DIJEFA: Dinasti International Journal of Economics, Finance & Accounting
E-ISSN: 2721-303X
P-ISSN: 2721-3021
https://dinastipub.org/DIJEFA dinasti.info@gmail.com +62 811 7404 455

DOI: https://doi.org/10.38035/dijefa.v7i1.6293
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Received: 01 February 2026 | **Revised:** 09 February 2026 | **Accepted:** 26 February 2026

Determinants of Profitability of Banking Companies Listed on the IDX for the 2020-2024 Period

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Abstract: This study examines the effect of Non-Performing Loans (NPL), Operating Expenses to Operating Income (BOPO), Loan to Deposit Ratio (LDR), and Firm Size on the profitability of banks listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period. Secondary data were obtained from 42 banks selected through purposive sampling, resulting in 210 observations. Multiple linear regression analysis was conducted using SPSS version 25. The results show that NPL and BOPO have a significant negative effect on bank profitability, indicating that higher credit risk and operational inefficiency reduce profits. Conversely, LDR and Firm Size have a significant positive effect, suggesting that effective fund utilization and larger business scale contribute to higher profitability. Simultaneously, these four variables explain 51.4% of the variation in bank profitability. The findings highlight the importance of strengthening credit risk management and improving operational efficiency to support sustainable and stable financial performance, particularly amid the dynamic conditions of Indonesia's banking industry.

Keywords: BOPO, Firm Size, LDR, NPL, Profitability.

INTRODUCTION

The stability of the banking sector is fundamental to a country's economic growth. Banks act as intermediaries, collecting funds from the public and channeling them back through loans, thus stimulating economic activity. Furthermore, banks are also a key instrument in the implementation of monetary policy by the central bank (Aditya et al., 2023). Therefore, a bank's financial health is a crucial indicator of the sustainability of a country's financial system. This level of health can be seen from its profitability, which essentially indicates a bank's capacity to generate profits from its assets (Dwiningtyas & Yoewono, 2023).

During the COVID-19 outbreak, the national financial sector faced significant challenges, including rising non-performing loans (NPLs) due to economic contraction and

declining customer income, which pressured bank profitability. However, with assistance from the government and Bank Indonesia (BI) for credit restructuring, the banking sector began to recover, albeit with careful risk management. In the post-pandemic period, banks focused more on financial consolidation and reducing non-performing loans as adaptation strategies to maintain stability and support sustainable economic growth.

Profitability, measured by the ROA ratio, is a key indicator for assessing a bank's capacity to generate profits through its operations. Previous researchers have provided varying results, influenced by various internal factors such as credit risk (NPL), operational effectiveness (BOPO), fund disbursement capacity (LDR), and company size (Dwiningtyas & Yoewono, 2023).

In the study by Mustafa and Sulistyowati (2022), Non-Performing Loans (NPL) are defined as a credit ratio that reflects the percentage of non-performing or substandard loans that fail to generate cash flows in accordance with the scheduled repayment. Kirana et al. (2022) found a negative effect of NPL on profitability, while Hutahuruk et al. (2024) reported that NPL was not proven to have a significant effect on profitability.

According to Lestari et al. (2020), BOPO describes the scale between production expenses and income from the activity process, where a smaller ratio indicates the efficiency of bank management. BOPO generally has a negative effect, as research (Hutahuruk et al., 2024; Kirana et al., 2022). However, there is research that explains the absence of an influence between BOPO and profitability, such as research by (Safira et al., 2025) .

Hutahuruk et al. (2024) explains that the LDR is a comparison that indicates a bank's capacity to disburse loans using funds collected from third parties. Research findings on the effect of LDR on profitability are contextual, and can have negative effects, as in the study by Yulianah and Aji (2021), or positive effects, as in the studies of Widyastuti & Aini (2021; Nugraha, 2024) .

According to Setiowati et al. (2023), Company size describes a business entity as measured by its total assets, market share, total revenue, and total number of employees. Company size yields mixed results, with some reporting an effect, as research (Natanael & Mayangsari, 2022) suggests. Others report no effect between company size and profitability, as research (Anisa & Febyansyah, 2024) suggests.

Based on the above relationship, the following report shows the average NPL, BOPO, LDR, and Firm Size on profitability over the past 5 years (2020-2024), shown in Table 1.

Table 1. Average ROA, NPL, BOPO, LDR, Banking *Firm Size* 2020-2024

YEAR	ROA (%)	NPL (%)	BOPO (%)	LDR (%)	FIRM SIZE (%)
2020	0.68	4.44	49.50	88.48	31.32
2021	-0.12	4.67	50.35	81.77	31.52
2022	0.64	4.31	48.96	96.28	31.62
2023	4.23	4.62	42.80	109.30	31.55
2024	1.35	4.30	41.28	97.86	31.66

Source: processed by researchers (2025)

During 2020-2024, the ROA and LDR ratios showed quite sharp fluctuations, particularly with an increase in 2023, which then declined again in the following year. Meanwhile, the NPL tended to be stable at around 4.3% to 4.6%, and the BOPO continued to decline significantly, indicating improving efficiency. This table concludes that banks are increasingly efficient and operationally sound. However, profitability and lending strategies continue to fluctuate annually. Therefore, this study aims to demonstrate and examine the relationship between NPL, BOPO, LDR, and firm size and the profitability of banks listed on the IDX from 2020-2024.

Literature Study

Resource-Based View Theory

This theory, introduced by Jay Barney (1991), explains the aspects and processes that underpin companies development and competitive reputation. Based on *the Resource-Based View Theory* (RBV), bank profitability is determined by the ability to manage internal resources, such as operational cost efficiency and asset structure. In this context, BOPO represents operational efficiency as an internal resource, while *Firm Size* reflects the bank's physical and financial resource capacity. Large banks tend to have economies of scale and greater diversification capabilities, thus increasing profitability (Mailani *et al*., 2024) .

Signaling Theory

Signaling Theory was originally proposed by Michael Spence (1973), explaining how banks signal to the market through their financial performance. Ratios such as the LDR and NPL can serve as signals to investors regarding a bank's ability to manage risk and distribute credit productively. An optimal LDR provides a positive signal about liquidity and intermediation. Meanwhile, NPL provides a negative indication because it reflects increased credit risk (Gunawan *et al*., 2023) .

Credit Risk Theory

Credit Risk Theory, proposed by Frank Knight (1921), describes the potential for banks to face losses due to borrowers failing to meet their loan repayment obligations as agreed (Bhatt *et al*., 2023) . This theory relates to non-performing loans (NPLs), where a higher NPL indicates a greater number of non-performing loans, potentially leading to financial losses for the bank. Consequently, an increase in NPLs significantly negatively impacts ROA, as losses from non-performing loans reduce net income and reduce the effectiveness of asset utilization (Kirana *et al*., 2022) .

Profitability

Profitability describes how effectively a company generates profits from its operations. Stable profits indicate promising opportunities and the ability to maintain business sustainability for a considerable period (Suryadi *et al*., 2022). Profitability can be tested using the ROA ratio, which estimates the company's efficiency in utilizing its assets to generate profits (Aditya *et al*., 2023). ROA reflects the extent to which all company assets generate profits and assesses the effectiveness of fund utilization. A high ROA reflects a company's positive image (Asyifa *et al*., 2025) .

Non-Performing Loan (NPL)

Non-performing loans (NPL) estimate the number of loans experiencing repayment problems due to customers failing to fulfill their obligations to the bank (Chun & Ardaaragchaa, 2024). High non-performing loans will increase risk premiums, loan costs, and interest rates, forcing banks to increase reserves, which reduces capital (Khoiriyah & Dailibas, 2022) . The higher the percentage of non-performing loans, the greater the potential for losses due to unpaid loaned funds, ultimately reducing interest income and profits (Yulianah & Aji, 2021) . Previous research conducted by Hartiwi (2023); Trilogi and Selatan (2024) proves that NPLs affect profitability. From the explanation above, H1 is concluded:
H1: *Non-Performing Loans* have an impact on bank profitability.

Operating Costs Operating Income (BOPO)

BOPO describes a bank's ability to manage operations by considering expenditure burdens with production income (Hasanah & Muniarty, 2024). A lower BOPO indicates

efficient business management, where an increase in BOPO is usually in line with increased profitability, and a lower BOPO indicates a bank's ability to manage its business more efficiently (Hartiwi, 2023). According to research by Kirana *et al*. (2022); Sari and Nurdiawansyah (2024); Juniarti *et al*. (2025); Rusli *et al*. (2025) BOPO has an impact on profitability. From the explanation above, H2 is concluded:
H2: Operating costs to operating income have an impact on bank profitability.

Loan to Deposit Ratio (LDR)

The LDR is intended to assess a bank's capability in channeling funds from the public into productive credit by comparing total loans with deposits from involved parties, such as savings, checking accounts, and time deposits (Abdat *et al*., 2024) . Previous studies by Wiranthie and Hartri (2020); Aditya *et al.* (2023); and Sadewo and Mawardi (2024) indicate that LDR significantly impacts profitability. Based on this explanation, H3 is concluded:
H3: *Loan to Deposit Ratio* has an influence on bank profitability.

Company Size

Company size / *Firm Size* explains the scale of variables based on the assets it owns which reflect the size of the company. (Abdat *et al*., 2024) . In previous research, according to Natanael and Mayangsari (2022); Rahmawati *et al*. (2021), company size has a positive influence on profitability. Based on the leading explanation, H4 is determined:
H4: Company size has an influence on bank profitability.

This study also analyzes the joint influence of independent variables on the dependent variable and then states H5 which concludes: H5: *Non-Performing Loans*, BOPO, *Loan to Deposit Ratio*, and Company Size collectively have an influence on bank profitability.

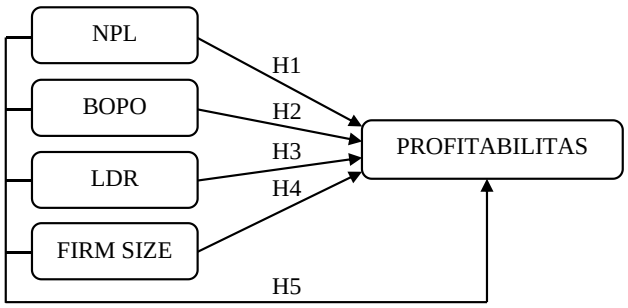


Figure 1. Thinking Framework
Source: processed by researchers (2025)

Based on the hypothesis and previous studies, it can be assumed that NPL and BOPO negatively influence ROA, as increased credit risk and cost efficiency will reduce bank profits. Conversely, LDR and company size are expected to positively influence ROA, as the ability to disburse large-scale loans can increase bank efficiency and profitability. This relationship is depicted in Figure 1 as a framework for this research.

METHODS

Methodology Study

This research applies a quantitative methodology to examine the influence of non-performing loans, BOPO, loan-to-deposit ratio, and company size on the profitability of banks listed on the Indonesia Stock Exchange from 2020 to 2024. The following study uses secondary data based on each bank's annual financial reports available on the IDX website (www.idx.co.id).

Population and Sample

The population in this study includes all 47 banks listed on the Indonesia Stock Exchange from 2020 to 2024. The sample was selected using a purposive sampling method in accordance with the following provisions:

1. The bank was consistently listed on the IDX from 2020 to 2024.
2. Publish complete annual financial reports according to the observation period.
3. Presents the financial data needed to calculate all research variables.

Based on the provisions above, 42 banks were obtained as samples so that the number of observations over five years was 210 panel data (42 ×5).

Definition Operational Variables

Table 2. Operational Definitions of Variables

Variables	Formula	Scale	Direction of Expectations	Source
ROA	$\frac{\text{Net Income}}{\text{Total Assets}} x100\%$	Ratio	Variables Dependent	(Asyifa et al., 2025)
NPL	$\frac{\text{Non} - \text{Performing Loans}}{\text{Total Loans}} x100\%$	Ratio	Negative	(Chun & Ardaaragchaa, 2024)
BOPO	$\frac{\text{Operating Expenses}}{\text{Operating Revenue}} x100\%$	Ratio	Negative	(Hasanah & Muniarty , 2024)
LDR	$\frac{\text{Loans Granted}}{\text{Thrid} - \text{Party Funds}} x100\%$	Ratio	Positive	(Abdat et al., 2024)
Firm Size	LN (Total Assets)	Ratio	Positive	(Abdat et al., 2024)

Source: processed by researchers (2025)

Analysis Model

The empirical model used in this study is multiple linear regression and is formulated with the equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Information:

Y	:	Bank profitability (ROA)
β_0	:	Regression constant / model intercept
$\beta_1, \beta_2, \beta_3, \beta_4$	:	Regression coefficient
X_1	:	Non-performing loan (NPL) ratio
X_2	:	Bank operational efficiency ratio (BOPO)
X_3	:	Loan to third party funds ratio (LDR)
X_4	:	Bank size (*Firm Size*)
e	:	Error term

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

Table 3. Results of Descriptive Statistical Tests

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Standard Deviation
NPL	202	-.94	3.08	1.2379	.77924
BOPO	202	2.78	5.57	3.7711	.39001

Long Distance Relationship	202	2.30	6.27	4.4324	.49444
FIRM SIZE	202	3.33	3.57	3.4506	.05493
ROA	179	-2.81	1.42	-.2227	.99001
Valid N (listwise)	179				

Source: processed by researchers (2025)

Descriptive analysis presents a clear picture of the data distribution and trends. Table 3 shows that the average NPL is 1.2379, indicating significant variation in credit risk between banks. The average BOPO is 3.7711, indicating significant differences in operational capabilities between banks. The average LDR is 4.4324, indicating significant variation in the use of third-party funds in lending. The average *Firm Size* is 3.4506, indicating relatively homogeneous *firm sizes* in the sample. The average ROA is -0.2227, indicating diverse profitability performance and a decline in banks' ability to generate profits, primarily due to the impact of the COVID-19 pandemic and the credit slowdown. These findings indicate that banking profitability continues to fluctuate. This statement supports the graph in the introduction that the performance of Indonesian banks has not stabilized post-pandemic.

Classical Assumption Test

Normality Test

Its use is to assess information according to a normal distribution pattern with the Kolmogorov-Smirnov test. Data is considered normally distributed if the Sig (p-value) is above the threshold of 0.05, while if the p-value is below 0.05, the data is believed not to follow a normal distribution pattern (Midway & White, 2025).

Table 4. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		179
Normal Parameters [a,b]	Mean	.0000000
	Standard Deviation	.82163253
Most Extreme Differences	Absolute	.055
	Positive	.049
	Negative	-.055
Test Statistics		.055
Asymp . Sig. (2-tailed)		.200 [c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Source: processed by researchers (2025)

The results from Table 4 show that the Asymp Sig. value is 0.200, exceeding the threshold of 0.05. This indicates that the residuals conform to a statistically normal distribution.

Multicollinearity Test

The Multicollinearity Test aims to observe the high level of relationship between the variables tested by measuring the tolerance value (To) along with the variance inflation coefficient (VIF), if Tol exceeds 0.1 and VIF exceeds 10, it means there is multicollinearity (Chairunnisa & Nohe, 2025).

Table 5. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	NPL	.760	1,315
	BOPO	.859	1,163
	Long Distance Relationship	.926	1,079
	FIRM SIZE	.854	1,172

Source: processed by researchers (2025)

According to the calculations in table 5, *the Tolerance* and VIF values do not indicate multicollinearity, as indicated by the calculation of the tolerance of the independent variable being more than 0.1 and the calculation of the VIF on the independent variable being less than 10.

Autocorrelation Test

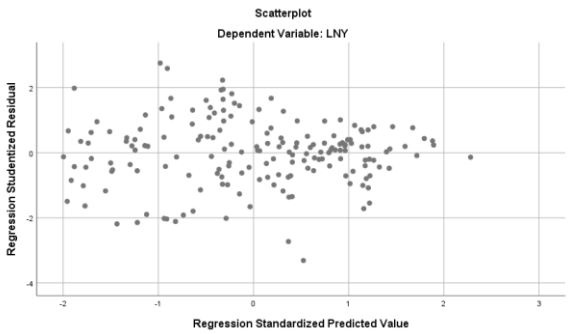
Table 6. Autocorrelation Test Results

DW	dU	dL	Decision
1,836	1.80305	1.74513	Not occur autocorrelation

Source: processed by researchers (2025)

In the Durbin Watson test above, the Durbin Watson value is 1.836, meaning it is between the upper limit (dU) of 1.80305 and the lower limit of autocorrelation (4-dU) of 2.19695, so the DW value has passed the upper limit and has not passed the negative lower limit of 1.80305 (dU) < 1.850 (DW) < 2.19695 (4-dU). The interpretation of the DW test shows that if the DW value is close to 2, it means there is no autocorrelation, if Durbin Watsom is less than 1.5, it indicates positive autocorrelation (Effendi & Hayati, 2025). Thus, the DW value obtained from the regression model indicates that there is no autocorrelation problem.

Heteroscedasticity Test



Source: processed by researchers (2025)

Figure 2. Heteroscedasticity Results

The Heteroscedasticity Test functions to check the error/residual variance (Sari *et al.*, 2025). Based on the scatterplot of the heteroscedasticity test on the dependent variable Y, it can be seen that the residual points are spread irregularly without showing a specific pattern, therefore it is stated that the regression model does not contain heteroscedasticity.

Coefficient of Determination

Table 7. Results of the Determination Coefficient Test

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.717 [a]	.514	.499	.67121

Source: processed by researchers (2025)

From table 7, the coefficient of determination (R2) was recorded as reaching 0.514, which is equivalent to 51.4% of the variation in bank profitability being explained by the four variables studied, while the other 47.6% was caused by factors outside the variables such as interest rates, inflation, or macroeconomic conditions.

Multiple Linear Regression Test

Multiple regression integrates several independent variables with one dependent variable and predicts the value of the dependent variable through the combined interaction of the independent variables. This method also facilitates a deeper understanding of the relationship patterns and the orientation of the influence of variables simultaneously (Choerunnisa *et al*., 2021) . The multiple regression model equation in this study is formulated as follows:

$$Y = -32.918 + (-0.216)\text{NPL} + (-0.541)\text{BOPO} + (0.411)\text{LDR} + (9.596)\text{SIZE}$$

Information:

1. The constant (-32.918) is the predicted ROA value when all independent variables are set to zero. In other words, when the independent variables are held constant, the resulting profitability value is (-32.918).
2. The coefficient β_1 (NPL) is -0.216 and the coefficient β_2 (BOPO) is -0.541 which shows a negative relationship with ROA, meaning that if NPL and BOPO increase then ROA tends to decrease.
3. The coefficient β_3 (LDR) is 0.411 and the coefficient β_4 *(Firm Size)* of 9.596 which shows a positive relationship with ROA, meaning that if LDR and *Firm Size* increase, ROA also tends to increase.

Hypothesis Testing

Partial Test (T-Test)

Table 8. T-Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-32,918	4,371		-7,531	.000
	NPL	-.216	.093	-.168	-2,334	.021
	BOPO	-.541	.199	-.185	-2,725	.007
	Long Distance Relationship	.411	.126	.213	3,252	.001
	FIRM SIZE	9,596	1,215	.538	7,898	.000

Source: processed by researchers (2025)

The T-test decision is based on the significance value (Sig). If < alpha, it is concluded that the variable has a significant influence on the dependent variable. Conversely, if Sig > alpha, it proves that there is no significant impact (Hasibuan, 2023) .

The analysis proves that there is a negative influence on NPL and BOPO as seen B -0.216, Sig 0.021 and B 0.541, Sig 0.007 which means that every increase in NPL and BOPO will significantly reduce ROA. Conversely, the LDR and *Firm Size variables* have a positive and significant effect (B = 0.411, Sig = 0.001 and B = 9.596, Sig = 0.000) which means that every increase in LDR and *Firm Size* will significantly increase ROA.

Simultaneous Test (F Test)

The simultaneous test determines the joint influence of independent variables at a significance level of 5% (0.05), where if the calculated F > F table the regression model is declared to have a significant effect, while if the calculated F < F table the model is declared insignificant (Hasibuan, 2023) .

Table 9. F Test Results

ANOVA [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54,296	4	13,574	19,655	.000 [b]
	Residual	120,164	174	.691		
	Total	174,460	178			

a. Dependent Variable: ROA

b. Predictors: (Constant), SIZE, BOPO, LDR, NPL

Source: processed by researchers (2025)

The table shows an F-count of 19.655 and an F-table of 2.416, indicating a positive effect, indicating a significant result with p = 0.000 < 0.05. This indicates that NPL, BOPOP, LDR, and company size have a collective effect on profitability, meaning the overall regression model is suitable for use.

Discuccion

The Impact of NPL on Profitability (Negative and Significant)

This study shows that an increase in the non-performing loan ratio will reduce a bank's profitability. This finding is consistent with Signaling Theory, which states that high NPLs send a negative signal to investors regarding the bank's asset quality. These results align with research (Hartiwi, 2023; Widyastuti & Aini, 2021).

The Effect of BOPO on Profitability (Negative and Significant)

BOPO describes a bank's operational competency. A high BOPO indicates high costs incurred to generate revenue, resulting in decreased profitability. These results support *the Resource-Based View Theory* (RBV), which posits that operational efficiency is a form of internal resource utilization. This finding also aligns with research (Kirana *et al*., 2022; Juniarti *et al*., 2025).

The Effect of LDR on Profitability (Positive and Significant)

An increasing LDR ratio indicates increased productive lending, which can boost bank profits. However, a ratio that is too high also poses a risk to liquidity. These results support *Signaling Theory*, as an optimal LDR is a positive signal to shareholders about a bank's ability to manage its finances. This finding is consistent with a study (Wiranthie & Hartri, 2020).

The Effect of Firm Size on Profitability (Positive and Significant)

A larger bank size allows for business diversification and scale efficiencies, thereby increasing profits. This aligns with the RBV view that large assets can be a source of competitive advantage and strengthens empirical evidence that *firm size* is a significant

predictor of profitability. This explanation aligns with research (Natanael & Mayangsari, 2022).

The Influence of NPL, BOPO, LDR and *Firm Size* on Profitability

The four variables, namely non-performing loans (NPL), BOPO, credit to deposit ratio (LDR), and *Firm Size* together have a significant influence on profitability, as evidenced by the calculated F exceeding the F table, namely 19.655 > 2.416 and Sig which is less than 5%.

CONCLUSION

This study aims to examine the influence of non-performing loans (NPL), BOPO, loan-to-deposit ratio (LDR), and firm *size* on the profitability of banks listed on the Indonesia Stock Exchange (IDX) during 2020-2024. The findings reveal that all four independent variables collectively have a significant impact on bank profitability. Unilaterally, NPL and BOPO have a significant negative impact on profitability, while LDR and *firm size* have a significant positive impact. This means that increasing the non-performing loan ratio and operational inefficiencies reduce bank profit performance, while increasing productive lending and a larger business scale can increase profitability. This study supports signaling theory , where financial data such as NPL and LDR serve as signals to investors regarding a bank's risk and liquidity conditions. These findings also align with risk theory , which emphasizes the importance of risk management to minimize potential losses and ensure operational stability. This study also supports *Resource-Based Theory* (RBV), which states that a bank's internal capabilities in optimizing resources (BOPO and asset size) play a critical role in increasing profitability. This study is in line with research (Kirana *et al* ., 2022; Hartiwi, 2023; Natanael & Mayangsari, 2022; Wiranthie & Hartri, 2020) . For further analysis, it is recommended to expand the variables by adding other aspects, such as capital adequacy ratio (CAR), net interest margin (NIM), gross domestic product (GDP), and inflation, to gain more comprehensive insight into the factors influencing bank profitability. The research period should also be longer so that the results can reflect normal economic conditions.

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