \text{NPLG} + \beta_2 \text{NPLN} + \beta_3 \text{LDR} + \beta_4 \text{GWM} + \beta_5 \text{GCG} + \beta_6 \text{ROA} + \beta_7 \text{NIM} + \beta_8 \text{BOPO} + \beta_9 \text{CAR} \dots \dots \dots 9$$

Where:

- $\ln \frac{P}{P-1}$ = Probability of a bank Financial Distress or Healthy
- β_0 = Constant
- $\beta_1 - \beta_9$ = Regression Coefficient
- NPLG = Non-Performing Loan Gross
- NPLN = Non-Performing Loan Net
- LDR = Loan to Deposit Ratio
- GWM = Rupiah Reserve Requirements/*Giro Wajib Minimum*
- GCG = Good Corporate Governance
- ROA = Return on Asset
- NIM = Net Interest Margin
- BOPO = Operating Income to Operating Expenses
- CAR = Capital Adequacy Ratio

IV. RESULTS AND DISCUSSION

Table 5. Descriptive Statistic of The Variables from 2013 – 2019

	N	Minimum	Maximum	Mean
NPLG	301	0.00	29.25	2.90
NPLN	301	-3.30	8.73	1.45
LDR	301	45.72	1873.71	98.69
GWM	301	5.60	19.49	7.91
GCG	301	1	4	2.25
ROA	301	-15.89	5.42	1.43
NIM	301	0.24	19.30	5.80
BOPO	301	49.85	258.09	87.27
CAR	301	12.28	181.38	24.99

Source: Processed Data

In table 5, the minimum ratio for the NPL Gross variable is 0%, indicating that the bank is very good at managing credit so that there is no NPL, the maximum NPL Gross ratio of 29.25% indicates that banks are experiencing financial distress, and the average NPL Gross ratio is 2.90% indicates that the average bank in Indonesia has managed its credit well so that the NPL Gross ratio is below the stipulated provisions, which is a maximum of 5%.

The NPL Net variable has a minimum ratio of -3.3%. This ratio is negative because the value of Non-Performing Loans is smaller than the Allowance for Impairment Losses (*CKPN/Cadangan Kerugian Penurunan Nilai*). The maximum NPL Net ratio of 8.73% indicates that banks are experiencing financial distress. The average NPL Net ratio of 1.45% indicates that the average bank in Indonesia has managed its credit well so that the NPL Net ratio is below the stipulated provisions, which is a maximum of 5%.

The result of calculating the minimum ratio of the LDR variable of 45.72% can be an indication that there are banks that do not market their funds in the form of a credit to the maximum so that the ratio is below the stipulation, namely 92%. The maximum ratio of LDR of 1873.71% indicates that there are banks that have liquidity difficulties because the credit given to debtors is higher than the third party funds managed by the bank. The average LDR ratio of 98.69% above the limit set by Bank Indonesia 92% indicates that on average the Third Party Funds received by banks from the public have been marketed by banks in the form of a credit to the maximum, even exceeding the public funds obtained.

The standard ratio of the *GWM* in 2013 and 2014 is 8%, in 2015 is 7.5%, from 2016 to 2019 is 6.5%, and in 2019 is 6%. The statistical results show that the minimum reserve requirement variable is 5.6%, indicating that there are banks that do not meet the *GWM* requirement. The maximum *GWM* ratio of 19.49% and the average *GWM* ratio of 7.91% indicate that on average banks have met the *GWM* requirement.

During the research year, 4 banks had a minimum value of GCG variable of 1 which means "Very Good", while the maximum value of GCG was 4 which means "Not Good" occurred in 1 bank. The GCG average score is 2.25 which indicates that in general banks have implemented GCG with a "Good" rating.

In 2019 there is a minimum ratio of the ROA variable of -15.89%, which indicates that there are banks that have suffered losses and the value is below the 0.5% requirement. The maximum ROA ratio of 5.42% and an average ROA ratio of 1.43% indicate that on average the bank has a good profit before tax so that the ROA ratio is above the 0.5%

The NIM variable has a minimum ratio of 0.24% which indicates that there is a problem bank, so the minimum NIM ratio is below the 1.5% requirement. Meanwhile, the maximum NIM ratio of 19.3% and the average NIM ratio of 5.8% indicate that, on average, banks in Indonesia receive high net interest margins, which are above the 1.5% requirement.

The minimum ratio of the *BOPO* variable is 49.85% and the average ratio of *BOPO* is 87.27%, which is below the 94% requirement, indicating that the bank manages its activities very efficiently so that it can reduce operational costs. Meanwhile, the maximum ratio of *BOPO* is 258.09%, which indicates that the bank is experiencing a loss.

The minimum CAR ratio of 12.28%, the maximum CAR ratio of 181.38%, and the average CAR ratio of 24.99% indicate that all banks have complied with the minimum CAR requirement of 8%.

Table 6. Goodness of Fit Test

<i>Goodness Of Fit Test</i>		<i>Result</i>
Hosmer and Lemeshow Test	Chi-square	7.950
	Sig.	0.438
Omnibus Tests	Chi-square	168.368
	Sig.	0.000
-2 Log likelihood	Block 0	396.296
	Block 1	227.928
Cox & Snell R Square	Cox	0.428
Nagelkerke R Square	Nagel	0.585

Source: Processed Data

The Hosmer and Lemeshow Test and the Omnibus Test are to ensure no weaknesses in the hypothesized model conclusions so that the empirical data fit with the model. The significance value of The Hosmer and Lemeshow Test 0.438 is greater than 0.05, which means that the model is acceptable and hypothesis testing can be done. The significance value of the Omnibus Test 0.000 less than 0.05 means this model is fit and hypothesis testing can be continued.

Maximum likelihood testing is done by comparing the value of -2 Log-Likelihood Value block number 0 (before the independent variable enters the model) with the -2 Log-Likelihood Value block number 1 (after the independent variable enters the model). The initial -2 Log-Likelihood value is 396,292 and when the nine other independent variables are entered, the -2 Log-Likelihood value at the end decreases to 227.928 indicating a good regression model or the hypothesized model fits the overall model assessment data.

Testing the coefficient of determination using the Nagelkerke R Square value aims to see the ability of the independent variable to explain the dependent variable. At the Cox & Snell R Square value of 0.428, the Nagelkerke R Square value is 0.585. The results of the analysis show that the independent variables NPL Gross, NPL Net, LDR, *GWM*, *GCG*, *ROA*, *NIM*, *BOPO*, and *CAR* can explain the financial distress variable as the dependent variable by 58.5%, while the remaining 41.5% is explained by other variables not included in the regression equation model.

Hypothesis testing to determine the effect of the independent variable on the dependent variable by comparing the Wald Test probability value (Significance) with a value of 0.05. If the significance value is less than 0.05, the regression coefficient is significant and the independent variable affects the probability of financial distress. If the Significance value is greater than 0.05 means that the independent variable does not affect the probability of financial distress.

Table 7. Test Result

Variable	B	Hipotesis	Sig.	Analysis	Test Result
NPLG	0.625	Can Predict	0.003	< 0.05 = Affecting	Can Predict
NPLN	-0.231	Can Predict	0.446	> 0.05 = Not affecting	Can Not Predict
LDR	0.146	Can Predict	0.000	< 0.05 = Affecting	Can Predict
<i>GWM</i>	0.204	Can Predict	0.066	> 0.05 = Not affecting	Can Not Predict
<i>GCG</i>	0.268	Can Predict	0.507	> 0.05 = Not affecting	Can Not Predict
<i>ROA</i>	0.873	Can Predict	0.130	> 0.05 = Not affecting	Can Not Predict
<i>NIM</i>	-0.087	Can Predict	0.502	> 0.05 = Not affecting	Can Not Predict
<i>BOPO</i>	0.176	Can Predict	0.003	< 0.05 = Affecting	Can Predict
<i>CAR</i>	0.001	Can Predict	0.970	> 0.05 = Not affecting	Can Not Predict
Constant	-31.445	Can Predict	0.000	< 0.05 = Affecting	Model Can Predict

Source: Data Processed

In table 7, the NPL Gross significance value is 0.003 less than 0.05, proving that NPL Gross has a significant effect on the occurrence of bank financial distress, so NPL Gross can predict the probability of bank financial distress. The results of this study are in line with research conducted by Susanto & Njit (2012)[24], Kowanda et al. (2015)[26], L. Sintha et al. (2016)[60], Gumbo&Zoromedza(2016)[61], Satrio et al. (2018)[62], Sumani& Setiawan (2018)[29], Africa (2019)[63], Widyanty&Oktasari(2020)[32], and Ramadhani(2019) [33]. The NPL Gross ratio has a positive effect, meaning that the higher this ratio, the greater the probability of bank financial distress. The high NPL Gross indicates that bank assets are uncollectible so that it will disrupt bank liquidity and can cause the probability of financial distress, this is consistent with the grand theory of financial distress put forward by Gordon (1971)[3], Oz & Yelkenci (2017) [19], and Waqas et al. (2018)[20]. NPL Net has

a significance value of 0.446 which is greater than 0.05, proving that NPL Net does not affect the occurrence of bank financial distress, so NPL Net cannot predict the probability of bank financial distress. The results of this study are in line with research conducted by Nugroho (2012)[25], Harahap (2016)[34], Handayani (2016)[28], Indriastuti & Ifada (2016)[74], Sistiyanini & Supriyono (2017)[36], Hakim (2017)[35], Sugiyanto & Murwaningsari (2018)[65], EL-Ansary & Saleh (2018)[30], and Fadhila(2019)[37]. The NPL Net ratio has a negative effect, meaning that the lower this ratio, the more likely a bank will experience financial distress, this is not following the provisions, so the NPL Net variable cannot be used to predict the probability of bank financial distress and is not consistent with the grand theory of financial distress proposed by Gordon (1971)[3], Oz & Yelkenci (2017)[19], dan Waqas et al. (2018)[20].

The LDR test results obtained a significance value of 0.000 less than 0.05, proving that LDR has a significant effect on the probability of bank financial distress, so LDR can predict the probability of a Bank's financial distress. This is in line with previous research conducted by Susanto & Njit(2012)[24], Nugroho (2012)[25], Kowanda et al.(2015)[26], L. Sintha et al. (2016) [60], Satrio et al. (2018)[62], Ramadhani (2019)[33], Fadhila (2019)[37], and Widyanty&Oktasari (2020)[32], but inconsistent with research conducted by Laksito&Nanang (2016)[27], Harahap (2016)[34], Handayani (2016)[28], Sistiyanini&Supriyono (2017)[36], Sumani& Setiawan (2018) [29], Hakim (2017) [35], and Africa (2019)[63]. The LDR ratio has a positive effect, meaning that the higher this ratio, the health of the bank will decrease so that the probability of bank financial distress is getting bigger. A high LDR indicates that the credit extended by the bank is higher than the Third-Party Fund collected by the bank and this indicates that the bank is experiencing liquidity difficulties and can have an impact on financial distress. The LDR ratio, which is the liquidity ratio, is the application of a financial distress prediction model using the cash flow component in the grand theory of financial distress Oz & Yelkenci(2017)[19], Gordon (1971), and Waqas et al. (2018)[20].

The *GWM* significance value of 0.066 is greater than 0.05, but if using alpha 0.1, the *GWM* significance value of 0.066 is smaller than 0.1, so using 10% alpha proves that *GWM* has a significant effect on the occurrence of bank financial distress, so *GWM* can predict the probability of the Bank's financial distress. The results of this study are consistent with previous research conducted by Susanto&Njit (2012)[24] and Sumani & Setiawan (2018)[29]. *GWM*, which is a proxy for compliance risk, is a liquidity ratio. The grand theory of financial distress put forward by Waqas et al.(2018)[20], Gordon (1971)[3], and Oz & Yelkenci (2017)[19] is that cash flow can be a predictor of the probability of bank financial distress and the results of this study are consistent with the grand theory.

The *GCG* significance value of 0.507 is greater than 0.05, proving that *GCG* does not affect the probability of bank financial distress so that the *GCG* rating cannot predict the probability of the Bank's financial distress. The results of this study are consistent with research conducted by Harahap (2016)[34], Sistiyanini & Supriyono (2017)[36], and Fadhila (2019)[37], but inconsistent with research conducted by Gumbo & Zoromedza(2016)[61], Hakim (2017)[35], Sugiyanto & Murwaningsari(2018)[65], Satrio et al. (2018)[62], and Africa (2019)[63]. *GCG* has a positive effect, meaning that the higher the *GCG* value, the worse the health of a bank, and the more likely a bank is in financial distress. *GCG* is implemented to improve the Bank's performance, protect the interests of stakeholders, and increasing compliance with applicable laws and regulations as well as generally accepted ethical values in the banking industry. The results of this study are inconsistent with the grand theory by Love & Klapper(2002)[38].

ROA shows that the company has a profit from the use of its assets. The *ROA* significance value of 0.130 is greater than 0.05, proving that *ROA* has no effect on the probability of bank financial distress, so *ROA* cannot predict the probability of bank financial distress. The results are consistent with research conducted by Susanto & Njit(2012)[24], Nugroho (2012)[25], Kowanda et al. (2015)[26], Indriastuti & Ifada (2016)[74], Sistiyanini & Supriyono(2017)[36], Ramadhani (2019) [33], and Widyanty & Oktasari (2020)[32]. The results of this study are inconsistent with previous research conducted by Laksito & Nanang (2016)[27], Harahap (2016) [34], Handayani (2016)[28], L. Sintha et al. (2016)[60], Sugiyanto & Murwaningsari (2018)[65], Satrio et al. (2018)[62], Africa (2019)[63], and Fadhila (2019)[37] who concluded that *ROA* has a significant effect on bank financial distress. The *ROA* ratio has a positive effect, meaning that the higher this ratio, the greater the possibility of a bank in financial distress and this is not following the provisions so that *ROA* cannot be used to predict bank financial distress. The grand theory of financial distress proposed by Waqas et al. (2018)[20] is about profitability ratios that can predict financial distress and the results of this study are contrary to the main theory of financial distress put forward by Waqas et al. (2018)[20].

The *NIM* significance value of 0.502 is greater than 0.05, proving that *NIM* does not significantly influence the occurrence of bank financial distress, so *NIM* cannot predict the probability of Bank financial distress. The results of this study are consistent with the results of research conducted by Susanto & Njit(2012)[24], Laksito&Nanang (2016)[27], Nugroho (2012)[25], Sistiyanini & Supriyono (2017)[36], Sumani & Setiawan (2018)[29], Hakim (2017)[35], and Widyanty&Oktasari (2020)[32], but inconsistent with previous research conducted by Handayani (2016)[28], Harahap (2016)[34], L. Sintha et al. (2016)[60], Satrio et al. (2018)[62],

Sugiyanto & Murwaningsari (2018)[65], and Fadhila (2019)[37]. According to the grand theory of financial distress put forward by Gordon (1971)[3], what is meant by financial distress is a condition where the company's ability to generate profits decreases. NIM is a ratio that serves as a tool to measure a company's ability to generate profits. The result of this research is that NIM cannot predict the probability of bank financial distress, so it is not consistent with the grand theory.

In the test results, the *BOPO* significance value of 0.003 less than 0.05 proves that *BOPO* has a significant effect on the probability of bank financial distress so that *BOPO* can predict the probability of a Bank's financial distress. The results of this study are consistent with previous research conducted by Kowanda et al. (2015)[26], L. Sintha et al.(2016)[60], Hakim (2017)[35], EL-Ansary & Saleh(2018)[30], and Widyanty & Oktasari (2020)[32], but contrary to research conducted by Susanto & Njit (2012)[24], Nugroho (2012)[25], Laksito & Nanang (2016)[27], Handayani (2016)[28], Sumani & Setiawan (2018)[29], and Ramadhani (2019)[33] which concluded that *BOPO* does not affect bank financial distress. The *BOPO* ratio has a positive effect, meaning that the higher this ratio, the greater the possibility of a bank experiencing a loss so that the possibility of financial distress becomes greater. The results of this study are consistent with the grand theory of financial distress put forward by Gordon (1971)[3].

The CAR test results with a significance value of 0.970 greater than 0.05 prove that CAR does not affect the probability of bank financial distress, so CAR cannot predict the probability of a Bank's financial distress. The results of this study are consistent with previous research conducted by Handayani (2016)[28], Laksito&Nanang (2016)[27], Susanto & Njit (2012)[24], Nugroho (2012)[25], Harahap (2016)[34], Indriastuti & Ifada (2016)[74], Sistiyanini & Supriyono (2017)[36], Sumani & Setiawan (2018)[29], Kowanda et al. (2015)[26], Widyanty & Oktasari (2020)[32], and Hakim (2017)[35], but inconsistent with previous research conducted by L.Sintha et al. (2016)[60], Satrio et al. (2018)[62], EL-Ansary & Saleh (2018)[30], Sugiyanto & Murwaningsari (2018)[65], Africa (2019)[63], L.Sintha (2019)[75], and Ramadhani (2019)[33]. The CAR ratio has a positive effect, meaning that the higher this ratio, the greater the probability of financial distress, thus the results of this variable study are not following the provisions so that CAR cannot be used to predict the probability of bank financial distress. The results of this study are inconsistent with the grand theory put forward by Senbet (2010)[17].

To find out how accurate the bank's financial distress probability prediction model, which is formed from the Risk-Based Bank Rating ratios, can predict the probability of the Bank's financial distress, a simultaneous test between the Goodness Fit Model and R Square is used. The results of the Goodness of Fit Test using the Hosmer and Lemeshow Test and the Omnibus Test show that the model is fit, acceptable, and hypothesis testing can be done with the Hosmer and Lemeshow test significance value $0.438 > 0.05$, and the Omnibus Test significance value $0.00 < 0.05$. While testing the whole model (Overall Model Fit) using the -2 Log Likelihood value, the results show that the regression model is good, this is evidenced by the decrease in the initial -2 Log Likelihood value after 9 independent variables are entered into the model. While testing the coefficient of determination using Nagelkerke R Square results in 0.585 which shows that the NPL Gross, NPL Net, LDR, *GWM*, *GCG*, *ROA*, *NIM*, *BOPO*, and *CAR* variables can explain the probability of bank financial distress by 58.5%, while the remaining 41,5% is explained by other variables not included in this regression model. Nagelkerke R Square values range from 0 to 1, with the greater the better. In this test, the R Square value is 0.585, which is above the mid-limit, 0.5, meaning that this model is good.

Based on the test results, the Logit Regression equation for this model is:

$$\ln \frac{P}{P-1} = -31,445 + 0,625 \text{ NPLG} - 0,231 \text{ NPLN} + 0,146 \text{ LDR} + 0,204 \text{ GWM} + 0,268 \text{ GCG} + 0,873 \text{ ROA} - 0,087 \text{ NIM} + 0,176 \text{ BOPO} + 0,001 \text{ CAR} \dots\dots\dots 10$$

Where:

- $\ln \frac{P}{P-1}$ = Probability of Bank Financial Distress or Healthy
- NPLG = Non-Performing Loan Gross
- NPLN = Non-Performing Loan Net
- LDR = Loan to Deposit Ratio
- GWM* = Rupiah Reserve Requirements/*Giro Wajib Minimum*
- GCG* = Good Corporate Governance
- ROA* = Return on Asset
- NIM* = Net Interest Margin
- BOPO* = Operating Income to Operating Expenses
- CAR* = Capital Adequacy Ratio

V. CONCLUSION

The Risk Profile which consists of credit risk, liquidity risk, and compliance risk affects the probability of the Bank's financial distress so that the risk profile can be used to predict the probability of a bank's financial distress. The effect of the Risk Profile which consists of credit risk, liquidity risk, and compliance risk on the

probability of a Bank's financial distress, which is credit risk, liquidity risk, and compliance risk has a significant effect on the probability of the Bank's financial distress. The proxy of credit risk that has a significant effect on the probability of Bank financial distress is NPL Gross, while NPL Net does not significantly influence the probability of Bank financial distress. The proxy of liquidity risk represented by the LDR variable has a significant effect on the probability of the Bank's financial distress. The proxy of compliance risk represented by the *GWM* variable has a significant effect on the probability of bank financial distress. Thus, empirical evidence is obtained that the proxies from the Risk Profile that can be used to predict the probability of bank financial distress are NPL Gross, LDR, and *GWM*, while NPL Net cannot be used to predict the probability of bank financial distress.

Good Corporate Governance as represented by the GCG Rating variable does not affect the probability of the Bank's financial distress. The effect of Good Corporate Governance on the probability of Bank financial distress is insignificant so that empirical evidence is obtained that GCG cannot be used to predict the probability of Bank financial distress.

Earning affects the probability of the Bank's financial distress. The influence of Earning on the probability of the Bank's financial distress is significant in the *BOPO* variable, while the NIM and ROA variables have no significant effect on the probability of the Bank's financial distress. Thus, empirical evidence is obtained that the proxy of earnings that can be used to predict the probability of bank financial distress is *BOPO*, while NIM and ROA cannot be used to predict the probability of bank financial distress.

Capital does not affect the probability of the Bank's financial distress. Capital that uses the CAR variable does not significantly influence the probability of the Bank's financial distress so that empirical evidence is obtained that CAR as a proxy for Capital cannot be used to predict the probability of a Bank's financial distress.

The accuracy level of the bank's financial distress probability prediction model which is formed from the sub-variable ratios of the Risk-Based Bank Rating to the probability of the Bank's financial distress is proven by using a simultaneous test between the Goodness Fit Model and R Square. The results of the Goodness of Fit Test using the Hosmer and Lemeshow Test and the Omnibus Test show that the model is fit, acceptable, and hypothesis testing can be carried out and testing the whole model (Overall Model Fit) using the -2 Log Likelihood value shows that the regression model is good. While testing the coefficient of determination using Nagelkerke R Square shows that the NPL Gross, NPL Net, LDR, *GWM*, GCG, ROA, NIM, *BOPO*, and CAR variables can explain the probability of bank financial distress.

The limitation of this study is that it only uses part of the RBBR component, so the variables used for this study, namely NPL Gross, NPL Net, LDR, *GWM*, GCG, ROA, NIM, *BOPO*, and CAR are only able to explain the probability of bank financial distress of 58.5%, while the rest is explained by other RBBR variables that are not included in the regression equation model of this study. Future research is expected to add more complete variables and to obtain better research results.

The results of this study are expected to provide theoretical benefits for other researchers as empirical evidence that the RBBR approach using the NPL Gross, LDR, *GWM*, and *BOPO* variables can provide information about the probability of bank financial distress so that the model formed can be used for the coming years and is expected to be tested, then we can find a new, more accurate, and more complete model for predicting the probability of bank financial distress. It is hoped that the research results can provide practical benefits to be used as evaluation material by bank management in making decisions and implementing effective strategies to overcome the problems faced by the bank, especially those related to bank financial risks. The results of this research are also expected to be useful for bank customers to help maintain the security of funds deposited in banking institutions. Investors and creditors are expected to be able to obtain information from this research for consideration in making investment actions and buying shares so that potential losses faced can be minimized. Also, the results of this study can serve as alternative tools for regulators in carrying out the function of bank supervision and can be used as a predictive model to determine the probability of bankruptcy as early as possible (early warning system) before the bank is declared legal bankruptcy.

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