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Research Article

Developing a Predictive Model About Bankruptcy in the Rural Areas of Indonesia

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Abstract

The purpose of this study is to develop a model for predicting bankruptcy in rural areas of Indonesia. The method used in this study uses logit. The data used is auxiliary data obtained from the World Bank publication reports during the period 2009-2018. The population used in this study is a rural bank in East Java, and the sample is based on intentional sampling. The results show that CAR, LDR, CG, NPL, OR and OBS have a significant impact on bankruptcy. NIM and CR have no major impact now. The rural banking industry needs to beware of indicators that indicate bankruptcy or bankruptcy. Banks must implement risk management and meet regulatory capital requirements to be able to resist risks and comply with bank governance rules so that rural banking businesses can generate high returns, thereby affecting resilience and resilience. its existence. This research will help identify banks that may fail in the future based on the variables discussed in this research. The ability to detect failures in the banking environment and distinguish between soundness banks and troubled banks predicts bank failures. As an early warning system, bank supervisors can use it to maintain the sustainability of the rural banking industry, but it has not yet been completed.

Keywords

Risk Bank Failure, Rural Banks, Finance, Early Warning System

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Introduction

The modern business world is in a rapidly changing competitive environment. According to the Basel Committee on Banking Supervision the global financial system has recently experienced economic turmoil. In an increasingly unstable environment, organizational systems and subsystems have become more open, competition levels have become higher and higher, and the direction of change has become more uncomfortable. To be clear, the turbulence of the financial system may cause various threats, thereby weakening the competitiveness of banks. In fact, it can even exclude you from the banking industry. In order to maintain viability in an unstable financial system, banks must be able to compete with competitive banks and other financial intermediaries that also provide financial services (Adnan & Taufiq, 2001; Altman, 2000). If a bank can provide better banking financial services than its competitors and can adapt to changes in the environment, then it is considered successful in business competition. How can bank managers turn dangerous environmental threats into multiple opportunities for profitable business? The bank's innovation and innovation management have always been committed to creating a variety of promising and profitable banking products, without forgetting the principle of asset and liability management (ALMA), which includes balancing profitability and risk. Although many rules and regulations have been enacted to keep the banks healthy, the banks are still bankrupt, especially the rural banks. Data in the last ten years from 2008 to 2018 show that the existence or existence of rural banks has declined. The role of rural banks in the Indonesian economy is very strategic. In particular, the government focuses on empowering rural banks to improve the local economy and MSME communities, and reduce unemployment, thereby reducing rural banking business to become the mainstay of the local economy. and you. In order to predict financial difficulties in banks, a system must be developed that can warn of financial problems that threaten bank operations in advance. Capital and financial risk factors play an important role in explaining bankruptcy. Benefit from an early understanding of the state of the banking industry, it is very possible for these banks to take anticipatory steps to prevent the financial crisis from being resolved immediately. This study aims to form a prediction model for rural bank bankruptcy which is used as an early warning signal for the condition of the bank prior to bankruptcy.

Literature Review

Theory Agency and Bank Bankruptcy

Agency Theory, is a concept that explains the contractual relationship between principals and agents. The principal is the party that mandates the other party, namely the agent, to carry out all activities on behalf of the principal in his capacity as a decision maker (Basel, 1999; Beaver et al., 1968; Boadi Lartey, 2016; Devi & firmansyah, 2018; Georgios et al., 2005; Govender Sharp, 2020). According to (Haq & Heaney, 2012; Hussain et al., 2020; Indrajati et al., 2020; Keyser et al., 2020), deposit-borrower (ie, bank) is one of the most important principal-agent relationships in the finance and financial services industry. All parties have rational interests that may cause problems. There are two types of problems in the principal-agent relationship (Khasanah, 2017; Mnisi & Ramoroka, 2020; Mongid, 2002), namely, unknown behavior (hidden behavior) and unknown information (hidden information). The research results of (Napitupulu et al., 2020; Nel & Masilela, 2020; Ohlson, 1980; Pettway & Sinkey, 1980) showed that the main reason for bank bankruptcy is poor management of the bank. The reason is that they have too much courage to take risks and poor supervision of fraud and theft. Sinkey (Pm & Parameswari, 2020; Puspitasari et al., 2020; Puspitasari et al., 2020; Rachmawati & Ningsih, 2018) believes that banking activities such as fraud, abuse of power, and bank crime are examples of hidden activities, while misjudgements on balance sheets and off-balance sheet accounts are examples of hidden information. When a bankruptcy signal appears, the depositor (customer) has the right to withdraw deposits from the bank (agent). Therefore, the agency relationship theory can explain the relationship between depositors and borrowers (for example, banks) and the causes of bank bankruptcy.

Profile Analysis and Prediction Distress Analysis.

In the past, bankruptcy research could not be separated from general research and disaster prediction analysis. The pioneer of profiling research was Fitz Patrick (Fitz Patrick) in 1932; Veenaco and Smith, 1935; and (Raz, 2018; Rencher, 1995; Sinkey et al., 1987; Sopandi & Sukardi, 2020). The pioneer of disaster prediction analysis research was Univariate model and multivariate model. The relationship between bankrupt companies and non-bankrupt companies. At the same time, predictive stress analysis pays more attention to the predictability of transactions on important topics such as corporate bankruptcy. The results of all these studies are based on the value and average of the company's financial indicators (used for summary analysis) and the degree of dispersion of the time before bankruptcy or bankruptcy (used for problem prediction analysis). Meanwhile, prediction distress analysis places more emphasis on the predictability of financial statement information on one important issue, such as business bankruptcy. The results of all these studies are based on the values and averages of the company's financial ratios (for profile analysis) and the extent of their dispersion (for prediction distress analysis) for some time prior to bankruptcy or failure.

An Empirical Study of Bankruptcy Predictions

uses the term bankruptcy in bankruptcy, which is a company that is legally bankrupt, either placed under trusteeship or guaranteed its right to be reorganized under the National Bankruptcy Act. Altman studied bankruptcy predictions using multivariate discriminant analysis (MDA) which developed 5 factors to predict the bankruptcy of manufacturing companies and is known as the Z-score model as a critique of the development of the previous Beaver model. The bankruptcy prediction formulated by Altman for manufacturing companies is in the form of an equation (Z = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5). These ratios relate to liquidity, profitability and company activities with a high degree of accuracy.
developed the Z-Score method by taking 66 samples of go-public companies consisting of 33 companies that experienced bankruptcy during the last 20 years and 33 companies that did not experience bankruptcy and were taken by random sampling. Altman's study results were able to obtain a prediction accuracy rate of 95% a year before bankruptcy, and a prediction accuracy rate of 72% two years before bankruptcy or failure.
In 1972, Deakin criticized Beaver's previous univariate model and refined it in the multivariate order to achieve a high degree of accuracy. introduced a new Zeta model with several new variables for finding financial difficulties. uses the term bankruptcy in bankruptcy and like previous research in bankruptcy studies, Ohlson is a pioneer in conditional probability models. The study of bankruptcy differs from other financial theories which begin with theoretical propositions, bankruptcy prediction studies have a limited theoretical framework but are driven by empirical tests and exploration of new econometric models, this is the reason so many bankruptcy studies focus on statistical models.
tried to compare the existing bankruptcy models and stated that the Altman model was the best model for bankruptcy prediction. Financial ratios are the best predictors of finding potential bankruptcy (Suharini & Baharsyah, 2020; Tomcikoval, 2020). In 2000, Altman divided the bankruptcy model formula into separate service companies (such as the banking industry) and for manufacturing companies (public and private). Based on the research results of there are four independent variables in the service company model including liquidity, profitability, productivity and solvency. A study conducted by Adnan and used the model for service companies to analyse the prediction of bankruptcy or failure in Indonesia in conventional commercial banking. The results of his research found that capital adequacy was an important factor in determining the potential for bank failure. The research on rural bankruptcy in Indonesia was conducted

Model Validation Test

Logically speaking, according to if the goal of research is to predict events, then logically speaking, we need to make empirical comparisons. For bankruptcy prediction, the estimated bankruptcy probability is a signal in the ranking of companies. I belong to a bankrupt group, but

not a bankrupt group believes that the probability of misclassification (called error rate) is used to assess the ability of classification techniques to predict group membership. The level of error can be determined using a verification test, which involves a comparison with real data to find type I and type II errors. Elsewhere, believes that a good predictive model is the one with the least error. According to hair etc. the empirical verification method is more suitable for testing regression models based on new samples from the population. The researchers divided the sample into two groups: the sub-sample design used to build the regression model and the retention/validation sub-sample used to test the regression model. According to model testing in fault prediction research usually uses classification accuracy methods for both design and verification samples.

Methodology

Research design

The first step of this research is to develop a predictive model for the dependent variable, review its validity, and then test the validity of the model based on new data (holdout samples).

Research Object and Population

The subject of this study is a rural bank in East Java, Indonesia. The region's largest rural bank is located in East Java and is expected to represent Indonesia's rural bank. The variables used include dependent and independent variables. Capital ratio, financial risk and temporary change (XT) are independent variables, while expected bank status (bankruptcy status) is the dependent variable (Y).

Operationalization of Variables and Research Data

The use of capital and financial risk indicators is based on the following reasons: (i) want to be more realistic about the quality of bank governance. (ii) In previous empirical studies, the capital ratio is an indicator that almost always leads to bank failures, and (iii) any decision of bank management may lead to many risks, which play an important role in determining bank bankruptcy.The data type used is auxiliary data in the form of the bank's monthly financial statements, which are collected regularly from January 2009 to December 2018. According to the model should be evaluated by checking the accuracy of its prediction based on design and verification. As long as the data used to check the accuracy is different from the data used to generate the classification (or prediction) function, there will be no deviation in the error rate generated Use the monthly data from January 2009 to December 2017 as the overall calculation model, and use the monthly data from January 2018 to December 2018 as the overall model verification. Banks classified as non-bankrupt are code 0, and banks classified as bankrupt are code 1. Variables are measured on a nominal scale according to unhealthy or unhealthy banking standards.

$$Ln\frac{P}{1-P} = \beta_0 + \beta_1 CAR_{it} + \beta_2 NIM_{it} + \beta_3 NPL_{it} + \beta_4 ROA_{it} + \beta_5 OR_{it} + \beta_6 CR_{it} + \beta_7 LDR_{it} + \beta_8 OBS_{it} + \beta_9 CG_{it} + \varepsilon_{it}$$

dimana:

$Ln\frac{P}{1-P}$: Probability of Bank Failure Risk
β_0 : intercept
$\beta_1 CAR_{it}$: coefficient *Capital Adequacy Ratio*
$\beta_2 NIM_{it}$: coefficient *Net Interest Margin*
$\beta_3 NPL_{it}$: coefficient *Non-Performing Loan*
$\beta_4 ROA_{it}$: coefficient *Return on Assets*
$\beta_5 OR_{it}$: coefficient Operation Ratio
$\beta_6 CR_{it}$: coefficient *Cash Ratio*
$\beta_7 LDR_{it}$: coefficient *Loan Deposit Ratio*
$\beta_8 OBS_{it}$: coefficient *Off-Balance Sheet*
$\beta_9 CG_{it}$: coefficient *Credit Growth*
ε_{it} : *error*

Table 1.
Empirical Results of Bankrupt Bank Prediction Models

Variable	Expected Sign	PM3 Coefficient	PM6	PM9	PM12
CAR	(-) negative	-0.029***	-0.024***	-0.024***	-0.025***
LDR	(+) positive	0.003***	0.012**	0.017***	0.021***
ROA	(-) negative	-0.026*	-0.021	-0.015	-0.040*
CG	(-) negative	-0.718***	-0.730***	-0.707***	-0.687***
NIM	(-) negative	-0.003	-0.002	-0.001	-0.001
NPL	(+) positive	0.168***	0.182***	0.181***	0.180***
OR	(+) positive	0.020**	0.028***	0.034***	0.027***
CR	(-) negative	-0.006	-0.006	-0.005	-0.001
OBS	(-) negative	-0.045***	-0.049***	-0.006***	-0.010***
C		-0.751**	-2.632**	-3.748***	-3.685***
Specification cut-off point		0.7699	0.7703	0.7734	0.7763
McFadden R^2		0.9203	0.902	0.902	0.8872
AIC		0.221	0.233	0.235	0.2254
SIC		0.212	0.230	0.233	0.2291
% Correct		98.86	97.12	97.19	96.96
% Incorrect		1.14	2.88	2.81	3.04
Data Bank		1736	3505	5332	6797
Goodness of Fit (α= 1%)		Fit	Fit	Fit	Fit
Validity test					
Data Bank		597	1194	2383	2383
Correct Estimates		94.14	93.63	93.45	93.6
Error Type I (%)		5.88	5.99	6.38	6.02
Error Type II (%)		5.55	11.84	8.75	11.87

***) Significant at the 1percent level.

**) Significant at the 5 percent level.

*) Significant at the 10 percent level.

Result and Discussion

The forecasting model is built based on the financial risk index of the bank 3 months, 6 months, 9 months and 12 months before bankruptcy. The reason for choosing the timing is the uniqueness of the banking business, which emphasizes trust. When a bank loses public trust, its customers will leave the bank, depositors will withdraw their deposits, lenders will cut/suspend lending, and investors will refuse to invest, which puts the bank at risk of bankruptcy. It may happen at any time. Today's bank may be healthy. However, due to the speculation caused by negative sentiment, market confidence has fallen. Therefore, the bank went bankrupt the next day and needed tools that could issue warning signals to the state before bankruptcy. name. The results of the empirical study show that the closer the bankruptcy time is, the lower the bank's cationic bankruptcy classification (bankruptcy-bankruptcy). Conducted empirical research: Model construction: the forecast model for the 3 months before bankruptcy, abbreviated as PM3, the forecast model for the 6 months before bankruptcy, abbreviated as PM6, the forecast model for 9 months before bankruptcy, abbreviated as PM9, the forecast model for 12 months before bankruptcy, Abbreviated as PM12.

The modeling of each prediction model goes through the following stages: a) factor analysis, b) creation of a bankruptcy prediction model, c) goodness of fit criterion, d) limit point specification, e) model verification. In the training and verification phase, the samples used for simulation and the samples used for verification are separated. According to the model should be evaluated by comparing the design sample and the test sample to check the accuracy of its prediction. The accuracy of the verification is different from the data used to generate the classification (or prediction) function, and the resulting error rate is unbiased in this study, a group in the sample was used to evaluate a model with data from 2009 to 2017. The model included a bankruptcy sample (bankruptcy bank) and a bankruptcy sample (physical bank) and a bankruptcy sample with 2018 data. The verification model, that is, among the four models (PM3, PM6, PM9 and PM12) successfully constructed by H. in Table 1, the correct value of PM3 is higher (98.86%), so PM3 is most suitable for predicting bankruptcy rather than bankruptcy Model. Then the other three predictive models (97.12%, 97.19% and 96.96%). At the model verification level, based on the verification sample the error types are compared, so that the error types in PM3 are lower than the error types in PM6, PM9 or PM12 (range 5%). The statement stated that PM3 is a better predictive model than PM6, PM9 and PM12, which makes PM3 suitable as a predictive model for the failure of rural banks in Indonesia.

Conclusion

This study confirms that rural banks need to improve their business management strategies, including those related to credit growth (CG) in carrying out their intermediation function and business efficiency. Rural banks need to optimize efficiency (OR) and avoid bad credit (NPL) as well as pay attention to OBS transactions in improving rural bank performance. Rural banks, which are the main source of support for Small and Medium Enterprises (SMEs), need to be able to survive in the competitive banking industry through the application of prudential principles and fulfillment of sound banking principles. This study is useful for rural banks to pay attention to the inherent risks examined in this research and to optimize their role in improving the local economy and MSMEs. Future studies may use different methodologies, variables, data or proxies.

References

Adnan, M. A., & Taufiq, M. I. (2001). Analysis of the accuracy of the prediction of the altman method on the occurrence of liquidation in banking institutions [the case of banking liquidation in Indonesia. Indonesian Journal of Accounting and Auditing, 5 (2), 181-203.

Altman, E. I. (2000). Predicting financial distress of companies: Revisiting the Z-score and Zeta Models. *Journal of Banking and Finance*.

Basel Committee. (1999). A new capital adequacy framework. consultative paper issued by the Basel Committee on Banking Supervision (BCBS), Basel, Switzerland.

Beaver, W. H., Kennelly, J. W., & Voss, W. M. (1968). Predictive ability as a criterion for the evaluation of accounting data. The Accounting Review, 43(4), 675-683.

Boadi, E. K., Li, Y., & Lartey, V. C. (2016). Role of Bank Specific, Macroeconomic and Risk Determinants of Banks Profitability: Empirical Evidence from Ghana's Rural Banking Industry. *International journal of economics and financial Issues*, *6*(2), 813-823.

Devi, A., & Firmansyah, I. (2018). Solution to overcome the bankruptcy potential of islamic rural bank in Indonesia. Journal of Islamic Monetary Economics and Finance, 3, 25-44.

Georgios, K., Kalliopi, K., & Kalliopi, M. (2005). The Edward I. Altman's Model of Bankruptcy and the Implementation of it on the Greek Cooperative Banks. In Proceedings of the 9th Annual MIBES International Conference, Cambridge, MA, USA, 14-18.

Govender, C. N., & Sharp, K. L. (2020). An Investigation into The Use of The Customer Relationship Management Tooling System of Ibm South Africa.

Haq, M., & Heaney, R. (2012). Factors Determining European Bank Risk. *Journal of International Financial Markets, Institutions and Money*, *22*(4), 696-718.

Hussain, H.I., Kamarudin, F., Mohamad Anwar, N.A., Nassir, A.M., Sufian, F., Mang Tan, K. (2020), Impact of Country's Governance Dimensions on Bank Revenue Efficiency: Overview on Middle East, Southeast Asia, and South Asia Countries, *Transformations in Business & Economics*, 19 (1), 191-228.

Indrajati, V., Yuvita, Y., Putri, N. A., Rismawati, F. O., & Puspitasari, D. M. (2020). Determinants of Financial Distress Rural Bank in Indonesia: A Logit Approach. *Solid State Technology*, *63*(3), 5069-5075.

Keyser, E., Adeoluwa, A. S., & Fourie, R. (2020). Time Pressure, Life Satisfaction and Absenteeism of Employees of Shift Work Within the Mining Industry in South Africa. The International Journal of Social Sciences and Humanity Studies, 12(2), 255-272.

Khasanah, N. (2017). Analysis of the Influence of the Ratio of CAR, NPF, FDR, BOPO on Profit Growth in Sharia Banking Companies in Indonesia in 2013-2015.

Mnisi, P., & Ramoroka, T. (2020). Sustainable Community Development: A Review on The Socio-Economic Status of Communities Practicing Ecotourism in South Africa. International Journal of Economics and Finance, 12(2), 505-519.

Mongid, A. (2002). Accounting Data and Bank Future Failure: A Model for Indonesia. The Indonesian Journal of Accounting Research, 5(1).

Napitupulu, S., Primiana, I., Nidar, S. R., Effendy, N., & Puspitasari, D. M. (2020). The effect of management capabilities in implementing good corporate governance: A study from Indonesia banking sector. *The Journal of Asian Finance, Economics, and Business*, *7*(1), 159-165.

Nel, D., & Masilela, L. (2020). Open Governance for Improved Service Delivery Innovation in South Africa. International Journal of eBusiness and eGovernment Studies, 12(1), 33-47.

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. Journal of accounting research, 109-131.

Pettway, R. H., & Sinkey, J. F. (1980). Establishing on-site bank examination priorities: An early-warning system using accounting and market information. The Journal of Finance, 35(1), 137-150.

PM, A. S., & Parameswari, J. (2020). Development and Validation of Gender Stereotype Scale. Journal of the Indian Academy of Applied Psychology, 46(1), 48-56.

Puspitasari, D. M., Febrian, E., Anwar, M., Sudarsono, R., & Napitupulu, S. (2020). An Empirical Study on Influence of Specific Bank's Variable and Macroeconomics on Bank's Default Risk: The Case of Foreign Exchange Banks in Indonesia. *International Journal of Psychosocial Rehabilitation*, *24*(2).

Puspitasari, D. M., Febrian, E., Anwar, M., Sudarsono, R., & Roespinoedji, D. (2020). Off-Balance Sheet Activities and Assessment on Tend To Default Bank Risk: Evidence From Rural Bank In Indonesia. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *17*(10), 1462-1470.

Puspitasari, D. M., Roespinoedji, D., & Napitupulu, S. (2020). Applicability of Altman Model in Predicting Financial Distress: Evidence from Rural Bank in Indonesia. Solid State Technology, 63(3), 3064-3069.

Rachmawati, L., & Ningsih, W. F. (2018). Financial Ratio Analysis as an Indicator of Bankruptcy Prediction in Sharia People's Financing Banks in East Java. JABE (Journal of Applied Business and Economic), 5 (1), 1-17.

Raz, A. F. (2018). Risk and capital in Indonesian large banks. *Journal of Financial Economic Policy*, *10*(1), 165-184.

Rencher, A. C. (1995). Methods of multivariate analysis, John Wiley & Son. Inc. Publication, Canada, 2, 380-407.

Sinkey Jr, J. F., Terza, J. V., & Dince, R. R. (1987). A zeta analysis of failed commercial banks. Quarterly Journal of Business and Economics, 35-49.

Sopandi, W., & Sukardi, R. R. (2020). Using Four-Tier Diagnostic Tests to Understand the Conceptions Held by Pre-Service Primary School Teachers about Sea Pollutant Migration. Review of International Geographical Education Online, 10(2), 13-29.

Suharini, E., & Baharsyah, M. N. (2020). Learning About Landslide Disaster Mitigation Based on a Role-Playing Method Assisted by the Disaster Education Pocket Book. Review of International Geographical Education Online, 10(4), 618-638.

TOMČÍKOVÁ, I. (2020). Implementation of Inquiry-Based Education in Geography Teaching-Findings about Teachers Attitudes. Review of International Geographical Education Online, 10(4), 533-548.