

Analysis of the Effect of Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL) and Operational Costs Operating Income (BOPO) on Return on Assets (ROA) in Conventional Commercial Banks (2018-2022)

Akmal Nadhif Hibatullah¹, Rina Yulistia², Edi Nursanta³

^{1,2}Student, Faculty of Economics, Gunadarma University, West Java, Indonesia

³Lecturer, Faculty of Economics, Gunadarma University, West Java, Indonesia

ABSTRACT: This study to analyze the effect of Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Costs Operating Income (BOPO) on Return on Assets (ROA) in conventional commercial banks in Indonesia during the period 2018-2022. CAR is measured based on the bank's capital adequacy ratio, LDR reflects liquidity, NPL indicates credit risk, and BOPO represents operational efficiency. The data used is quantitative data obtained from financial statements published on the official websites of the Indonesia Stock Exchange (IDX) and the Financial Services Authority (OJK). The research sample is selected using a purposive sampling method based on specific criteria. Multiple linear regression analysis is used to test the direct influence of the independent variables on ROA. The results show that CAR and LDR have no significant effect on ROA, while NPL and BOPO have a significant effect on ROA. The implication of this research is that conventional commercial banks in Indonesia need to focus on credit risk management and operational efficiency to enhance profitability.

KEYWORDS: CAR, LDR, NPL, BOPO, ROA, Banking

1. INTRODUCTION

The banking industry plays a crucial role in a country's economic growth by collecting funds from the public and distributing them as loans. Banks act as intermediaries supporting business activities and improving public welfare. Profitability, measured by Return on Assets (ROA), is a key indicator of how well banks manage their assets. Factors such as Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Costs Operating Income Ratio (BOPO) influence this profitability. Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Costs Operating Income Ratio (BOPO) are crucial factors influencing profitability in banking companies. CAR reflects the adequacy of a bank's capital to support its risk-taking activities. LDR measures a bank's liquidity by comparing loans to deposits. NPL indicates the credit risk level faced by the bank, representing loans that are not performing as expected. BOPO evaluates the operational efficiency of the bank. The banking sector plays a vital role as an intermediary institution, channeling funds from savers to borrowers and supporting national economic growth (Booklet Perbankan Indonesia, 2012). According to Dewi (2025), profitability can be assessed through Return on Assets (ROA), which measures how effectively a bank manages its assets to generate profit. Prior studies show varying results regarding the impact of these financial ratios on profitability (Yuliansyah & Setiawan, 2024; Hidayat et al., 2023; Wahyuni et al., 2023).

Bank profitability is commonly measured by Return on Assets (ROA), which reflects the company's ability to generate profit from its total assets (Sari & Putra, 2020). Financial performance in banks is influenced by several internal factors, including Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Costs Operating Income Ratio (BOPO) (Wulandari & Suhardi, 2021). CAR measures the bank's capital strength and ability to absorb losses (Hasanah & Nugroho, 2019). LDR reflects the efficiency of a bank in managing its funds by comparing loans to deposits (Prasetyo & Arifin, 2020). NPL indicates the quality of the bank's loan portfolio by showing the proportion of non-performing loans (Putri & Rahmawati, 2018). BOPO measures operational efficiency by comparing operational costs operating income (Santoso & Yulianti, 2019). Previous studies have shown that these financial ratios have significant effects on bank profitability, but results vary depending on the

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sample and period analyzed (Firdaus & Handayani, 2022; Kurniawan & Sari, 2023).

This study analyzes the impact of Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Efficiency Ratio (BOPO) on the profitability of conventional commercial banks in Indonesia, measured by Return on Assets (ROA). The banking industry is crucial in supporting economic growth as a financial intermediary. Understanding the influence of these financial ratios is vital for enhancing financial management and providing insights for investors in decision-making. The aim of this study is to evaluate the direct impact of CAR, LDR, NPL, and BOPO on ROA for conventional commercial banks listed on the Indonesia Stock Exchange (IDX) during the period 2018–2022.

This research adopts a quantitative approach, using secondary data obtained from the financial reports of conventional commercial banks published on their official websites. The sample is selected using purposive sampling, focusing on banks that meet specific criteria. Data analysis is conducted using multiple linear regression to evaluate the direct effect of CAR, LDR, NPL, and BOPO on ROA.

2. LITERATUR REVIEW

2.1 Basel Accord Theory (BAT)

Basel Accord is an international framework established by G-10 central banks to enhance global banking stability through standardized capital requirements (Ghozali, 2022). Basel Accord I, also known as the Cooke Ratio, requires banks to maintain a minimum capital of eight percent of risk-weighted assets. This capital is categorized into two main components. The first is Tier 1 Capital, which serves as core capital and consists of paid-up shares and disclosed reserves. The second is Tier 2 Capital, recognized as supplementary capital, which includes perpetual securities and subordinated debt. The accord enforces restrictions on risk exposures, prohibiting exposures exceeding twenty-five percent of total capital (Ghozali, 2022). Basel Accord II further develops this framework by expanding its scope to cover three essential aspects of banking regulation. The first aspect focuses on minimum capital requirements for market, credit, and operational risks. The second emphasizes supervisory review, ensuring banks implement effective risk management practices. The third aspect promotes market discipline by enhancing transparency and disclosure, providing stakeholders with accurate information on bank operations (Ghozali, 2022).

2.2 Capital Adequacy Ratio (CAR)

Capital Adequacy Ratio (CAR) is a ratio that measures a bank's ability to meet its financial obligations and absorb potential losses. CAR indicates the amount of capital a bank holds relative to its risk-weighted assets. This ratio is important to maintain the stability and trust of the bank's customers (Bank Indonesia, 2018).

2.3 Loan to Deposit Ratio (LDR)

Loan to Deposit Ratio (LDR) is the comparison between the total loans disbursed by the bank and the total third-party funds collected. This ratio reflects the bank's liquidity in distributing loans. An ideal LDR shows the bank's ability to optimize the funds it collects for lending purposes (Ghozali, 2016).

2.4 Non-Performing Loan (NPL)

Non-Performing Loan (NPL) is the ratio of problematic loans that have not been paid by debtors according to the agreed schedule. NPL indicates the quality of the bank's assets and the credit risk faced by the bank. The higher the NPL, the greater the risk of loss for the bank (Sari, 2019).

2.5 Operational Costs Operating Income (BOPO)

BOPO is a ratio that measures a bank's operational efficiency by comparing operational costs operating income. A low BOPO ratio indicates good efficiency because the bank can control costs while generating income (Kasmir, 2020).

2.6 Return on Assets (ROA)

Return on Assets (ROA) is a ratio that measures a bank's ability to generate profit from its total assets. ROA serves as a profitability indicator showing how effectively the bank uses its assets to produce earnings (Brigham & Houston, 2009).

2.7 Previous Research on CAR, LDR, NPL, BOPO, and ROA

Halim and Aulawi (2023) found that Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LDR) have a positive effect on bank profitability measured by Return on Assets (ROA), while Non Performing Loan (NPL) and Operational Costs Operating Income (BOPO) have a negative effect on bank profitability. Their study used secondary data from the Indonesia Stock Exchange (IDX) and quantitative methods. Sutrisno and Fitria (2022) similarly reported that CAR and LDR positively affect ROA, whereas NPL and

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BOPO negatively influence bank profitability, based on secondary data from IDX and a quantitative approach. Setiawan and Kusuma (2021) concluded that CAR and LDR positively impact ROA, but NPL negatively affects bank profitability, also using secondary IDX data with quantitative analysis. Muda and Asmarani (2020) showed a positive influence of CAR on ROA and a negative effect of NPL on bank profitability, employing quantitative methods and IDX secondary data. Haryanto and Suryani (2020) found that NPL has a significant negative effect on ROA in conventional banks, using quantitative research with IDX secondary data. Husna and Agustin (2020) revealed that CAR significantly affects ROA, while LDR and NPL showed no significant impact on ROA, based on quantitative research using IDX secondary data. Setiawan and Hadi (2019) found that BOPO significantly influences ROA, but CAR does not have a significant effect on ROA, using secondary IDX data in a quantitative study. Lestari and Wahyuni (2019) reported a positive effect of CAR on ROA and a negative effect of BOPO on ROA, using quantitative analysis and secondary data from IDX. Nasution and Darmawan (2018) concluded that LDR and BOPO do not significantly affect ROA, based on quantitative research with IDX secondary data. Napitupulu and Rambe (2018) found that CAR significantly influences ROA, whereas NPL and LDR do not have significant effects on ROA, using secondary data from IDX and quantitative methods.

3. METHOD

This study was conducted on conventional commercial banks listed on the Indonesia Stock Exchange (IDX) over the period of 2018-2022. The objective of this research is to analyze the impact of Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Costs Operating Income (BOPO) on Return on Assets (ROA). The population includes all conventional commercial banks listed on the IDX that meet specific criteria, such as having complete financial statements during the study period. A sample was selected using purposive sampling. Data sources include annual financial reports published on the official IDX website (www.idx.co.id) and the Financial Services Authority (OJK). This quantitative study applies multiple linear regression analysis. The variables used are ROA (dependent), CAR, LDR, NPL, and BOPO (independent). Data analysis was conducted using SPSS software to examine relationships between variables. Descriptive statistics provide an overview of the data, including maximum, minimum, mean, and standard deviation values. Classical assumption tests (normality, multicollinearity, autocorrelation, and heteroskedasticity) were performed to ensure unbiased data analysis. Hypothesis testing was performed using multiple linear regression through the coefficient of determination (R^2), F-test, and t-test to assess the influence of independent variables on ROA, both simultaneously and individually.

4. RESULT AND DISCUSSION

4.1 Research Data

This research was conducted on conventional commercial banks in Indonesia listed on the Indonesia Stock Exchange (IDX) from 2018 to 2022, using 15 banking companies as samples.

4.2 Descriptive Statistical Tests

Descriptive Statistics

N		Range	Minimum	Maximum	Mean	Std. Deviation
CAR	66	12,59	17.38	29.97	22.8262	2.68882
BOPO	66	52.50	46.50	99.00	78.3876	11.73350
LDR	66	41.93	56.97	98.90	81.0215	10.59098
NPL	66	.87	2.00	2.87	2.3926	.25209
ROA	66	3.69	1.00	4.69	2.6930	.83209

Figure 1 Descriptive Statistics

Capital Adequacy Ratio (CAR): The CAR variable ranges from 17.38 to 29.97, with a mean of 22.8262 and a standard deviation of 2.68882. This indicates moderate variability around the mean, reflecting consistent data distribution. Operational Costs Operating Income (BOPO): The BOPO variable ranges from 46.50 to 99.00, with a mean of 78.3876 and a standard deviation of 11.73350. The high variability suggests significant fluctuation in BOPO values. Loan to Deposit Ratio (LDR): The LDR variable ranges from 56.97 to 98.90, with a mean of 81.0215 and a standard deviation of 10.59098. This shows considerable variability, indicating a wide dispersion of LDR values. Non-Performing Loan (NPL): The NPL variable ranges from 2.00 to 2.87, with a mean of 2.3926

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and a standard deviation of 0.25209. The low range and standard deviation suggest high consistency in NPL data. Return on Assets (ROA): The ROA variable ranges from 1.00 to 4.69, with a mean of 2.6930 and a standard deviation of 0.83209. This indicates moderate variability, reflecting a relatively wide dispersion in asset performance.



Figure 2. Increase in CAR and Fluctuations in BOPO, LDR, NPL, and ROA

The descriptive statistics graph for financial variables (CAR, BOPO, LDR, NPL, and ROA) reveals varying trends across these indicators. In CAR, the average value is around 20%, with low variability, indicating stable capital adequacy. BOPO shows a high average close to the maximum, reflecting significant fluctuations in operational efficiency. In LDR, the average value is also high, with noticeable variability, suggesting unstable loan distribution. NPL maintains consistently low values with minimal variation, indicating strong credit quality. Finally, ROA shows near-zero values with minimal variation, reflecting stable but low profitability. Overall, the graph indicates that BOPO and LDR exhibit the highest variability, while NPL and ROA are the most stable.

4.3 Classical Assumption Tests

The results of the Kolmogorov-Smirnov statistical test with Monte Carlo significance values are presented in Table Normality Test Results for Equation (Variable X Against Z). The residual variable is considered normally distributed if the significance level is greater than 0.05 or 5% (Ghozali, 2018).

Table 3 Normality Test Results for Equation (Variable X Against Y)

Method	Table Significance (Monte Carlo)	Conclusion
Kolmogorov-Smirnov	4.1	0.272
Histogram	4.2	
P-Plot	4.3	

Based on the Kolmogorov-Smirnov test, the Monte Carlo significance value of 0.272 is greater than 0.05, indicating normal distribution of residuals. The histogram shows a symmetric bell curve, and the P-Plot shows points scattered around the diagonal line, further confirming normality.

4.5 Multicollinearity Tests

The results of the multicollinearity test are presented Equation (Variable X Against Y). A regression model is considered free from multicollinearity if the Tolerance value is greater than 0.10 and the VIF value is less than 10 (Ghozali, 2018).

Table 4 Equation Multicollinearity Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
1(Constant)		
CAR	,985	1,015
BOPO	,978	1,023
LDR	,988	1,013
NPL	,983	1,017

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The VIF value is less than 10.00 and the Tolerance value is greater than 0.1, indicating that there is no multicollinearity in the data.

4.6 Heteroscedasticity

The results of the heteroscedasticity test are presented for Equation (Variable X Against Z). A regression model is considered free from heteroscedasticity if the scatterplot shows a dispersed pattern (Ghozali, 2018).

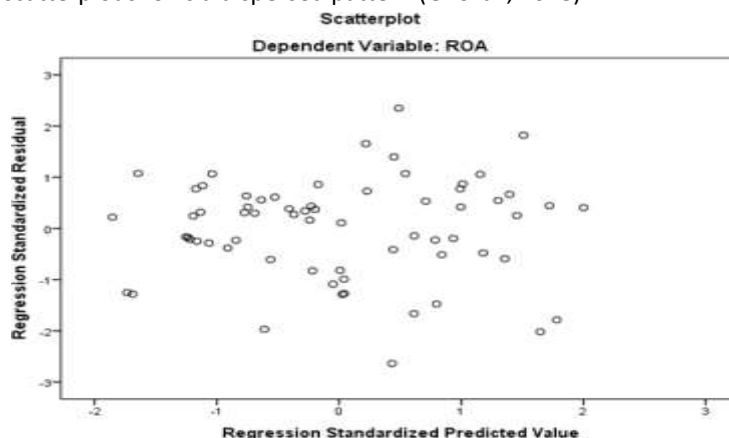


Figure 5. Equation Heteroscedasticity Test Scatterplot

If there is a distributed pattern of dots on the scatterplot, the regression model passes the heteroscedasticity test. The scatterplot for Equation above indicates that there is no heteroscedasticity in this study because the points are evenly distributed.

4.7 Autocorrelation

The results of the autocorrelation test are presented for Equation (Variable X Against Y). A regression model is considered free from autocorrelation if the Durbin-Watson value is close to 2 (Ghozali, 2018).

Table 6 Equation Autocorrelation Test Results

Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Durbin-Watson
1	.551 ^a	.303	.258	.71688	1.436

The Durbin-Watson value obtained is 1.436. The upper critical value (d_U) is 1.7092, and $4 - d_U$ is 2.2908. Since $1.436 < 1.7092$, it indicates that the Durbin-Watson value is below the upper critical value. Therefore, it cannot be conclusively stated that there is no autocorrelation.

4.8 Path Analysis

Unstandardized analysis Coefficient and Sig

The analysis of Unstandardized Coefficients and Significance for CAR, BOPO, LDR, and NPL variables is presented in the following equation. Mediation tests are used to identify intervening variables and understand the indirect effect of independent variables on the dependent variable. An effect is considered significant if the p-value (Sig.) is less than 0.05 (Ghozali, 2009).

Table 7 Equation (Variable X Against Y) Unstandardized Coefficient and Sig Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	3,479	1,507		2,308
CAR	3,479	1,507		2,308	,024
BOPO	-,061	,033	-,196	-1,824	,073
LDR	-,029	,008	-,415	-3,839	,000
NPL	,010	,008	,128	1,189	,239

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Based on Equation, the analysis of Unstandardized Coefficients and Significance indicates that CAR has a coefficient of 3.479 with a significance value of 0.024, which is less than 0.05. This means CAR has a significant effect on the dependent variable. BOPO shows a coefficient of -0.061 with a significance of 0.073, which is greater than 0.05, indicating an insignificant effect. LDR has a coefficient of -0.029 and a significance value of 0.000, which is highly significant. Lastly, NPL shows a coefficient of 0.010 with a significance of 0.239, which is not significant. Therefore, only CAR and LDR variables have a significant impact on the dependent variable in this model, while BOPO and NPL do not show a significant effect.

4.9 Hypotesis Test

Based on the path coefficients results in tables 7, the analysis of the research hypotheses for the Indonesian banking industry sector for the period 2018-2022 can be summarized as follows:

Table 8 partial test Result

Hypotesis	Causal relationship	Original (O)	Sample T-Statistics	P-Value	Results
H1	CAR -> ROA	-1,824	-1.781	0.073	Not accepted
H2	LDR -> ROA	-0,974	-3.147	0.331	Not Accepted
H3	NPL -> ROA	3,157	0.857	0,002	accepted
H4	BOPO -> ROA	4,302	-0.046	0.000	accepted

Path coefficients show T-Statistics results of $-1.824 \leq 1.96$ and p-value of $0.073 \geq 0.05$, indicating that Capital Adequacy Ratio (CAR) does not have a significant effect on Return On Assets (ROA). Path coefficients show T-Statistics results of $1.189 \leq 1.96$ and p-value of $0.239 \geq 0.05$, indicating that Loan to Deposit Ratio (LDR) does not have a significant effect on Return On Assets (ROA). Path coefficients show T-Statistics results of $2.461 \geq 1.96$ and p-value of $0.017 \leq 0.05$, indicating that Non-Performing Loan (NPL) has a significant positive effect on Return On Assets (ROA). Path coefficients show T-Statistics results of $-3.839 \leq -1.96$ and p-value of

$0.000 \leq 0.05$, indicating that Operational Costs Operating Income (BOPO) has a significant negative effect on Return On Assets (ROA). This negative effect suggests that the higher the BOPO ratio, the lower the Return On Assets (ROA) obtained by the bank.

4.9 Coefficient of Determination

The results of the coefficient determination test are presented for Equation (Variables X1, X2, X3, X4 and against Y).

Table 9 Coefficient of Determination Equation

Equation	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Equation	1	.551 ^a	.303	.258	.71688

Based on the results of the coefficient of determination test, Equation (Variables X1, X2, X3, and X4 against Y) has an R Square of 0.303 and an Adjusted R Square of 0.258, meaning that variables X1, X2, X3, and X4 influence Y by 30.3%. This indicates that 30.3% of the variation in the dependent variable Y can be explained by the independent variables X1, X2, X3, and X4, while the remaining 69.7% is influenced by other factors not included in the model.

5. Impact of Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), Non-Performing Loan (NPL), and Operational Cost (BOPO) on Profitability (ROA) in the Indonesian Banking Sector

Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LDR) have no significant partial effect on Profitability, as measured by Return on Assets (ROA), in the Indonesian banking industry sector. Conversely, Non-Performing Loan (NPL) and Operational Cost (BOPO) have a significant partial effect on ROA in the same sector. On a simultaneous basis, NPL and BOPO significantly influence ROA, while CAR and LDR do not. This analysis demonstrates that the quality of credit risk and operational efficiency play a more critical role in influencing bank profitability in Indonesia during the 2018–2022 period.

The path coefficients reveal that CAR does not have a significant effect on ROA (T-Statistic: $-1.824 \leq 1.96$, p-value: $0.073 \geq 0.05$). This aligns with the findings of Ariffin and Sofyan (2019) and Wahyuni and Mulia (2018), which suggest that although CAR reflects capital strength and regulatory compliance, it does not necessarily translate into higher profitability. Banks with high CAR may

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focus more on maintaining financial stability and meeting regulatory benchmarks rather than maximizing short-term returns. Moreover, Indonesian banks tend to manage CAR conservatively, which limits their ability to use capital for profit-generating activities (Puspita & Suryani, 2016).

Similarly, LDR does not significantly affect ROA (T-Statistic: $-0.974 \leq 1.96$, p-value: $0.331 \geq 0.05$). This is consistent with studies by Mulyadi and Utami (2019) and Arifin and Sari (2018), which found that high LDR does not guarantee higher profits. A high LDR indicates aggressive lending, which may elevate credit risk and deteriorate asset quality, particularly if not backed by strong risk management. The impact of LDR on profitability is often indirect and depends heavily on the performance of the loan portfolio and credit policies (Fariha & Nugroho, 2017).

In contrast, NPL significantly affects ROA (T-Statistic: $3.157 > 1.96$, p-value: $0.002 < 0.05$). This supports the findings of Anwar and Wulandari (2017), and Simatupang and Rukmini (2019), which concluded that higher NPL levels reduce asset quality, increase credit loss provisions, and lower overall profitability. As NPL rises, banks must allocate more reserves for bad loans, which directly cuts into net income and thus decreases ROA. Effective credit risk management becomes crucial for maintaining financial performance under such conditions.

BOPO also has a significant impact on ROA (T-Statistic: $4.302 > 1.96$, p-value: $0.000 < 0.05$), indicating that operational efficiency is a key determinant of profitability in the banking sector. A high BOPO reflects inefficiencies in cost management, which reduces profit margins. The R Square value of 0.295 implies that 29.5% of the variation in ROA can be explained by BOPO. This aligns with the findings of Lestari (2018) and Putra & Sari (2018), which highlight that better control over operational costs contributes to higher financial performance. Efficient cost structures allow banks to retain more of their earnings, thereby improving ROA.

Overall, this study suggests that credit risk (NPL) and operational efficiency (BOPO) are the most influential factors on bank profitability in Indonesia, while capital adequacy (CAR) and liquidity management (LDR) show limited explanatory power in determining ROA over the 2018–2022 period. Banks seeking to enhance profitability should focus on minimizing non-performing loans and optimizing operational expenditures to achieve sustainable financial outcomes.

CONCLUSIONS

This study concludes that Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LDR) do not have a significant impact on the profitability of Indonesian banking companies as measured by Return on Assets (ROA) during the period 2018–2022. On the other hand, Non-Performing Loan (NPL) and Operational Costs Operating Income (BOPO) have a significant negative impact on ROA. This highlights the crucial role of credit risk control and operational efficiency in determining bank profitability. Therefore, banking companies should focus on strengthening credit quality and optimizing operational costs to improve financial performance. Future research is expected to extend the observation period, include more diverse banking institutions, and incorporate external variables such as economic growth, inflation, digital banking adoption, and regulatory policies to provide a more comprehensive understanding of the factors influencing bank profitability.

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