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MARKETING INTERNATIONAL SEMINARS AND THE 4th INTERNATIONAL CONFERENCE ON BUSINESS AND BANKING INNOVATIONS

Surabaya, 29th January 2022

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Proceeding Book of The 4th International Conference on Business and Banking Innovations (ICOBBI) 2022
"The Strategy of Digitalization in Business for Gaining Competitive Advantages after Pandemic"

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FOREWORD

Alhamdulillah, praise be to Allah Subhanahu Wa Ta'ala for granting us the opportunity to organize and publish the proceedings of the 4th International Conference on Business and Banking Innovations (ICOBBI) with the topic "The Strategy of Digitalization in Business for Gaining Competitive Advantages after Pandemic". This proceeding contains several researches articles from many fields in Business & Marketing, Banking & Sharia Banking, Accounting & Financial Management, Human Resources Management, Operations Management, Investasi, Insurance & Capital Market, Strategic Management, Technology Management, and Information System.

The 4th International Conference on Business and Banking Innovations was held on 29th January 2022 by virtual (online) zoom meeting and organized by the Master Management Study Program of Universitas Hayam Wuruk Perbanas in Collaboration with five Higher Education Institutions in Indonesia and three Universities from Asia countries. Keynote speakers in this conference were: Chonlatis Darawong, P.hD (Sripatum University, Thailand), Associate Prof. Dr. Ellisha Nasrudin (University of Science, Malaysia), Dr. Sanju Kumar Singh (Postdoctoral Fellowship in Universitas Airlangga, Tribhuvan University Nepal) and Prof. Dr. Abdul Mongid, MA., P.hD (Universitas Hayam Wuruk Perbanas, Indonesia).

I would like to give high appreciation to the Rector of Universitas Hayam Wuruk Perbanas for his support at this event. Acknowledgments and thank you to all the steering and organizing committees of the ICOBBI for the extra ordinary effort during the conference until this proceeding published. Thank you very much to all presenter and delegates from various Universities. Beside it, I would like to express our gratitude to the three universities, namely Universitas 17 Agustus Surabaya, STIE YKPN Yogyakarta, Universitas Negeri Gorontalo, Universitas Surabaya and Universitas Muhammadiyah Surakarta which has been the co-host of this event.

Hopefully, the proceeding will become a reference for academics and practitioners, especially the business and banking industry to get benefit from the various results of the research field of Business and Banking associated with Information Technology. Proceedings also can be accessed online on the website http://eprints.perbanas.ac.id/

Chair of the Master Management Study Program
Universitas Hayam Wuruk Perbanas

Prof. Dr. Tatik Suryani, M.M.

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Stress Test of Financing Quality at Islamic Rural Bank in Indonesia
Using Montecarlo Simulation

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ABSTRACT

This study aims to examine the effect of financing growth, GDP growth, inflation, interest rate and exchange rate on financing quality (Non performing Financing) with the stress test of financing quality at Islamic rural Bank in Indonesia using montecarlo simulation. The data used are quantitative time series for the monthly period per January 2010 - March 2020, taken from the web of Bank Indonesia (BI) and the Otoritas Jasa Keuangan (OJK). The tests used are Error Correction Model (ECM) regression and Stress Test. The regression results show that GDP growth, inflation and exchange rate have significant effect on the Non performing Financing (NPF) in the long term, while interest rate has significant effect on the NPF in the short term. The financing growth has no significant effect on the NPF in both the long and short term. Stress test results show that Islamic rural Bank has a high probability of default with forcasting NPF max.is 10.91%, difference NPF max. is 0,33 % and certainty level is 95%. The bank must pay attention to the factors that affect NPF especially exchage rate which has strong effect and try to anticipate the high probability of default with sufficent capital to cover losses.

Keywords: *Sress Test, Montecarlo Simulation, Non Performing Financng, Error Correction Model*

1. BACKGROUND

The stability of Islamic rural bank or called Bank Pembiayaan Rakyat Syariah (BPRS) system as one of the financial intermediary institutions has an important value in supporting the community's economy in the real sector. The stalling of bank functions can disrupt the smooth economy of the community, especially for the micro small and medium enterprise or called Usaha Mikro Kecil dan Menengah (UMKM) group which is the largest financing object for islamic rural bank in Indonesia.

Financing is a term used in Islamic banks, as in conventional banks it is called credit (lending). Financing means the provision of funds and/or claims based on mudharabah and/or musyarakah contracts and/or other financing based on profit-sharing principles (Bank Indonesia Regulation No. 5/7/PBI/2003). Islamic rural bank (BPRS) which in one business function is to channel financing, are at risk of being affected by financing risks. Financing risk or credit risk in conventional terms is defined as the risk arising from the failure of the customer or other party to fulfill their obligations to the bank, resulting in poor financing quality.

There are 5 levels of financing quality including current, special mention, substandard, doubtful, and loss (SK.Dirut BI No.30/267/KEP/DIR). The non-current financing consists of substandard, doubtful, and non-performing financing quality. An increase in the number of non-current financing or non-performing financing has an impact on increasing the value of the Non-Performing Financing (NPF) ratio.

Non Performing Financing (NPF) is the ratio between the total non-current category of financing provided and the total financing provided. The safe limit for the NPF ratio of BPRS based on Bank Indonesia Circular Number 9/29/PBI/DPbs of 2007 concerning Assessment of the Soundness of Rural Banks Based on Sharia Principles (TKS-BPRS) is 7%.

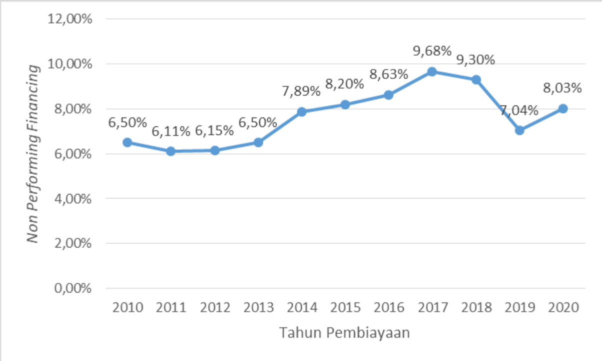

Figure 1. NPF of BPRS in Indonesia 2010-2020

The high non-performing financing (NPF) of the BPRS with an average NPF of 8.54 % and a high NPF of 11.8 % in July 2018 indicates the the high level of problematic financing experienced by the BPRS. This can have a negative impact on the health of the BPRS, because it will result in a larger reserve for bank losses, the impact on bank operating profit will be lower, and the formation of additional bank capital will be low. For Third Party Fund (DPK) customers, this has an impact on lower profit sharing so that customers have the potential to move to other banks or to other more profitable investments. Yulianto and Solikhah (2016) stated that if the NPF ratio of a bank increases, there will be a decrease in the number of deposits that can be collected from customers. People's desire to save or put their funds in Islamic banks will decrease for fear that the stored funds cannot be returned by the bank or only get a small profit share. If it drags on and is not handled properly, then the high NPF ratio can have a negative impact on the bank's collapse (bankruptcy).

The factors that affect financing or non-performing loans in banking can generally be sourced from internal factors and external factors. Internal factors are caused by banking operational activities themselves including financing growth and external factors are caused by macroeconomics such as economic growth, inflation, interest rate, exchange rate, etc. (Auliani, 2016).

Previous studies do not appear to show consistency in disclosing the factors that affect the quality of financing which is proxied by Non Performing Financing/Loan (NPF/L). Karmila (2017) and Saputro (2019) reveal that credit growth has a positive effect on NPL, in contrast to Harahap (2017) who reveals that credit growth has a negative effect on NPL. The GDP growth variable according to Novi (2016) has a positive effect on NPF, in contrast to Endah (2016) and Indra (2018) which reveal that GDP has a negative effect on NPF, while Wanri (2020), Dewi (2020), and Romadhoni (2017) revealed that GDP has no effect on NPF. Inflation according to Wanri (2020), Indra (2018) has a positive effect on NPF while according to Romadhoni (2017), Dewi (2020) and Rindang (2019) inflation has no effect on NPF of BPRS. Interest rates according to Indra (2018), Rindang (2019) and Marwan (2019) have a positive effect on NPF/NPL, in contrast to Putri (2016) who revealed that interest rates have a negative effect on NPF, while according to Wanri (2020) interest rates have no effect against NPF. The exchange rate according to Romadhoni (2017) has a positive effect on NPF while according to Endah (2016) and Sherly (2019) the exchange rate has no effect on NPF. Seeing the inconsistent findings, the author is interested in conducting further studies related to the factors that affect the Non Performing Financing (NPF) with the stress test of financing quality at Islamic rural Bank in Indonesia, considering that the authors have not found any research related that the author meant in previous studies

2. OBJECTIVES

This study aims to examine the effect of financing growth, GDP growth, inflation, interest rate and exchange rate on financing quality (Non performing Financing) with the stress test of financing quality at Islamic rural Bank in Indonesia using montecarlo simulation.

3. THEORITICAL REVIEW

This study uses several related theoretical foundations as an analytical tool in answering the intended problem formulation, so that logical and scientific conclusions are expected to be reached.

3.1. Islamic Rural Bank

Islamic Bank is a bank that carries out business activities based on sharia principles, or Islamic legal principles regulated in the fatwa of the Indonesian Ulema Council such as the principles of justice and balance ('adl wa tawazun), benefit (maslahah), universalism (natural), and does not contain gharar, maysir, usury, injustice and unlawful objects (Hasan, 2009). Islamic banks consist of Commercial Banks and Islamic rural bank or called Bank Pembiayaan Rakyat Syariah (BPRS), with the main difference that BPRS are prohibited from accepting deposits in the form of demand deposits and participating in payment system traffic (UU No. 21. of 2008).

3.2. Business cycle Theory

Business cycle theory explains that naturally the economic condition will experience a phase of economic improvement (expansion) and will experience a phase of economic decline (contraction) and the two phases will repeat alternately in a certain period. Abel and Bernanke (2001) divide the business cycle indicators as follows:

a. Procyclical Indicator, indicators that move in the direction of the movement in the business cycle
b. Countercyclical Indicator, indicators that move against the business cycle both during contraction and contraction
c. Acyclical Indicator, indicators that move without a clear relationship to the business cycle

2.3. Financing Quality

Financing is the provision of funds and/or claims based on mudharabah and/or musyarakah contracts and/or other financing based on profit-sharing principles (Bank Indonesia Regulation No. 5/7/PBI/2003). financing has the potential to be a source of risk if the distribution is not accompanied by the prudent principle. There are 5 classifications of financing quality : current, special attention, substandard, doubtful, and loss.

Non Performing Financing (NPF) is the ratio between the number of non-performing financing and the total financing provided. The number of non-performing loans is the amount of financing classified as Substandard, Doubtful, and Loss Collectibility.

$$NPF = \frac{Non\ Performing\ Financing}{Total\ Financing} x100\% \quad (1)$$

The safe limit for the BPRS NPF ratio is 7% (SEBI No. 9/29/PBI/DPbs of 2007). The assessment of the soundness of the Islamic Rural Bank based on the Non-performing Financing Ratio (SEOJK.03/2019) includes :

Level	Non Performing Financing (NPF)
1	NPF ≤ 7%
2	7% < NPF ≤ 10%
3	10% < NPF ≤ 13%
4	13% < NPF ≤ 16%
5	NPF > 16%

Table 1. Level of NPF at BPRS in Indonesia

3.4. Financing Growth

Financing Growth or credit growth shows an increase or decrease in the total amount of financing over time (usually ini the form of a percentage). Financing growth is measured by the formula :

$$FNCGt = \frac{Financing_t - Fiannc ing_{t-1}}{Financing_{t-1}} \text{ x } 100\% \quad (2)$$

The growth of financing has the potential to increase the opportunity for banks to obtain credit income, thereby potentially reducing the NPL ratio. This is in line with Harahap (2017) who revealed that credit growth has a negative effect on Non-Performing Finance, in contrast to Karmila (2017), Saputro (2019) and Keeton (1999) in Ghosh (2015) which reveals that the faster credit growth will have implications for increased credit losses, due to loose credit standards so that many debtors are incompetent and bring bad credit problems to banks

H1 : Financing growth has a significant effect on financing quality

3.5. GDP Growth

Gross Domestic Product (GDP) is a macro variable that is often used to indicate economic growth, GDP is the market value of the total of all goods and services produced by a country at a certain time. GDP growth is measured by the formula

$$GDP_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \text{ x } 100\% \quad (3)$$

GDP growth shows an increase in individual and company income, therefore the ability to pay debts (credit) increases so that it has the potential to reduce NPF (Ahmad & Bashir, 2013). in contrast to Novi (2016) and Alfaro (2015) which reveal that GDP growth which also shows economic growth can provide high expectations for banks in assessing the ability to pay customers so that banks are less careful in distributing loans or financing provided so that it has the potential to increase NPF.

H2 : GDP growth has a significant effect on financing quality

3.6. Inflation

Inflation is the process of increasing the price of goods continuously which has an impact on the decline in people's purchasing power because in real terms the level of income also decreases with the assumption that the income level of the community is constant (Mankiw, 2013). Inflation is measured by the Consumer Price Index (CPI) with the formula ;

$$Inflation = \frac{IHK_t - IHK_{t-1}}{IHK_{t-1}} \text{ x } 100\% \quad (4)$$

High inflation can have a negative impact on the decline in people's purchasing power and ability to pay debts so that it has the potential to worsen the quality of bank financing (Taswan, 2006), as revealed by Indra (2018), Wanri (2020) that inflation has a positive effect on NPF. This is different from Andreani (2016) and Klin (2013) which reveal that the real value of debt payments tends to decrease with higher inflation, thereby reducing NPLs

H3 : Inflation has a significant effect on the quality of financing.

3-7. Interest Rate

Interest rates are fees for services provided by banks based on conventional principles to customers who buy or sell their products (Kasmir, 2011). Islamic banks use market interest rates such as LIBOR, SIBOR or Jibor as a benchmark in their financing operations (Veitzhal Rivai, 2013: 248). Chong & Liu (2010) confirmed that Islamic banking was not free of interest but it is still an interest-based banking.

When interest rates rise, the competitiveness of Islamic banks increases with the profit/loss sharing ratio of Islamic banks being able to compete with the increasing interest rates of conventional bank loans. this causes people to tend to choose to borrow or finance at Islamic banks whose cost of funds is considered lower (Kasmir, 2011) thus causing financing at Islamic banks to be higher and affect the larger NPF ratio. This is in line with Indra (2018), Rindang (2019) and Marwan (2019) which reveal that interest rates have a positive effect on NPF/NPL. in contrast to Putri (2016) who revealed that interest rates have a negative effect on NPF, because the increase in interest rates results in people being reluctant to borrow funds from banks, thereby reducing non-performing financing due to low demand for financing.

H4 : Interest rate has a significant effect on the quality of financing

3.8. Exchange Rate

Exchange rate is the price of one currency in another country's currency (Sukirno, 2002:358). he Nominal Exchange Rate is the relative price of the currencies of two countries. The real exchange rate is the relative price of goods between two countries. The exchange rate of a country is very closely related to exports if the real exchange rate is low then domestic goods will be cheaper than foreign goods, so that it will increase exports (Mankiw, 2006: 131).

When the currency weakens, the cost of production increases, especially related to imports. The increase in production costs has an effect on decreasing the income of entrepreneurs and decreasing the ability to pay debts so that it has the potential to increase the NPF. as revealed by Indra (2018) that the depreciation of the exchange rate contributed to the increase in NPL and NPF, On the other hand, an increase in the exchange rate has an impact on benefiting export entrepreneurs (exporters) because the price of domestic goods increases, so that entrepreneurs earn more income and the ability to pay debts increases, resulting in a decrease in bank NPF, as Widyaningsih (2021) states that the exchange rate has a negative effect on NPL

H5 : exchange rate has a significant effect on financing quality

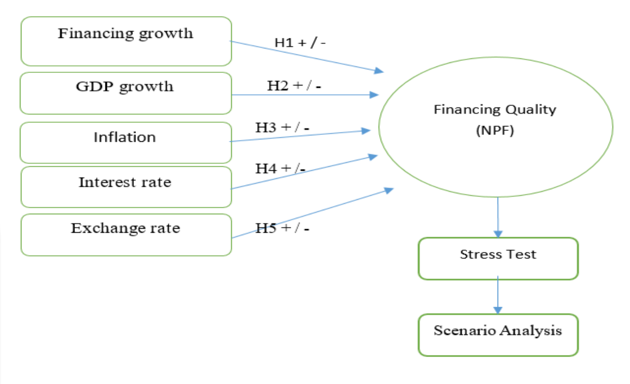

Figure 2. Conceptual Framework

After the estimation results of the NPF equation are obtained, stress tests will be carried out based on variables including Financing growth, GDP growth, interest rates, inflation rates, and currency exchange rates.

3-9. Stress Test

Stress test is a method to assess the level of resilience and soundness of banks when faced with crisis conditions that originate from extreme shocks, either externally or internally. A stress test helps the authority and management to develop the knowledge in risk assessment proccess, and improve understanding and perception of risks (BCBS, 2009).

We simplify the test using financing risk only. as measured by the ratio of non-performing financing which also shows the probability of default. Quagliariello (2009: 237) reveals that external shocks originating from macroeconomics can have an effect on giving stress to the probability of default (PD), and Expected Loss (EL) with hypotheses on Loss Given Default (LGD) and Exposure at Default (EAD), which have an impact on bank’s profit and capital.

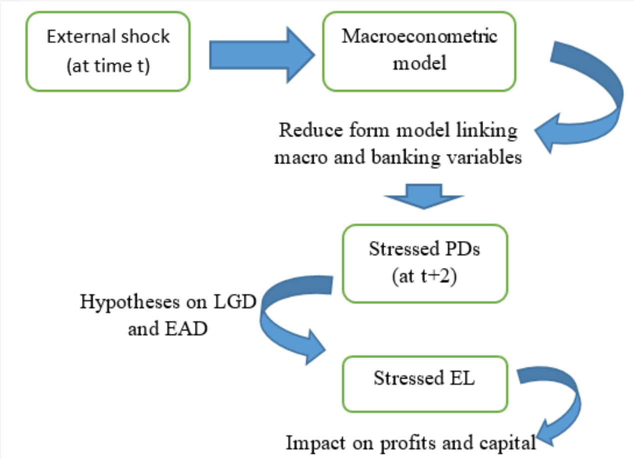

Figure 3. Bank Stress Test

The probability of default (PD) is the probability that the debtor will default on his obligations to the creditor. The probability of default is measured using the ratio of Non Performing Loans (NPL) or Non Performing Financing (NPF), adopting the default risk model from Ong (1999: 63) which assumes that default risk is a company's uncertainty in terms of its ability to fulfill all obligations to debtors and obligators.

Expected Loss (EL) is the amount of loss that is expected as a result of default (default). Exposure at Default (EAD) is an estimate of the amount of loss that may be faced by a bank when a default occurs. Loss Given Default (LGD) is the portion of bank losses that cannot be returned to the bank due to a default, after taking into account the collateral provided by the debtor as a substitute for the debtor's obligations (Hibbeln, 2010).

3-10. Montecarlo Simulation

Montecarlo simulation, which is one of the quantitative risk assessment techniques that can be used by various organizations in the risk management process, especially in the stages of risk analysis and/or risk evaluation that has a random variable phenomenon involving a probability distribution of the data variables collected based on past data and theoretical probability distributions.

During a Monte Carlo simulation, values are drawn randomly from the input probability distribution. Each set of samples is called an iteration, and the results resulting from those samples are recorded. A Monte Carlo simulation does this hundreds or thousands of times, and the result is a distribution of possible outcomes. In this way, the Monte Carlo simulation provides a much more comprehensive view of what might happen and even how likely it is

4. METHOD

The population in this study is Islamic banks in Indonesia registered with the OJK and summarized in the consolidated data of islamic banks in Indonesia, with a sample of islamic rural banks or called Bank Pembiayaan Rakyat Syariah (BPRS), operating from January 2010 to March 2020. The data used are monthly time series data on financing growth (FNCG), inflation (INFL), interest rates (JIBOR), exchange rates (LKURS) and Non-Performing Financing (NPF), while GDP growth data refers to quarterly data for the period January 2010 – March 2020. Data is taken from data documentation officially released by the websites of Bank Indonesia (BI) and the Otoritas Jasa Keuangan (OJK).

The tests used in this study include descriptive analysis, Error Correction Model (ECM) regression, Classical Assumption test, hypothesis test and Stress test using Montecarlo Simulation..

3.1.. Descriptive Analysis

Descriptive analysis aims to describe the data so that it is clearer, relevant, and easy to understand. includes standard deviation, mean, minimum, maximum etc. of each variable studied

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3.2. Error Correction Model (ECM)

Error Correction Model (ECM) is a regression technique for correcting short-term imbalances towards long-term balance, related to the aim of explaining the effect of financing growth, GDP growth, inflation, interest rates and exchange rates (exchnge rates) on the quality fianncing (NPF) of BPRS in Indonesia.

The stages and criteria in carrying out the ECM method such as stationarity test, degree of integration test and cointegration test were carried out using the statistical application of Eviews 0.8.

3.2.1. Stasionary test

The stationary of the data shows a tendency for the distribution of research data to approach the average value so that the variance of the data tends to be constant. Stationary test is important to do to avoid lancing regression (false) which results in unreliable interpretation results.

The Phillips-Perron test (PPTest) is a standard procedure for the stationarity test. This study uses the PP test at a significance level of 5% with the criteria that if the probability value is less than the critical value of 5% then the data is stationary, otherwise if the probability value is greater than the critical value of 5%, the data is not stationary.

3.2.2. Degree of Integration test

The degree of integration test is a continuation of the unit root test and is only needed if all the data is not stationary at degree zero or 1 (0). The degree of integration test is used to determine to what degree the data will be stationary. This test is also carried out with PP test with a significance level of 5% until the resulting data is stationary.

3.2.3. Cointegration test

Cointegration is a long-term relationship between variables which although individually are not stationary, but the linear combination between these variables can be stationary.

The cointegration test used is the Johansen Cointegration test. If the trace statistic value is greater than the critical value and the probability value is less than the critical value 0.05, it can be concluded that there is a cointegration relationship between variables.

3.2.3. ECM Model estimation

Error correction model (ECM) is an econometric model used to find short-term and long-term regression equations.

The ECM (short term equation) estimation is :

D(NPF) = α + β1 D(FNCG) + β2 D(GDP) + β3 D(INFL)+ β4 D(JIBOR)+ β5 D(LKURS) + β6 ECT(-1) + ε (5)

The long-term equation estimation is:

NPF = α+ β1 FNCG + β2 GDP + β5 INFL+ β4 JIBOR+ β5 LKURS+ ε (6)

Description :

NPF	= Non Performing Financing
FNCG	= Financing growth
GDP	= GDP growth
INFL	= inflation
JIBOR	= interest rate
LKURS	= exchange rate
ECT	= Error Correction Term
D	= Difference
α	= Constanta
β1,2,3…dst.	= coefficient
ε	= Error term

ECM estimates are valid if the cointegrated variables are supported by significant ECT coefficient values (ECT coefficient <1) and negative. If the ECT coefficient is positive, then the direction of the variables used will be further away from the long-term balance so that the ECM model cannot be used (Rahnutami, 2011: 6)..

3.3. Classic Assumption test

The regression model is good if it meets the classical assumptions including multicollinearity, autocorrelation, and heteroscedasticity, so that it is the Best Linear Unbias Estimator (BLUE).

3.4. Hypothesis test

The hypothesis test aims to prove the truth of the hypothesis, adjusted to the results of existing research

3.4.1. F-test

The F test aims to test whether the independent variables jointly affect the dependent variable (Imam, 2011:98). This study examines the effect of financing growth variables (FNCG), GDP growth (GDP), inflation (INFL), interest rate (JIBOR), and exchange rate (LKURS) together on financing quality (NPF).

if the value of prob (F-statistic) < 0.05 means that the independent variables jointly affect the dependent variable and the regression model is fit, on the other hand if the value of prob (F-statistic) > 0.05 means that the independent variables jointly have no effect significant to the dependent variable and the regression model is not fit.

3.4.2. T-test

The t-test shows how far the influence of the independent variables individually in explaining the variation of the dependent variable (Imam, 2011:98). This study examines the effect of financing growth variables (FNCG), GDP growth (GDP), inflation (INFL), interest rates (JIBOR), and exchange rates (LKURS) individually on financing quality (NPF).

If the probability value < 0.05 (significance level 5%) indicates that there is a significant effect between the independent variables on the dependent variable. On the other hand, if the probability value is > 0.05 (significance level 5%) it shows that there is no significant effect between the independent variables on the dependent variable.

3.5. Stress Test using Montecarlo Simulation

Stress tests with Montecarlo simulation were used to predict the value of Non-Performing Financing at Islamic Rural Banks (BPRS) in Indonesia with several stages including:

1. Determine the best equation model
   This simulation uses previously tested equations as (5) and (6)
2. Determine the coefficients, variable values, standard errors and data distribution assumptions to be used in the simulation
   In this simulation, the data distribution is assumed to be normal

Table 2. Assumption of Simulation

Long term				
Variabel	coefficient	Data		Distribution
		Mean	Std.error	
C	-55,56			
FNCG	-0,02	1,57	1,35	Normal
GDP	0,28	4,65	1,91	
INFL	-0,12	4,66	1,66	
JIBOR	-0,11	5,20	0,88	
LKURS	6,83	9,37	0,19	
Short term				
Variabel	coefficient	Data		Distribution
		Mean	Std.error	
C	- 0.010396			
D(FNCG)	0,02	0,02	1,63501	Normal
D(GDP)	0,06	-0,02	1,08393	
D(INFL)	-0,05	-0,01	0,56718	
D(JIBOR)	-0,23	-0,02	0,39531	
D(LKURS)	3,68	0,00	0,01886	
ECT(-1)	-0,16	-8.41E-15	0,79143	

3. Incorporate into the monte carlo simulation
   The simulation in this study was carried out to predict the value of Non Performing Financing (NPF) based on the intended equation model formula, using Crystal Ball software by Oracle.
4. Set the number of experiments
   The simulation in this study used 500,000 trials with a 95% confidence level.
5. Carry out simulations and download simulation results

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