# Bank Bankruptcy Prediction Model with Risk-Based Bank Rating (RBBR): BUKU1 and BUKU2 Categories

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Abstract: This study aims to obtain empirical evidence that the risk approach through the Risk-Based Bank Rating variables is an appropriate source to be used as a predictor of banks problem. The model formed is expected to have the right model accuracy to be applied in Indonesia as one of the early warning tools. The research variables are Risk Profile, GCG, Earning, and Capital by using risk ratios and financial ratios. The research population is bank financial statements in the period from 2005 - 2014 with bank categories BUKU 1 and 2. Econometric models with logistic regression analysis techniques to find the variables that influence bank bankruptcy. The results of the study with logistic regression testing found that bank prediction models with BUKU 1 and BUKU 2 categories partially and simultaneously showed that from all the research variable indicators tested supported the hypothesis and had a significant effect on the 5% accurate level in predicting the financial condition of a bank, this is evident from the 74.07% backtesting and Rsquare results.

## 1 INTRODUCTION

The phenomenon of bank bankruptcy in Indonesia has been seen since the existence of banking deregulation in 1983, where competition between banks, whether it is the government, private, joint venture and foreign banks was increasing. Banks that have small capital and do not have a market experience financial difficulties which are eventually liquidated, frozen or taken over by the government. With the liquidation, the level of public trust in the banking sector has decreased, and people prefer to invest their funds abroad so that banks can experience a lack of funds. Therefore, an early warning system is needed that can provide information about problems that occur in the banking industry (Suharman, 2007). With the early detection of banking conditions, financial difficulties can be anticipated before reaching a crisis. Financial risk factors have an essential role in explaining the phenomenon of the bankruptcy of the bank. With the early detection of banking conditions, the bank can take anticipatory steps to prevent the financial crisis from being handled immediately. Previous researchers also tried to overcome this problem by making a model that was built from indicators of financial ratios to predict the financial difficulties of a bank. The model in question is a way of representation of the condition of the bank that is described by financial ratios into a particular bank that is simple, where it is expected that the resulting model can describe the financial condition of a bank in an integrated manner. The existence of this model is expected to help interested parties in the existence of banks, especially banks with BUKU 1 and BUKU 2 categories, either directly or indirectly, to participate in monitoring and overseeing the bank's financial performance so that they can immediately anticipate the possibility of deteriorating financial conditions these banks in the future.

Based on the description of the importance of market risk management, credit risk, liquidity risk, good corporate governance, profitability and bank capital adequacy, this study examines the effect of these variables on the bank soundness rating in the BUKU1 and BUKU2 categories in predicting bank bankruptcy in Indonesia.



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# 2 LITERATURE REVIEW

## 2.1 Bank Risk

Risk management is a risk management activity so that risks can be minimized in the future by supporting adequate infrastructures such as organizations, guidelines, and information systems. Such activities include the identification of risks, measuring risk, controlling routinely, and recommending policies (risk shifting/hedging, absorbing risks by pricing, insurance, and increasing capital).

W.Santoso and E. Pariantoro (2003) say that risk is the possibility of banks experiencing losses as a result of changes in conditions that affect the value of the position of the bank.

Bank Indonesia classifies risks into 8 (eight) types of risk, which are generally divided into 2 (two) risk categories, namely those that can be measured (quantitatively) and those that are difficult to measure (qualitative) as follows:

1. Risks that can be measured (quantitatively) include:
   a. Credit Risk
      Credit risk is a risk due to the failure of the debtor and/or other parties to fulfil obligations to the bank. Credit risk can be sourced from various bank business activities.
   b. Market Risk (Market Risk)
      Market risk is risk in the balance sheet and administrative account positions, including derivative transactions, due to overall changes in market conditions, including the risk of changes in option prices. Market risk includes, among others, interest rate risk, exchange rate risk, equity risk, and commodity risk.
   c. Liquidity Risk (Liquidity Risk)
      Liquidity risk is a risk due to the inability of banks to fulfil maturing obligations from cash flow funding sources and /or from high-quality liquid assets that can be pledged, without disrupting the activities and financial condition of the bank.
   d. Operational Risk
      Operational risk is a risk due to insufficiency and /or non-functioning of internal processes, human errors, system failures, and /or the presence of external events that affect the bank's operations. Operational risk can be sourced from, among others, Human Resources (HR), internal processes, systems and infrastructure, and external events.

2. Risks that are difficult to measure, namely
   a. Legal Risk
      Legal risk is the risk due to lawsuits and /or weaknesses in juridical aspects. Legal risk can be sourced from, among other things, weaknesses in the juridical aspects caused by the weakness of the engagement made by the bank.
   b. Reputation Risk (Reputation Risk)
      Reputational risk is a risk due to a decrease in the level of trust of stakeholders (stakeholders) originating from negative perceptions of the bank.
   c. Strategic Risk (Strategy Risk)
      Strategic risk is a risk due to inaccuracy in making and /or implementing a strategic decision and failure to anticipate changes in the business environment.
   d. Compliance Risk
      Compliance risk is a risk due to banks not complying with and /or not implementing the applicable laws and regulations.

## 2.2 Concepts and Methods of Risk-Based Bank Rating (RBBR)

Bank Indonesia issued a new regulation regarding guidelines for rating bank soundness, namely Bank Indonesia Regulation (PBI) No.13 / 1 / PBI / 2011 concerning Soundness Rating for Commercial Banks, which requires Commercial Banks to conduct self-assessments on Bank Soundness by using the Risk approach (Risk-based Bank Rating / RBBR) both individually and on a consolidated basis.

Guided by Basel II from the Bank for International Settlements (BIS) there are 8 (eight) types of risks inherent in the banking industry, but from experience shows that there are significant risks that often arise and are the cause of a bank facing various complicated problems. These risks are grouped into 4 (four) main groups, namely risks related to Credit Risk, Market Risk, Liquidity Risk and Operational Risk.

The criteria used are the Risk-Based Bank Rating (RBBR) method approach, namely: (1) Risk Profile; (2) Good Corporate Governance; (3) Earning; and (4) Capital.

Risk Profile. Assessment of risk profile factors is an assessment of inherent risk and the quality of risk management implementation in bank

operations, namely credit risk, market risk, liquidity risk, strategic risk. Each of these types of risks refers to the general principles of assessing the soundness of commercial banks. The minimum parameters/indicators that must be used as a reference by banks in assessing Risk Profiles are credit risk, market risk, liquidity risk and bank operational risk.

Good Corporate Governance (GCG). As a financial institution that plays a vital role in supporting the economy in Indonesia, banks face increasingly complex risks and challenges. Corporate governance is a concept to improve company performance through supervising or monitoring management performance and ensuring management accountability to stakeholders by basing it on the regulatory framework (M. Nasution and D. Setiawan (2007).

Profitability (Earnings. Earnings are one indicator to see banking performance. According to Joen and Miller, therefore, earnings performance is represented by ROE. ROE shows the rate of return given by the bank to the shareholders. The higher the ROE, the better the state of the bank. However, the lower the ROE, the worse the bank concerned.

Capital. The provisions of bank capital in the Basel Accord 1 of 1988, have been shown to increase bank capital in Europe (Fiordelisi et.all, 2010). The capital provisions issued by the International Settlement Bank (BIS) were adopted by Bank Indonesia in regulating bank capital in Indonesia in requiring that the amount of bank capital be at least 8% of the risky total assets of the bank called RWA (Risk-Weighted Assets). If bank capital is sufficient to cover the level of asset risk, the bank's performance will improve. This condition is due to an increase in the level of trust of depositors to deposit their funds even though the interest rates of third party funds are deficient. In terms of assets, a high level of capital adequacy will provide an opportunity for asset diversification for banks and can expand so that it can improve the ability of bank profitability or bank financial performance, Rose (2002). Fiordelisi et al. (2011) examined the relationship between capital and risk, indicating that banks with high income resulted in increased bank risk and bank capital could increase. Banks with high capital levels have a positive impact on supervisory institutions to achieve long-term benefits so that financial stability is maintained.

Based on bank classification based on the core capital owned by the Bank (Bank Indonesia Regulation Number 14/26 / PBI / 2012) grouped into four business groups (Business Banks - BUKU) as follows: (a) BUKU 1, Banks with core capital less than Rp1 Trillion; (b) BUKU 2, Banks with core capital of Rp1 Trillion up to less than Rp 5 Trillion; (c) BUKU 3, Banks with core capital of IDR 5 Trillion up to less than IDR 30 Trillion; and (d) BUKU 4, Banks with core capital above Rp30 Trillion.

Bank classification based on Core Capital in 2005 - 2014, can be seen in Table 1 below that banks with small and medium-sized core capital are more dominant than banks with large amounts of core capital.

Table 1: Bank Classification Based on Core Capital 2005-2014.

| | Core Capital | Total Bank |
|---|---|---|
| BUKU 1 | < 1 Trillion | 51 |
| BUKU 2 | 1< Core Capital < 5 Trillion | 44 |
| BUKU 3 | 5 < Core Capital < 30 Trillion | 21 |
| BUKU 4 | >30 Trillion | 4 |

## 2.3 Indicators Research

Captions should be typed in 9-point Times. They should be centred above the tables and flush left beneath the figures. This research is conducted on financial statements periodically (quarterly) in the form of annual bank reports and bank financial statements published from all banks (populations), namely bankrupt and non-bankrupt banks operating in Indonesia during the period 2005 to 2014. Financial ratios selected because financial ratios are representations of management's performance in carrying out its business. With financial ratios can be seen the position and financial condition of a bank in a certain period (Cole, 1972; Foster, 1986; Frase, 1995); because financial ratios can be the primary indicator for predicting bankruptcy of a bank, it can also be used as a precautionary step before bankruptcy occurs (Hempel, 1994). From this signal, it can be seen whether the bank can be predicted to experience bankruptcy problems or even vice versa the signal is not able to provide accurate information on the future of the bank's condition.

The Observation Unit in this study is all Banks in Indonesia listed in the Indonesian Banking Directory Book, namely State Banks, Foreign Exchange National Private Banks, Non-Foreign Exchange National Private Banks, Regional Development Banks (BPD), Mixed Banks and Foreign Banks with the total bank as shown in Table 2.

Table 2: Number of Observation Bank Populations 2005 – 2014.

| | | BUKU 1 | Result | BUKU 2 | Result |
|---|---|---|---|---|---|
| Constant | | 6.206 | | 26.757 | |
| APB | + | -1.091 | x | -57.551 | x |
| PPAPTAP | + | -0.483*** | x | 21.576 | x |
| NPLgross | + | 0.400*** | v | -8.761 | x |
| NPLnet | + | 0.353 | x | -16.445 | x |
| PDN | + | 0.156** | v | 1.696 | x |
| LDR | + | 0.011** | v | 0.173 | x |
| GWM | - | -0.323** | v | 0.657 | x |
| BOPO | + | -0.111*** | x | -0.927* | v |
| ROE | - | -0.032*** | v | -.058 | x |
| GCG | + | 3.344*** | v | 39.224* | v |
| ROA | - | -0.283 | x | -9.686 | x |
| NIM | - | -1.454*** | v | -6.512 | x |
| CARCR | - | 0.666 | x | 1.391 | x |
| CARMR | - | -0.107 | x | -0.158 | x |
| CARCROR | - | -1.039 | x | 2.255 | x |
| CARCRMROR | - | 0.145 | x | -2.313 | x |
| CAR | - | 0.247 | x | 1.094 | x |
| Nagelkerke $R^2$ | | 68.88% | 74.07% | | |
| Chi-Square | | 212.678*** | | 167.882*** | |
| | | | | | |

Source: Direktori Perbankan Indonesia 2005 - 2014

Some causes of the decrease in the number of banks were because the bank was revoked. The business license was liquidated, acquired by another bank. Later, it will merge with a bank or self-liquidation.

# 3 RESEARCH METHODS

The study was conducted using a quantitative approach with a level of descriptive and verification achievement. In the level of description, an overview of the state of the research variables is presented: Risk Profile, GCG, Earning and Capital studied. Furthermore, from the population carried out by purposive sampling based on the criteria available for complete financial report data for 2005 and 2014 obtained a sample of 74 banks for 2005 - 2014 consisting of 12 troubled/bankrupt banks and 62 non-bankrupt banks. This research utilizes a panel data state to predict the occurrence of a bank quarterly before the occurrence of a troubled bank. For this reason, this study uses a logit model because it will form a model that is expected to answer the probability of bankruptcy

# 4 RESULTS AND DISCUSSION

Table 3: Model Testing Results.

| Year | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| Population | 131 | 130 | 130 | 124 | 121 |
| Year | 2010 | 2011 | 2012 | 2013 | 2014 |
| Population | 122 | 120 | 120 | 120 | 119 |

Source: Data processed, *** Supported statistically at alpha 1%, ** at alpha 5%, and * at alpha 10%

Regression of bank partially showed that the prediction models with core capital are less than 1 trillion (BUKU 1). The variable risk profile is the only variable of PPAPTAP, NPLgros PDN, LDR and ROE. It supported the hypothesis and have a significant effect on the level of 5%. The rating of Good Corporate Governance has a significant positive effect on the level of 1%. In the earnings variable, only the NIM is significant while the variable capital has no significant indicator. The regression test results of bankruptcy prediction models with core capital <1 trillion (BUKU 1) simultaneously show that the variable Risk Profile, GCG, Earning and Capital have a significant effect in predicting bankruptcy of banks at a significance level of 1%. The ability of bank bankruptcy prediction model can be seen from the value of Negelkerke R-squared 68.88%, meaning that 68.88% of the variables in the model are able to predict bankruptcy in the BUKU 1 category. In comparison, the remaining 31.12% is the magnitude of other factors beyond predicting Bank bankruptcy in the BUKU 1 category.

Table 4: Backtest and Rsquare of BUKU 1.

| Prediksi | | Aktual | | |
|---|---|---|---|---|
| | | Y | | Percentage Correct |
| | | Non Pailit | Pailit | |
| Y | Non Pailit | 765 | 17 | 97.83% |
| | Pailit | 6 | 25 | 80.65% |
| Overall Percentage | | | | 97.17% |
| Rsquare | | | | 68.88% |

Source: Data processed

With a high total accuracy level of 97.17%, it can be said that the logistic regression model of the BUKU 1 category is formed accurately in predicting the financial condition of a bank, this is evident from proper backtesting and Rsquare results. Based on the results of the accuracy of the classification above, the logit model for bankruptcy has quite good robustness because it has an accuracy of above 80% for the non-bankrupt, bankrupt and total groups (Greene, 2010).

The regression test results of bank prediction models with core capital are less than 1 trillion (BUKU 2). It partially showed that all tested research indicators support the hypothesis and have a significant effect on the 5% level only NPLgross, CARMR, CARCROR and CARCRMROR. While PPAPTAP has a significant influence on the level of 10%, the regression test results of predictive bank models with core capital of 1-5 trillion (BUKU 2), simultaneously showing that the variable Risk Profile, GCG, Earning and Capital have a significant effect in predicting bankruptcy of banks at a significance level of 1%. The ability of bank bankruptcy prediction models can be seen from the value of Negelker to R-squared of 74.07%, which means 74.07% of the variables in the model can predict bankruptcy in the BUKU 2 group, while the remainder of 25.93% is the magnitude of other factors predict bank bankruptcy in the BUKU group.

Table 5: Backtest and Rsquare of BUKU 2.

| Prediksi | | Aktual | | |
|---|---|---|---|---|
| | | Y | | Percentage Correct |
| | | Non Pailit | Pailit | |
| Y | Non Pailit | 695 | 8 | 98.86% |
| | Pailit | 4 | 20 | 83.33% |
| Overall Percentage | | | | 98.35% |
| Rsquare | | | | 74.07% |

Source: Data processed

With a high level of total accuracy of 98.35%, it can be said that the logit regression model of Bank BUKU 2 category is formed accurately in predicting the financial condition of a bank, this is supported by proper backtesting and Rsquare results. Based on the results of the classification above, the logit model For bankruptcy, it has reasonably good robustness because it has an accuracy of above 80% for non-bankrupt, bankrupt and total categories.

Regression of bank prediction models with core capital is less than1 trillion (BUKU 1). It partially shows that the variable risk profile is only variable PPAPTAP, NPLgros PDN, LDR and ROE that support the hypothesis and have a significant effect on the level of 5%. The rating of Good Corporate Governance has a significant positive effect on the level of 1%. In the earnings variable, only the NIM is significant while in the capital variable, there is no significant indicator. The regression test results of bank bankruptcy prediction models with core capital <1 trillion (BUKU 1) simultaneously indicate that the variable Risk Profile, GCG, Earning and Capital have a significant effect in predicting bankruptcy of banks at a significance level of 1%. The ability of bank bankruptcy prediction model can be seen from the value of Negelkerke R-squared 68.88% meaning that 68.88% of the variables in the model can predict bankruptcy in the BUKU 1 group, while the remaining 31.12% is the magnitude of other factors beyond predicting Bank bankruptcy in the BUKU group 1.

Table 6: Backtest and Rsquare of BUKU 1.

| Prediksi | | Aktual | | |
|---|---|---|---|---|
| | | Y | | Percentage Correct |
| | | Non Pailit | Pailit | |
| Y | Non Pailit | 765 | 17 | 97.83% |
| | Pailit | 6 | 25 | 80.65% |
| Overall Percentage | | | | 97.17% |
| Rsquare | | | | 68.88% |

Source: Data processed

With a high total accuracy level of 97.17%, it can be said that the logistic regression model of BUKU 1 category is formed accurately in predicting the financial condition of a bank, this is evident from proper backtesting and Rsquare results. Based on the results of the accuracy of the classification above, the logit model for bankruptcy has quite good robustness because it has an accuracy of above 80% for the non-bankrupt, bankrupt and total groups (Greene, 2010).

The regression test results of bank prediction models with core capital are less than 1 trillion (BUKU 2). It partially indicates that all tested research indicators supported the hypothesis and have a significant effect on the 5% level only NPLgross, CARMR, CARCROR and CARCRMROR. While PPAPTAP has a significant influence on the level of 10%, the regression test results of bankruptcy prediction models with core capital of 1-5 trillion (BUKU 2), simultaneously showing that the variable Risk Profile, GCG, Earning and Capital have a significant effect in predicting bankruptcy of banks at a significance level of 1%. The ability of bank bankruptcy prediction models can be seen from the value of Negelker to R-squared of 74.07%, which means 74.07% of the variables in the model can predict bankruptcy in the BUKU 2 category, while the remaining 25.93% is the magnitude of other factors predict bank bankruptcy in the BUKU 2 category.

Table 7: Backtest and Rsquare of BUKU2.

| Prediksi | | Aktual | | |
|---|---|---|---|---|
| | | Y | | Percentage Correct |
| | | Non Pailit | Pailit | |
| Y | Non Pailit | 695 | 8 | 98.86% |
| | Pailit | 4 | 20 | 83.33% |
| Overall Percentage | | | | 98.35% |
| Rsquare | | | | 74.07% |

Source: Data processed

With a high level of total accuracy that is equal to 98.35%, it can be said that the logit regression model of BUKU 2 Bank category is formed accurately in predicting the financial condition of a bank, this is supported by proper backtesting and Rsquare results. Based on the results of the accuracy of the classification above, the logit model for bankruptcy has reasonably good robustness because it has an accuracy of above 80% for the non-bankrupt, bankrupt and total categories with a bank or self-liquidation.

# 5 CONCLUSION

The study was conducted using a quantitative approach with a level of descriptive and the right model used to predict bankruptcy in Indonesia is the Risk-Based Bank Rating (RBBR) model. As a predictive model, the findings of this model are expected to contribute to banks, namely by utilizing it as an early warning system for bank management. The application of this model can be known as the probability of bankruptcy as early as possible before the bank is declared legal bankruptcy. The findings of this model can also be used as alternative tools in carrying out bank supervision functions. As a prediction model for bankruptcy of commercial banks built on capital and financial risk factors, the findings of this model can be a complementary reference for depositors, investors, creditors, and the roader community in evaluating commercial banks operating to protect their interests.

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