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IMPACT OF DERIVATIVES AND STRUCTURED PRODUCTS ON RISK AND PROFITABILITY IN INDONESIA BANKING COMPANIES

Saur Costanius Simamora[1], Ryando[2], Toni Heryana[3]

[12]Dirgantara Marsekal Suryadarma University, [13]Universitas Pendidikan Indonesia

*Email : saur@unsurya.ac.id [*1], saurcsimamora@upi.edu [1], ryando83@gmail.com[2],toniheryana@upi.edu[3]*

ABSTRACT

In this study, the primary purpose is to know the impact of derivatives and structure products on the risk and profitability of banking companies listed for the data period from 2017 to 2022 using logistic regression analysis techniques. The factors examined in this study are ROA (return on assets), the logarithm of the fair value of the bank's financial derivatives-structure products, the logarithm of bank product structure, the natural logarithm of the bank's total assets, non-performing loans, Loan Deposit Ratio, the debt - asset ratios, and the debt-equity ratio.

The impact of using derivatives and structure products in this study will be measured in 2 regression equations. The research results on the first equation, the debt ratio, loan-to-deposit ratio, and derivatives-structure products, positively correlate with profitability proxied by return on assets (ROA). For total assets negatively correlated with profitability (ROA). In terms of profitability, conventional banks' use of financial derivatives-structure products positively affects profitability. For the second equation, profitability, debt to assets, loans to deposits, and derivatives-structure products are positively correlated. In contrast, debt to equity and total assets are negatively correlated with the level of risk proxied by non-performing loans. The results show that risk prevention, financial derivatives, and structure products can help hedge risks for conventional banks in Indonesia.

Keywords: banks, derivatives, structured product, risk, profitability

1. INTRODUCTION

The Asian Financial Crisis in 1997 demonstrated the importance of banks practicing efficient risk management to ensure survival in an uncertain business climate. Banking operations are particularly affected by fluctuations in interest rates, which cause financial imbalances. As a result, banks are now required to implement an effective management structure incorporating risk management efficiency measures that help reduce their various risks (Zakaria, 2017).

The era of globalization has indirectly changed the way companies do business from a traditional market to a free global market. This ultimately forces companies to develop creative strategies to survive. Previously, companies only had to think about local competitors. At the same time, many other elements must be considered due to the openness

of international markets, which change dynamically and rapidly, including currency and interest rates, as part of financial risk (Fitria, 2018)

One way to manage financial risk in the global market is with derivative transactions. According to Bank Indonesia regulation Number 23/10/PBI/2021 concerning the Money Market, Derivative Transactions are transactions based on a contract or payment agreement whose value is derived from the value of the underlying instruments such as interest rates, exchange rates, commodities, equities, and indexes. Followed by movement or without movement of funds or instruments, but not including Credit Derivatives. Derivatives can bring substantial economic benefits. Derivative instruments assist economic agents in improving credit and market risk management. They also drive financial innovation and development, increasing the market's resilience to shocks.

Derivative products also play an essential role in economic activity by enabling and helping businesses and investors to better manage the risks they face and to more effectively align their exposures with risk tolerance and risk management requirements. Derivatives markets also significantly increase transparency by providing forward information about the underlying commodities, securities, or assets, which ultimately contributes to long-term sustainability goals (Lannoo & Thomadakis, 2020). The main challenge for policymakers is ensuring that derivative transactions are correctly traded and carefully monitored. This requires designing regulations and rules that aim to prevent excessive risk-taking by market participants by not slowing down aspects of financial innovation. Furthermore, it also requires increasing data quantity and quality to improve understanding of the derivatives market (Chui, 2008).

According to (Fitria, 2018), Several countries in Asia have many potential markets to develop but contain more significant financial risks than European countries. As one of the developing countries in Southeast Asia, Indonesia is a suitable example of this condition. Interest and exchange rates are still unstable and easily influenced by several issues ranging from economic activities to political factors. However, research (Lantara, 2010) participation rate in Indonesia using derivatives is 28.8 percent, much lower than in developed countries.

Research from (Utamie, 2021) regarding state-owned banks in Indonesia, which on a large scale, have more potential to use derivative instruments as risk mitigation. The costs of using derivatives are considered variable costs, and usually, large-scale companies such as BUMN have more funds to cover these costs and consider economic benefits. This is in line with research (Chanzu & Gekara, 2014) that product derivatives contribute positively to the financial performance of companies in Nairobi and reduce bank risk in India (Sinha, Pankaj and Sharma, 2016). Interestingly, this is not in line with research (Taşkın & Sarıyer, 2020) which found that the use of bank derivative products causes a decrease in the profitability of the banking system and increases bank risk in Turkey so that banks are advised not to use derivatives to protect their risks. Research (Ahmed, 2021) shows that the impact of using derivative products does not have a significant effect on the financial performance of banks in developed countries such as the USA, Denmark, Italy, Japan, and Norway.

2. LITERATURE REVIEW

Derivative and Structured Product

According to futures exchange experts, Derivatives are contracts or agreements whose value or profit opportunity is related to the performance of other assets. These other assets are referred to as underlying assets. Derivative securities are derivative securities of "main" securities in the form of equity and debt. Derivative effects can mean direct derivatives of the "main" Securities or subsequent derivatives (https://www.idx.co.id/produk/derivatif). In a more specific sense, derivatives are financial contracts between 2 (two) or more parties to fulfill promises to buy or sell assets/commodities, which are used as traded objects at a time and price, which is a mutual agreement between the seller and the buyer. The future value of the traded object is strongly influenced by its parent instrument in the spot market.

Structured products are investments whose return value comes from developing one or more underlying assets. These underpinnings often combine traditional securities such as equities, bonds, commodities, and one or more derivative components. (Maringer et al., 2015).

Definition of Risk

Risk is defined by the Oxford English Dictionary as "a likelihood or prospect of danger, loss, harm, or other unfavorable effects," while at risk is defined as "exposed to danger." Risk in this context refers to unfavorable outcomes (Hopkin, 2017). Yet, taking a chance might also have a good effect. The third possibility is that risk and result uncertainty are connected.

Risk is defined by the Institute of Risk Management (IRM) as the result of an event's likelihood and consequences. Consequences can be either favorable or unfavorable. This definition has a wide range of applications and is useful and simple to use. Thus, risk is anything that can cause the company not to achieve its goals. According to the Bank Indonesia Dictionary, Non-Performing Loans (NPL) or Non-Performing Financing (NPF) are problem loans consisting of loans classified as substandard, doubtful and loss. The NPL term is intended for conventional banks, while the NPF is for Islamic banks.

Profitability

Return on assets (Y) is the ratio that determines the amount of net profit resulting from the use of company assets by relating net income to total assets (Arthur J. Keown, John D Martin, J. William Petty, 2017). ROA is a profitability ratio that can compare net income to total assets at the end of the period, which is used as an indicator of a company's ability to generate profits. ROA is used because it can provide an adequate measurement of the overall effectiveness of a company and can take into account profitability.

3. DATA AND RESEARCH TEHNIQUE ANALISYS

According to a review of relevant literature, the impact of financial derivatives and structured products on conventional banks is primarily in two areas: on the one hand, the impact on bank profitability, and most academic circles believe that financial derivatives and structured products can improve the bank's performance level; on the other hand, the

impact on the bank's risk level, which is controversial. The purpose of this article is to perform empirical study on the profitability and risk level of Indonesian conventional banks as a result of financial derivatives and structured product transactions.

Population and Sample Selection Technique

The objects in this study are banking companies from 2017 – 2022. Their financial reports can be accessed via the Indonesian Stock Exchange website and the official website of each banking company listed on the Indonesia Stock Exchange (IDX) (www.idx.co.id). The total population of this study is 30 conventional banking companies listed on the Indonesian stock exchange. However, of this total population, only 20 companies have data. Furthermore, it had five consecutive years of complete data, with 100 observational data. Therefore, the data used in this study is secondary data which is time series or time series data.

Variable Measurement

The dependent variable used in this study are risk and profitability. The independent variables used are financial derivatives and structured product, bank's total assets, non-performing loan, loan deposit ratio, the debt asset ratio, and the debt equity ratio.

- The return on net assets is the ratio of net profit to shareholders' equity, which can reflect the efficiency with which the bank uses funds for profit; the operating profit rate is the ratio of the bank's operating profit to operating income, considering the bank's operating costs; and the total return on assets is the ratio of the bank's operating profit to operating income. As a result, the net profit to total assets ratio, which displays the income generated by bank unit assets, can more accurately depict the bank's profitability.
- The bad loan ratio (non-performing loan) is the proportion of financial institutions' non-performing loans to the total loan balance. The higher the bad loan ratio, the greater the risk conventional banks face. With the available data, this study chooses the bad loan as a variable to measure the bank risk level.
- Bank total assets. In this paper, the size assets of conventional banks will show economies of scale and thus enhance profitability. As a result, the bank's total assets improve large banks' profitability and ability to withstand risks.
- The loan-to-deposit ratio. The loan-deposit ratio compares total bank loans to total bank deposits. The greater the Loan-deposit Ratio, the greater the bank's profitability. A bank's low Loan-deposit Ratio indicates that it is expensive and that its profitability is weak.
- The debt-to-asset ratio. The debt asset ratio (or leverage ratio) is the total debt ratio to total assets. It is used to assess a company's ability to use creditors to provide finances for business activities and to reflect the security level of creditors' loans.
- The debt-to-equity ratio. The liabilities-to-equity ratio is the ratio of total obligations to total owner's equity. The high debt-equity ratio implies that the bank's total capital has a high debt capital, indicating insufficient debt capital protection. The low debt-equity ratio implies that the bank's financial strength is good, implying that debt capital is reasonably well protected.

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Data analysis method

The research data retrieved 20 listed conventional banking issuer companies on the Indonesia Stock Exchange (IDX) from 2017 – 2022. In this study, the data analysis technique used is logistic regression with a statistical data processing program, namely Eviews software version 12.0, as a tool for processing data. Logistic regression is one of the most used statistical procedures in research. Unlike traditional linear or ordinary regression, logistic regression is appropriate for modeling a binary variable (Hilbe, 2015).

The logistic regression technique includes limits and inherent biases of its own. As an example: Linearity assumption: Logistic regression presupposes a linear relationship between the independent factors and the log probabilities of the dependent variable, which is not always the case. Overfitting: If the model is too sophisticated, it may overfit the data, resulting in poor generalization of new data. Separation: If the data are perfectly separated based on the independent variable values, the model may fail to converge or generate inaccurate estimates.

Return on asset are used as an dependent variable to measure bank profitability, with the following model:

$$ROA_{it} = \alpha_i + \beta_1 LnDSSP_{it} + \beta_2 LnAsset_{it} + \beta_3 BLR_{it} + \beta_4 LDR_{it} + \beta_5 DAR_{it} + \varepsilon_{it} \ldots\ldots \textbf{(1)}$$

Bad loans ratio (non-perfoming loan) are used as an dependent variable to measure bank risk, with the following model:

$$BLR_{it} = \alpha_i + \beta_1 LnDSSP_{it} + \beta_2 ROA_{it} + \beta_3 LnAsset_{it} + \beta_4 LDR_{it} + \beta_5 DER_{it} + \varepsilon_{it} \ldots\ldots \textbf{(2)}$$

Where:

ROA = *return on assets*
LnDSSP = logarithm of the fair value of the bank's financial derivatives & structure product
LnAsset = natural logarithm of the bank's total assets
BLR = *non-performing loan*
LDR = *Loan Deposit Ratio ratio*
DAR = *the debt-asset ratios*
DER = *the debt-equity ratio*

Research Instrument Test

Classic assumption test

The classical assumption test is a statistical requirement that must be carried out in an ordinary least square-based multiple linear regression analysis. In the 41 OLS there is only one dependent variable, while the number of independent variables is more than one. According to (Ghozali, 2018) The requirements for model accuracy must be tested for several classical assumptions: the normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test.

Data Normality Test

The data normality test aims to test whether, in the regression model, the independent variables and the dependent variable have a normal distribution. A good regression model has a standard or close-to-normal distribution. The normal distribution will form a straight line diagonally, and plotting the data will be compared with the diagonal line. If the data distribution is normal, then the line connecting the actual data will follow the diagonal line (Ghozali, 2018).

In this study, the normality of the data was tested using the histogram chart method and the Jarque-Bera test. The basis for making a decision on the normality test is as follows:

1. If the probability value is > 0.05 (greater than 5%), then the data can be said to be normally distributed.
2. If the probability value is <0.05 (smaller than 5%), then it can be said that the data is not normally distributed.

Multicollinearity Test

The multicollinearity test was used to test whether the regression model found a correlation between the independent (independent) variables. Multicollinearity testing can be carried out with the following conditions:

1. If the correlation value is > 0.80 then H_0 is rejected, meaning that the regression model contains multicollinearity.
2. If the correlation value is <0.80 then H_0 is accepted, meaning that the regression model does not contain multicollinearity.

Multicollinearity is a situation that describes a strong relationship between two or more independent variables in a regression model. A good regression model should not have a correlation in each variable.

Heteroscedasticity Test

The heteroscedasticity test aims to test whether in the regression model there is an inequality of residual variance from one observation to another (Ghozali, 2018). If the residual variance from one observation to other remains, it is called homoscedasticity; if it is different, it is called heteroscedasticity. A good regression model has homoscedasticity or does not have heteroscedasticity. To detect whether there is heteroscedasticity in this study is to use the Glejser test was used. The Glejser test is performed by regressing the absolute value of the residuals on the independent variables.

Heteroscedasticity testing with the Glejser test can be carried out with the following conditions:

1. If the probability value on Obs*R-squared > 0.05 then there is no heteroscedasticity.
2. If the probability value on Obs*R-squared < 0.05 then there is heteroscedasticity.

Autocorrelation Test

According to (Ghozali, 2018) The autocorrelation test aims to test whether, in the linear regression model, there is a correlation between the confounding errors in period t and the interfering errors in the t-1 (previous) period. A good regression model is a regression model that is free from autocorrelation. To test the presence or absence of

autocorrelation symptoms in this study, it can be detected using the LM test, especially for observations above 100 observations.

This test is indeed more appropriate to use than the DW test, especially when the sample used is relatively large and the degree of autocorrelation is more than one. The LM test will produce Breusch-Godfrey statistics, so the LM test is sometimes called the Breusch-Godfrey Test (Ghozali, 2018). Decision making with the Breusch Godfrey Correlation LM test by comparing the test results with the level of 43 research significance. If the probability value is > 0.05 then there is no autocorrelation.

Panel Data Regression Test

Lagrange Multiplier Test

The Lagrange multiplier test is a test used to select the best approach between the Common Effect Model (CEM) and Random Effect Model (REM) approaches in estimating panel data. The Random Effect Model developed by Breusch-food was used to test the significance based on the residual values of the OLS method..

Basic criteria as follows:

1. If the Breusch-food cross section value is > 0.05 (significant value) then H_0 is accepted, so the most appropriate model to use is the Common Effect Model (CEM).
2. If the value of the Breusch-food cross section <0.05 (significant value) then H_0 is rejected, so the appropriate model to use is the Random Effect Model (REM).

The hypothesis used is:

H_0: Common Effect Random (CEM)

H_1: Random Effect Model (REM)

Chow/Likelihood Ratio test

The Chow test is a test used to select the best approach between the Common Effect Modal (CEM) and Fixed Effect Model (FEM) approaches in estimating panel data. The basic criteria of the examiner are as follows:

1. If the probability value (P-value) for the cross-section F > 0.05 (significant value) then H_0 is accepted, so the most appropriate model to use is the Common Effect Model (CEM).
2. If the probability value (P-value) for the cross-section F <0.05 (significant value) then H_0 is rejected, so the most appropriate model to use is the Fixed Effect Model (FEM).

The hypothesis used is:

H_0: *Common Effect Model* (CEM)

H_1: *Fixed Effect Model* (FEM)

4. RESULT AND DISCUSSION

Linear Descriptive

In a study, a thorough analysis is needed to obtain a detailed description of the variables used in the study. Descriptive statistical analysis, which includes analysis of the data mean, median, maximum value, minimum value, standard deviation, skewness, kurtosis, and jarque-bera statistics and p-value. Below Table 4.1. are the results of the descriptive statistical analysis of the variables used in the study.

4.1. Linear Descriptive Statistical Analysis 1

	ROA	DAR	DER	LDR	SP	SIZE
Mean	0.007266	0.032578	0.836948	18.61155	0.877523	5.836906
Median	0.009847	0.028480	0.844639	18.84991	0.868772	5.436725
Maximum	0.030548	0.119660	0.934016	21.17610	1.713196	14.15512
Minimum	-0.089189	0.000756	0.721724	16.57481	0.469899	2.782636
Std. Dev.	0.016340	0.022131	0.048592	1.384441	0.219455	2.111436
Skewness	-2.641648	1.468972	-0.433234	0.205239	1.267585	1.299904
Kurtosis	14.50250	5.567309	2.630646	1.954357	5.889606	5.089798
Jarque-Bera	1335.173	126.8549	7.393230	10.51551	123.1409	92.71884
Probability	0.000000	0.00000	0.024807	0.005207	0.000000	0.000000
Sum	1.453180	6.515635	167.3896	3722.309	175.5046	1167.381
Sum Sq. Dev.	0.053130	0.097470	0.469872	381.4185	9.583946	887.1740
Observations	200	200	200	200	200	200
Cross sections	20	20	20	20	20	20

Source: Self Proceed (2023)

Regression Test Equation 1

Chow test

The Chow test aims to determine the best model between the Common Effect approach or the Fixed Effect approach to be used to perform panel data regression. The basis for decision making in the Chow test is seen from the value of the probability cross-section F.

Table 4.2 The Chow Test

Redundant Fixed Effects Tests

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.352210	(19,135)	0.0000

Cross-section Chi-square	89.837585	19	0.0000

Source: Self Proceed (2023)

The results of the Chow test show that the probability value of the chi-square cross-section is 0.0000. This value is below 0.05. Based on the Chow test decision making criteria that have been described, the model chosen is the fixed effect approach.

Haussman's test

The Hausman test aims to determine the best model between the random effect approach and the fixed effect method which should be used in panel data modeling.

Table 4.3 The Haussman's Test

Correlated Random Effects - Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.178509	5	0.0218

Source: Self Proceed (2023)

Based on the estimation results of the Hausman test in table 4.3, it can be seen that the significance value of the random cross-section probability is smaller than the significance value (0.0218 <0.05). So it can be concluded that rejected and accepted, and thus the model chosen is the fixed effect model.

Table 4.4 The Fixed Effect Model

Evidence	***β Coefficient***	***T_{counts}***	***Prob***
C	-0.316666	-2.283678	0.024
DAR	0.15005	2.112079	0.0365
DER	0.163075	2.643443	0.0092
LDR	0.009977	1.458548	0.147
SIZE	-0.003546	-3.42158	0.0008
DSSP	0.002212	0.384383	0.7013
F_{test}			11.91519
Prob			0.0000

Source: Self Proceed (2023)

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Based on Table 4.4. the regression results using the Fixed Effect Model (FEM) above, it can be represented that the constant value is -0.316666, the t-statistic value is -2.283678 with a probability of 0.0240 <0.05, meaning that if there are no independent variables consisting of DAR, DER, LDR, SIZE, and derivatives-structure product that affects ROA, then the value of Y = -0.316666, while the DAR regression coefficient is 0.150050 t-statistic value is 2.112079 with a probability of 0.0365 <0.05 has a significant positive effect on ROA at the level of α = 5%, if DAR increases by 1 % then ROA will increase by 0.150050. The results of this study are in line with (Husin & Purnamasari, 2021) that Debt to asset ratio has an effect on return on assets.

Whereas for the DER variable, which has a regression coefficient of 0.163075, the t-statistical value is 2.643443 with a probability of 0.0092 <0.05, meaning that it has a significant positive effect on ROA at the level α = 5% if DER increases by 1% then ROA will increase by 0.163075. but the results of this study are different from (Zeuspita & Yadnya, 2019) where DER has positive effect on ROA.

For the LDR variable, which has a regression coefficient of 0.009977, the t-statistic value is 1.458548 with a probability of 0.1470 > 0.05, meaning that it has an insignificant positive effect on ROA at the level of α = 5% if LDR increases by 1% then ROA will increase by 0.009977. The results of this study are in accordance with (Parhusip & Cakranegara, 2021) (D. N. Sari et al., 2018) where LDR has no effect on ROA, but contradicts the results of the study (Moorcy, 2020) (L. Sari & Fitri, 2022) (Cicih et al., 2021) (Muhammad & Siskawati, 2018).

For the variable SIZE, which has a regression coefficient of -0.003546, the t-statistic value is -3.421580 with a probability of 0.0008 <0.05, meaning that it has a significant negative effect on ROA at the level of α = 5%, if SIZE increases by 1%, ROA will increase by -0.003546. The results of this study are in line with research (Michello et al., 2022) (Husin & Purnamasari, 2021) but the result are different (Sriwati, 2021). The natural logarithm of total assets is tested at the 1% level, and the coefficient is positive. This phenomenon may be related to the bank scale effect. The larger the size of a conventional bank, the lower the cost of financing will have a positive impact on the total return on assets at the end of the period.

For derivatives and structure products variable, which has a regression coefficient of 0.002212, the t-statistical value is 0.384383 with a probability of 0.7013 > 0.05, meaning that it has an insignificant positive effect on ROA at the level of α = 5%, if derivative and the structure product increases by 1%, ROA will increase by 0.002212. These results are different from research (Putri et al., 2022), but according to research (Pertiwi & Susanto, 2019)(Omar & Banafa, 2022). From the regression results, although the natural logarithm coefficient of the fair value of bank financial derivatives and structure product is positive for ROA, the effect is not significant. This shows that the level of bank income has no significant effect on the number of financial derivatives it owns.

F test

Statistical F test is used to show whether all the independent variables in the model have a simultaneous (together) effect on the dependent variable (Ghozali, 2018)). This test uses a significance level of 0.05 (α = 5%). According to the test results in table 4.5, the F test can be described in the following table:

Table 4.5 The F Test

F-statistic	11.91519
Prob(F-statistic)	0.000000

Source: Self Proceed (2023)

Based Table 4.5, on the results of the F test, it has a Prob (F-Statistic) value of 0.000000 less than 0.05 (P <0.05), so this research model is fit. This means that all independent variables, namely DAR, DER, LDR, SIZE, derivatives and structure products simultaneously have a significant effect on ROA.

The coefficient of determination (R-squared) is used to measure how well the regression line matches the actual data (goodness of fit) and measures the total percentage of variation in the dependent variable explained by the independent variables in the regression line (Widarjono, 2010). According to the test results in the previous table, the F test can be described as follows:

Table 4.6 Coefficient of determination

R-squared	0.679308
Adjusted R-squared	0.622296
S.E. of regression	0.010481
Sum squared resid	0.014830
Log likelihood	515.8735

Source: Self Proceed (2023)

Based on Table 4.6 the results of the Coefficient of determination test, it shows that the value of Adjusted R^2 is 0.622296. This shows that the variation of the DAR, DER, LDR, SIZE, and derivatives and structure products variables is 62%, while 38% can be explained by other factors outside the regression model.

Regression Test Equation 2

Chow test

Table 4.7 The Result of The Chow Test

Redundant Fixed Effects Tests

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	26.023180	(19,134)	0.0000
Cross-section Chi-square	247.264227	19	0.0000

Source: Self Proceed (2023)

The results of the Chow test show that the probability value of the chi-square cross-section is 0.0000. This value is below 0.05. Based on the Chow test decision making criteria that have been described, the model chosen is the fixed effect approach.

Haussman Test

Table 4.8 The Result of The Haussman Test

Correlated Random Effects - Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	29.471049	6	0.0000

Source: Self Proceed (2023)

Based on the estimation results of the Hausman test in table 4.8, it can be seen that the significance value of the random cross section probability is smaller than the significance value (0.000 <0.05). So, it can be concluded that rejected and accepted, and thus the model chosen is the fixed effect model.

Fixed Effects Model

Table 4.9 The Result of The Fixed Effects Model

Evidence	**β Coefficient**	**T_{counts}**	**Prob**
C	0.075338	8.243582	0.0000
ROA	0.100162	1.180677	0.2398
DAR	0.207062	3.849505	0.0002
DER	-0.008141	-6.421336	0.0000
SIZE	-0.013	-1.466773	0.1448
LDR	0.006532	1.044089	0.2983
DSSP	0.000126	0.528396	0.5981
F_{test}			27.3896
Prob			0.0000

Source: Self Proceed (2023)

For the derivatives and structure products variable, which has a regression coefficient of 0.002212, the t-statistical value is 0.384383 with a probability of 0.7013 > 0.05, meaning that it has an insignificant positive effect. Based on Table 4.9, the regression results using the Fixed Effect Model (FEM) model above can be represented that the constant value is 0.075338, the t-statistic value is 8.243582 with a probability of 0.0000 <0.05, meaning that if there are no independent variables consisting of ROA, DAR, DER, LDR, SIZE, and derivatives and structure product that affect NPL, then the value of Y =

0.075338, while the regression coefficient ROA is 0.100162, the t-Statistics value is 1.180677 with a probability of 0.2398 > 0.05 has a non-significant positive effect on NPL at the level of α = 5%, if ROA increases by 1%, the NPL will increase by 0.100162. The results of this study are in line with the findings that NPL affects ROA (Sutrisno, 2018) (Pertiwi & Susanto, 2019).

Whereas for the DAR variable which has a regression coefficient of 0.207062, the t-statistic value is 3.849505 with a probability of 0.0002 <0.05 has a significant positive effect on NPL at the level α = 5%, if DAR increases by 1% then NPL will increase by 0.207062. The results of this study are in accordance with research from (Septiani, 2021).

The DER variable has a regression coefficient of -0.008141, a t-statistic value of -6.421336 with a probability of 0.0000 <0.05 has a significant negative effect on NPL at the level α = 5%, if DER increases by 1% then NPL will decrease by -0.008141. this result is contrary to research (Sutrisno, 2018).

The SIZE variable has a regression coefficient of -0.013000, a t-statistic value of -1.466773 with a probability of 0.1448 > 0.05 has no significant negative effect on NPL at the level α = 5%, if SIZE increases by 1% then NPL will decrease by -0.013000. But the results of this study are different from (Astrini et al., 2018) bank size has a positive and significant effect partially on NPLs.

The LDR variable has a regression coefficient of 0.006532, a t-statistic value of 1.044089 with a probability of 0.2983 > 0.05 has no significant positive effect on NPL at the level α = 5%, if SIZE increases by 1% then NPL will increase by 0.006532. This research contrarty with research (Barus & Erick, 2016), but in line with research (Wardhana & Prasetiono, 2015).

Derivative and structure product structure variable has a regression coefficient of 0.000126, a t-statistic value of 0.528396 with a probability of 0.5981 > 0.05 has no significant positive effect on NPL at the level of α = 5%, if derivative-structure product increases by 1% then NPL will increase by 0.000126. From the regression results above, the coefficient before the natural logarithm of the fair value of conventional bank financial derivatives-structure product is negative and not significant at the 1% confidence level. This proves that the use of financial derivatives reduces the level of risk faced by banks.

F Test

Table 4.10 The Result of The F Test

F-statistic	27.38961
Prob(F-statistic)	0.000000

Source: Self Proceed (2023)

Based on the results of the F test, it has a Prob (F-Statistic) value of 0.000000 less than 0.05 (P <0.05), so this research model is fit. This means that all independent variables

namely ROA, DAR, DER, LDR, SIZE, and derivatives and structure product simultaneously have a significant effect on NPL.

R^2 test

Table 4.11 The Result of The R^2 Test

R-squared	0.836334
Adjusted R-squared	0.805799
S.E. of regression	0.010022

Source: Self Proceed (2023)

Based on Table 4.11, the results of the Coefficient of determination test, it shows that the value of Adjusted R^2 is 0.805799. This shows that the variation of the ROA, DAR, DER, LDR, SIZE, and derivatives-structure product variables is 80.57%, while 19.43% can be explained by other factors outside the regression model.

Based on the results of the regression equation 1 of the panel data regression for each company in the fixed effect model, it can be determined that the smallest and greatest sensitivity of the 20 company constants to company value is:

a) PT. Bank Woori Saudara Indonesia 1906 Tbk
ROA = 0.028224 - 0.316666 + 0.150050*DAR + 0.163075*DER + 0.009977*LDR -0.003546*SIZE + 0.002212*DSSP
From the equation above, it can be concluded that the firm's sensitivity/constant to firm value is PT. Bank Woori Saudara Indonesia 1906 Tbk (SDRA) with a constant value of (Ci + 0.005102) = 0.028224 + 0.005102 = 0.033326.

b) PT. Bank Bukopin Tbk. (BBKP)
NPL = - 0.035115 - 0.316666 + 0.150050*DAR + 0.163075*DER + 0.009977*LDR -0.003546*SIZE + 0.002212*DSSP
From the data equation, it can be concluded that the sensitivity / constant of the company to the smallest company value is PT. Bank Bukopin Tbk with a constant value of (Ci + 0.005102) = - 0.035115 + 0.005102 = -0.030013

Based on the results of the regression equation 2 of the panel data regression for each company in the fixed effect model, it can be determined that the smallest and greatest sensitivity of the constants of 20 companies to firm value are:

a) PT. Bank Bukopin Tbk. (BBKP)
NPL = 0.081874 + 0.075338 + 0.100162*ROA + 0.207062*DAR - 0.008141*DER -0.013*SIZE + 0.006532*LDR + 0.000126*DSSP
From the equation above, it can be concluded that the firm's sensitivity/constant to firm value is PT. Bank Bukopin Tbk with a constant value of (Ci + 0.368079) = 0.081874 + 0.368079 = 0.449953.

b) PT. PT. Bank Woori Saudara Indonesia 1906 Tbk
NPL = -0.037759 + 0.075338 + 0.100162*ROA + 0.207062*DAR - 0.008141*DER -0.013*SIZE + 0.006532*LDR + 0.000126*DSSP
From the equation above, it can be concluded that the sensitivity / constant of the company to the smallest company value is PT. PT. Bank Woori Saudara Indonesia 1906 Tbk with a constant value of (Ci + 0.368079) = - 0.035115 + 0.368079 = 0.332964

This research has shown that using derivatives and structure products can increase market efficiency by allowing investors to manage risk better (Ahmed, 2021) and allocate capital more efficiently. However, derivatives also have the potential to amplify market volatility and lead to systemic risk if not adequately regulated. As such, regulators and policymakers play an essential role in ensuring that derivatives markets are transparent, well-functioning, and appropriately regulated to protect stakeholders.

For investors, financial derivatives and structure products can offer opportunities for risk management and enhanced returns, but they also carry risks and require a sophisticated understanding of financial markets. Therefore, investors should consider the risks and potential benefits of using derivatives-structure product in their investment strategies and seek advice from qualified professionals. Overall, using derivatives and structured products in financial markets has benefits and risks, and stakeholders such as investors and regulators need to understand and manage these risks appropriately. Prior research can provide valuable insights into the potential implications of derivatives and inform decisions about their use and regulation.

5. CONCLUSION

This study identifies the impact of derivatives and structured products on risk and profitability in banking companies listed on the Indonesia stock exchange period 2017 – 2022 using logistic regression analysis techniques. The factors examined in this study are ROA (return on assets), logarithm of the fair value of the bank's financial derivatives-structure product, natural logarithm of the bank's total assets, non-performing loan, Loan Deposit Ratio, the debt-asset ratios, and the debt-equity ratio.

The results of the research on equation 1, it can be concluded that the debt ratio, loan to deposit ratio, and product structure have a positive correlation with profitability proxied by return on assets (ROA). For total assets negatively correlated with profitability (ROA). In terms of profitability, the use of financial derivatives by conventional banks has a positive effect on profitability. Derivatives are beneficial for conventional banks to increase their profitability to some extent, but this positive effect is not significant. Equation 2, it can be concluded that profitability, debt to assets, loans to deposits and product structures are positively correlated, while debt to equity and total assets are negatively correlated with the level of risk proxied by non-performing loans. The results show that in terms of risk prevention, financial derivatives can help hedge risks for conventional banks. In addition, variables such as the loan-to deposit ratio will also reduce the risk of conventional banks to a certain extent. In terms of risk prevention, financial

derivatives can help conventional banks hedge risks. In addition, variables such as LDR will also reduce the risk of conventional banks to some extent.

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