

Surviving Financial Shocks: Cash Flow Volatility and Corporate Resilience in Indonesia

By :

Tabah Rizki¹

Universitas Sriwijaya, Palembang, South Sumatera, Indonesia

tabahrizki@unsri.ac.id

Muhammad Prans Panca Renta²

Universitas Sriwijaya, Palembang, South Sumatera, Indonesia

muhammadpranspancarenta@unsri.ac.id

Co Author *tabahrizki@unsri.ac.id

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ABSTRACT

This study examines the effects of financial resilience and cash flow volatility on financial performance, measured by Return on Assets (ROA), among manufacturing companies listed on the Indonesia Stock Exchange during 2020–2024. Using a quantitative approach, the study analyzes 220 firm-year observations through multiple linear regression. The results show that financial resilience has a positive and significant effect on financial performance, while cash flow volatility has a negative and significant effect. Simultaneously, both variables significantly affect financial performance. These findings indicate that stronger financial resilience enables firms to maintain operational continuity and financial flexibility, whereas higher cash flow volatility increases liquidity uncertainty and constrains financial management. Consistent with Agency Theory, effective management of financial resources and cash flows can reduce managerial inefficiencies and agency conflicts, thereby supporting improved financial performance.

Keywords: Cash Flow Volatility, Financial Performance, Financial Resilience, Manufacturing Companies.

INTRODUCTION

Manufacturing companies operate in a dynamic environment shaped by the COVID-19 shock, supply-chain disruptions, commodity-price movements, and geopolitical uncertainty. In Indonesia, real manufacturing value added increased from IDR 2,209.9 trillion in 2020 to IDR 2,618.9 trillion in 2024, while the sector's contribution to national GDP fell from 19.87% in 2020 to 18.34% in 2022 before recovering to 18.98% in 2024. Manufacturing GDP contracted by 2.93% in 2020 and then grew by 3.39% in 2021, 4.89% in 2022, and 4.64% in 2023. These sector-level indicators describe the changing operating environment, but they should not be interpreted as evidence that every firm experienced the same shock. Firm-level outcomes depend on product markets, cost structures, access to financing, working-capital cycles, and management decisions. World Bank evidence on commodity-price fluctuations further

highlights uncertainty in the costs of energy and raw materials, which can affect production costs, inventories, cash conversion cycles, and profitability.

These challenges became particularly pronounced during the COVID-19 pandemic, which represented an unprecedented global economic shock and substantially disrupted manufacturing activities, supply chains, consumer demand, and corporate cash flows. Restrictions on mobility, temporary factory closures, labor disruptions, transportation constraints, and international trade interruptions created substantial operational and financial pressures for manufacturing companies (Juan & Li, 2023). At the same time, uncertainty surrounding the duration and magnitude of the pandemic made it more difficult for firms to forecast sales, manage inventories, maintain liquidity, and secure external financing. Consequently, the COVID-19 pandemic provides an important context for examining whether firms possessing stronger financial resilience were better able to absorb

economic shocks and maintain financial performance. The pandemic also creates an opportunity to observe differences in corporate financial conditions across pre-COVID-19, during-COVID-19, and post-COVID-19 periods, thereby providing a more comprehensive assessment of corporate resilience over different stages of economic disruption and recovery (Zahedi et al., 2022).

The Indonesian manufacturing sector was similarly exposed to these disruptions. During the pandemic, restrictions on economic activity and disruptions in domestic and international supply chains affected production capacity, product demand, raw material availability, and corporate liquidity. However, the effects were not necessarily uniform across firms. Companies with stronger liquidity positions, more flexible capital structures, and better cash flow management may have possessed greater capacity to absorb the shock and sustain their operations (Qaisar et al., 2025). As economic activity gradually recovered following the pandemic, manufacturing firms were required to adjust again to changing consumer demand, input prices, supply chain conditions, and financing costs. Therefore, the transition from the pre-COVID-19 period to the pandemic period and subsequently to the post-COVID-19 recovery period represents an economically meaningful setting for examining the role of financial resilience in sustaining corporate performance.

These uncertainties are further compounded by macroeconomic conditions such as high inflation, exchange rate fluctuations, and unpredictable international trade policies, all of which complicate corporate financial and operational planning. In Indonesia, Purchasing Managers' Index (PMI) data reveals that while manufacturing activity remains in an expansionary phase, companies must still adjust production capacities and inventory management to anticipate unstable demand (Neldy, 2025). The experience of the COVID-19 pandemic further demonstrates that manufacturing companies need financial flexibility not only to respond to routine market fluctuations but also to withstand severe and unexpected systemic shocks. In this context, a company's ability to withstand and adapt to economic shocks becomes increasingly crucial. The concept of financial resilience is highly relevant, as it reflects a firm's capacity to absorb financial pressure, maintain operational continuity, and recover from economic disruptions through sufficient liquidity, capital structure flexibility, and effective cash flow management (Alam et al., 2024; Zahedi et al., 2022).

However, cash flow volatility reflects a company's ability to generate cash consistently, as well as the degree of uncertainty surrounding its operating cash flows over time (Ball & Nikolaev, 2022). High cash flow volatility increases operational uncertainty and business risk, potentially limiting a company's ability to finance investments, meet short-term obligations, and sustain business operations (Kuron et al., 2023). This issue became particularly important during the COVID-19 pandemic because declining demand, delayed customer payments, supply chain disruptions, and temporary restrictions on business activities could generate substantial fluctuations in operating cash flows. Firms with unstable cash flows may therefore have experienced greater difficulty maintaining liquidity and financing ongoing operations during the pandemic. Conversely, firms with relatively stable cash flows and stronger financial resilience may have been better positioned to absorb the shock and preserve their financial performance. Even in the post-COVID-19 period, cash flow stability remains important because firms continue to face changes in input prices, interest rates, consumer demand, and global supply chain conditions.

Furthermore, companies with high cash flow volatility tend to face higher external financing costs, as creditors and investors perceive them as riskier (Lulaj & Minguéz-Vera, 2024). From an agency theory perspective, cash flow volatility may also reflect inefficient managerial decisions or opportunistic behavior by managers, particularly when corporate governance and oversight mechanisms are weak (Banimahd et al., 2021). Within the framework of information asymmetry theory, significant cash flow fluctuations increase uncertainty regarding a company's future performance prospects, thereby eroding market confidence and potentially undermining the assessment of its financial performance (Chen & Nguyen, 2025). These theoretical arguments become particularly relevant when firms are exposed to an extraordinary external shock such as COVID-19, because the pandemic amplified information uncertainty and made future operating cash flows more difficult to predict. Consequently, cash flow volatility serves not only as an indicator of financial risk but also as a signal of the quality of financial management and the company's operational stability.

Financial performance serves as a key indicator for assessing the effectiveness of a company's resource management and its ability to generate sustainable economic value for stakeholders (Juan & Li, 2023; Khresat et al., 2023). In

capital-intensive manufacturing firms, financial performance reflects both short- and long-term financial health, typically measured by profitability ratios such as Return on Assets (ROA) (Arifaj et al., 2023). Theoretically, firms with high financial resilience are expected to maintain more stable financial performance despite facing cash flow volatility and business environment pressures, as they possess the flexibility to adaptively adjust their financing and operational strategies (Lee & Chen, 2022). This expectation is particularly relevant across different phases of the COVID-19 shock. During the pre-COVID-19 period, firms generally operated under relatively normal economic conditions; during the COVID-19 period, firms faced an exceptional and simultaneous demand, supply, and liquidity shock; while in the post-COVID-19 period, firms entered a recovery and adjustment phase characterized by changing demand patterns, supply chain normalization, and continuing macroeconomic uncertainty. Examining these three periods therefore enables a more comprehensive understanding of whether financial resilience is associated with financial performance consistently across different levels of economic disruption.

The COVID-19 pandemic may also have altered the relationship between financial resilience, cash flow volatility, and financial performance. During normal economic conditions, firms may have sufficient access to markets, suppliers, customers, and external financing, reducing the immediate consequences of temporary cash flow fluctuations. In contrast, during the pandemic, the simultaneous occurrence of demand shocks, supply chain disruptions, operating restrictions, and financial market uncertainty potentially increased the sensitivity of financial performance to both financial resilience and cash flow volatility (Ahmad et al., 2024). As economic conditions improved in the post-COVID-19 period, firms were required to transform their crisis-response strategies into longer-term financial and operational adjustments. Consequently, comparing the pre-, during-, and post-COVID-19 periods provides an opportunity to identify whether the relationship among financial resilience, cash flow volatility, and financial performance remains stable or changes according to the economic environment.

However, findings from prior empirical studies regarding the impact of cash flow volatility on financial performance remain inconsistent, particularly across different industrial sectors and within the context of developing nations (Nikbakht, 2024). Furthermore, research on financial resilience within the manufacturing sector remains relatively

limited, with existing studies largely focusing on macroeconomic crises or MSMEs (Wójtowicz & Hodžić, 2022)). Most studies also examine financial factors in isolation, failing to simultaneously integrate financial resilience and cash flow volatility into a single empirical model. More importantly, relatively limited attention has been given to whether these relationships differ across distinct phases of a major systemic shock such as COVID-19, particularly among publicly listed manufacturing companies in emerging markets such as Indonesia.

This situation highlights a significant research gap concerning manufacturing firms in Indonesia. The pre-, during-, and post-COVID-19 periods provide a natural temporal setting for examining corporate financial resilience under different economic conditions. Rather than treating COVID-19 merely as a background event, this study considers the pandemic period as an important context in which the ability of firms to absorb financial pressure, manage cash flow volatility, and maintain financial performance can be evaluated. The pre-COVID-19 period represents relatively normal operating conditions, the during-COVID-19 period captures the firm's response to an unprecedented systemic shock, and the post-COVID-19 period reflects the recovery and adaptation phase. This periodization allows the study to provide a more nuanced assessment of whether financial resilience remains relevant when firms move from normal conditions into crisis and subsequently toward economic recovery.

Consequently, this study offers a novel contribution by integrating financial resilience and cash flow volatility as key determinants of financial performance within a unified empirical model and examining these relationships across the pre-, during-, and post-COVID-19 periods. This approach provides a more holistic understanding of how financial resilience and cash flow stability jointly influence corporate performance under different economic conditions. By focusing on Indonesian manufacturing companies, the study also extends the existing literature from predominantly crisis-level or MSME contexts to publicly listed manufacturing firms in an emerging-market setting. Accordingly, this study addresses the following research questions: (1) Does financial resilience significantly affect the financial performance of Indonesian manufacturing companies? (2) Does cash flow volatility significantly affect the financial performance of Indonesian manufacturing companies?. The findings are expected to provide empirical evidence regarding whether financially resilient firms are better able to sustain performance during periods of severe

disruption and whether the effects observed during the pandemic persist into the post-COVID-19 recovery period.

LITERATURE REVIEW

Agency theory explains the contractual relationship between principals (shareholders) and agents (managers), where differences in interests and information asymmetry have the potential to give rise to agency conflicts (Fama & Jensen, 1983). In manufacturing companies in Indonesia, this conflict often arises in financial decisions, especially liquidity management, cash policy and cash flow stability (Kuron et al., 2023). Managers can act opportunistically, such as holding excess cash or making investment decisions that are not optimal, so that they are not fully in line with shareholders' goals of maximizing financial performance.

In the perspective of agency theory, financial resilience reflects the effectiveness of management in maintaining the company's financial stability and sustainability, which shows the alignment of interests between agents and principals and has a positive impact on financial performance (Zahedi et al., 2022). On the other hand, high cash flow volatility increases uncertainty and liquidity risk, opens up opportunities for manager opportunistic behavior, and has the potential to reduce financial performance. Thus, agency theory emphasizes that management's ability to build financial resilience and maintain cash flow stability is an important factor in determining the financial performance of manufacturing companies in Indonesia.

Financial Resilience and Its Measurement

Financial resilience refers broadly to a firm's capacity to absorb financial pressure, maintain operational continuity, and adapt to shocks through liquidity, financing flexibility, and cash-flow management (Rezaei Soufi et al., 2023). In this study, financial resilience is proxied by the Debt-to-Equity Ratio (DER), calculated as total debt divided by total equity. DER captures one dimension of resilience capital structure and reliance on debt but does not directly measure liquidity reserves, cash-flow adequacy, or the ability to absorb shocks. A higher DER generally indicates greater leverage and cannot automatically be interpreted as stronger resilience. Accordingly, the results are interpreted cautiously as results for the DER-based proxy, not as a comprehensive measure of financial resilience.

Cash Flow Volatility

Cash flow volatility (CFV) is the degree of fluctuation in operating cash flows over time and indicates the predictability of internally generated cash resources (Ball & Nikolaev, 2022). It is measured as the standard deviation of annual operating cash flows, using the financial information described in Table 2. Higher values indicate greater variability in operating cash flows, which may complicate working-capital management, financial planning, and the fulfillment of operating obligations.

Financial Performance

Financial performance refers to a firm's ability to use its assets and other resources to generate earnings. This study measures financial performance using Return on Assets (ROA), calculated as net income divided by total assets. ROA reflects the profitability generated from the asset base and is obtained from company financial statements (Arifaj et al., 2023; Zhang et al., 2023).

Hypothesis Development

The Simultaneous Effect of Financial Resilience and Cash Flow Volatility on Financial Performance

Financial resilience and cash flow volatility represent complementary dimensions of a firm's financial condition. Financial resilience reflects a firm's capacity to absorb financial pressure and maintain business continuity, whereas cash flow volatility reflects the uncertainty surrounding operating cash flows. Considering both variables simultaneously provides a more comprehensive understanding of financial performance because profitability depends not only on the firm's ability to withstand financial shocks but also on the stability of cash resources generated from operations. For manufacturing companies, these conditions are particularly important because adequate financial resources and stable cash flows are required to support production, working capital, investment, and financial obligations (Ball & Nikolaev, 2022; Rezaei Soufi et al., 2023).

From an Agency Theory perspective, managers are entrusted by shareholders to manage corporate resources, while information asymmetry may arise because managers possess greater knowledge of the firm's financial condition and operating activities. Strong financial resilience provides managers with greater flexibility to respond to financial pressures, while relatively stable cash flows improve the predictability of resources available for managerial decisions (Arifaj et al., 2023). These conditions can support more efficient

resource allocation, strengthen shareholder monitoring, and reduce financial distress and agency costs. Conversely, weak financial resilience combined with high cash flow volatility may increase financial constraints, managerial uncertainty, information asymmetry, and opportunities for inefficient resource allocation (Qaisar et al., 2025; Rezaei Soufi et al., 2023). Consequently, the joint condition of financial resilience and cash flow stability is expected to influence the effectiveness of managerial decisions and, ultimately, corporate financial performance (Zhang et al., 2023).

The 2020–2024 period includes pandemic-related disruptions and the subsequent recovery, which provide context for why capital structure and operating cash-flow stability are important to manufacturing firms. Because the model does not separately estimate period effects, this context does not imply that the study tests differences among the pre-COVID, during-COVID, and post-COVID periods.

H₁: The DER-based financial-resilience proxy and cash flow volatility jointly affect the financial performance of manufacturing companies in Indonesia.

The Effect of Financial Resilience on Financial Performance

Financial resilience reflects a firm's ability to absorb financial pressure, maintain business continuity, and recover from economic disruptions through adequate liquidity, a healthy capital structure, and financial flexibility (Rezaei Soufi et al., 2023). These capabilities are particularly important for manufacturing companies because their operations require substantial working capital and fixed-asset investment and are exposed to fluctuations in raw material prices, market demand, supply-chain conditions, and production costs. From an Agency Theory perspective, managers are responsible for managing corporate resources on behalf of shareholders and generally possess greater information about the firm's liquidity, financing capacity, and operational risks (Marsat et al., 2021). Therefore, managers' decisions regarding liquidity, capital structure, financing, and resource allocation determine whether corporate resources are managed efficiently and aligned with shareholders' interests. Strong financial resilience indicates managers' ability to anticipate financial risks, preserve financial flexibility, and maintain operational continuity (Juan & Li, 2023).

Financial resilience can further reduce potential agency problems by limiting financial constraints that may encourage managers to

prioritize short-term interests (Wójtowicz & Hodźić, 2022). Adequate liquidity allows firms to meet operational and financial obligations without excessive reliance on external financing, while a healthy capital structure provides flexibility in responding to unexpected financial pressures. Effective management of these financial conditions can reduce the likelihood of financial distress, preserve productive investment capacity, and improve resource utilization, ultimately supporting financial performance. Empirical evidence confirms this relationship: financially resilient firms are better able to overcome economic shocks and maintain profitability (Alam et al., 2024), achieve stronger performance during crises (Marsat et al., 2021) and sustain performance through effective liquidity management and financing structures. Financial flexibility also enables firms to adjust investment and cost decisions in response to changing economic conditions (Lee & Chen, 2022; Zhang et al., 2023).

The importance of financial resilience became particularly evident during the COVID-19 pandemic, when manufacturing firms faced simultaneous disruptions in supply chains, production, labor availability, consumer demand, and operating cash flows (Chen & Nguyen, 2025). During this period, managerial decisions concerning liquidity preservation, financing, investment, and operational continuity became critical for maintaining firm performance. While financial resilience primarily helped firms manage conventional business risks in the pre-COVID-19 period, it served as an important financial buffer against the systemic shock during COVID-19 and remained relevant in the post-COVID-19 period as firms restored operations and adapted to changing market conditions. Thus, stronger financial resilience enables managers to mitigate financial constraints and agency problems while maintaining efficient resource utilization, leading to better financial performance. Accordingly, the following hypothesis is proposed:

H₂: The DER-based financial-resilience proxy has a positive association with the financial performance of manufacturing companies in Indonesia.

The Effect of Cash Flow Volatility on Financial Performance

Cash flow volatility refers to the degree of fluctuation and uncertainty in a firm's operating cash flows over time (Ball & Nikolaev, 2022). Stable operating cash flows provide greater certainty regarding the availability of financial resources for production, working capital, investment, debt repayment, and other operating activities, whereas

high volatility increases liquidity risk, financing requirements, and difficulties in financial planning (Lulaj & Miguez-Vera, 2024). Under Agency Theory, shareholders delegate decision-making authority to managers who possess greater information about the firm's operations and financial condition. This information advantage creates information asymmetry, making it more difficult for shareholders to determine whether cash flow fluctuations arise from external business conditions, inefficient resource allocation, or managerial decisions. Consequently, high cash flow volatility may increase managerial discretion and agency costs, particularly when unstable cash flows constrain long-term planning and create incentives for managers to prioritize short-term financial objectives (Ahmad et al., 2024).

Empirical evidence generally indicates that high cash flow volatility is associated with greater financial risk and weaker financial performance. Firms with volatile cash flows tend to face higher external financing costs because creditors and investors perceive them as riskier (Nikbakht, 2024), while high volatility can reduce profitability and operational efficiency (Khresat et al., 2023). Similarly, Arifaj et al., (2023); Bamsaye et al., (2025) found that cash flow volatility increases liquidity risk and capital costs, thereby negatively affecting corporate performance. Rompotis, (2024) also showed that firms with unstable cash flows tend to experience weaker financial outcomes. These effects became particularly relevant during the COVID-19 pandemic, when production disruptions, supply-chain interruptions, changes in consumer demand, delayed customer payments, and labor constraints increased uncertainty in manufacturing firms' operating cash flows. Thus, the pre-COVID-19 period represents relatively normal operating

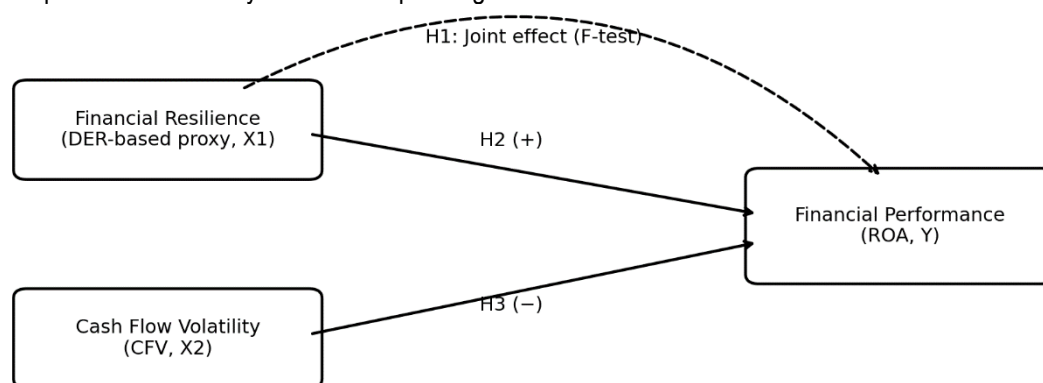
conditions, the during-COVID-19 period captures heightened cash flow uncertainty caused by the systemic shock, and the post-COVID-19 period reflects recovery accompanied by continuing adjustments in demand, input prices, financing costs, and supply-chain conditions (Olagunju et al., 2022; Roqijah et al., 2022).

Taken together, persistent cash flow volatility can increase information asymmetry and managerial uncertainty while limiting the firm's ability to allocate resources efficiently and maintain stable operations. More predictable operating cash flows, in contrast, provide managers with a stronger basis for financial planning and enable shareholders to evaluate managerial decisions more effectively. Therefore, higher cash flow volatility is expected to increase financial risk, constrain managerial and operational flexibility, and ultimately weaken corporate financial performance. Based on these arguments, the following hypothesis is formulated:

H₃: Cash flow volatility has a negative effect on the financial performance of manufacturing companies in Indonesia.

RESEARCH METHODOLOGY

This quantitative study uses an associative research design to examine the relationship of financial resilience, proxied by the Debt-to-Equity Ratio (DER), and cash flow volatility with financial performance, measured by ROA. Figure 1 presents the conceptual framework and identifies all three hypotheses: H1 represents the joint statistical significance of both independent variables, tested using the F-test; H2 and H3 represent the respective partial relationships, tested using t-tests. The conceptual relationship and the three hypotheses are illustrated in Figure 1:



Source: Developed by the authors based on the research hypotheses (2026)

Figure 1. Conceptual Framework.

The dependent variable, financial performance (FP), is measured by ROA. Cash flow volatility (CFV) is measured as the standard deviation of operating cash flows; the manuscript should specify the exact calculation window and scaling used in the dataset (for example, whether cash flow is scaled by total assets before calculating the standard deviation). The variable labelled financial resilience (FR) is operationalized as the debt-to-equity ratio (DER). Because DER directly measures leverage and has no unambiguously positive direction as a resilience measure, the variable is more precisely described as a leverage-based proxy. A higher DER may increase financing capacity in some circumstances but can also increase financial distress risk. This construct-proxy limitation is material to interpreting the positive estimated coefficient. ROA is calculated as net income divided by total assets, and all formulas should be applied consistently across firm-years.

The population comprises all manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 observation period. Manufacturing companies were selected as the population because this sector plays an important role in the Indonesian economy and is characterized by substantial operating activities, capital requirements, and cash flow fluctuations. These characteristics make manufacturing companies relevant for examining the relationship between financial resilience, cash flow volatility, and corporate financial performance.

The observation period of 2020–2024 was selected because it covers three distinct economic conditions, namely the period preceding the COVID-19 pandemic, the period during the pandemic, and the period of economic recovery following the pandemic. This period therefore provides an appropriate setting for examining whether companies with stronger financial resilience are better able to maintain their financial performance amid changes in economic and operating conditions. Furthermore, the period captures substantial variations in business activity, operating cash flows, capital structures, and financial performance among Indonesian manufacturing companies.

The reported screening table identifies 300 firms in the initial population and 44 eligible firms after exclusions, producing 220 firm-year observations (44 firms $\times$ 5 years). This arithmetic is consistent with a balanced panel if each selected firm contributes one valid observation for every year from 2020 to 2024. The final dataset should therefore be checked against the original company-year records

to confirm that no observations are missing and that the screening categories are mutually exclusive.

The sample selection process was conducted by comparing the initial population against each criterion sequentially. Companies that failed to satisfy one or more of the criteria were excluded from the sample. This procedure was intended to ensure that the final sample consisted only of manufacturing companies with sufficiently complete, consistent, and comparable financial information. Because the study uses annual panel observations, each company that satisfies the selection criteria contributes observations for each year from 2020 to 2024. Thus, the final number of observations is determined by multiplying the number of eligible companies by the five-year observation period, subject to the availability and completeness of the required data.

The sample was selected using purposive sampling. The initial population comprised manufacturing companies listed on the IDX during 2020–2024. Companies were screened against the criteria in Table 1, focusing on continuous annual-report availability, identifiable manufacturing activities, complete data for calculating all study variables, and continuity of corporate identity during the observation window.

The following criteria were applied in selecting the final sample, Manufacturing companies listed on the Indonesia Stock Exchange during the 2020–2024 period; Companies that consistently published annual financial statements for the entire 2020–2024 observation period, allowing the required variables to be measured consistently across the study period; Companies that provided sufficient and analyzable financial information, particularly information relating to total assets, operating cash flows, and capital structure, which are required to calculate the research variables; Companies whose business activities and financial information were clearly identifiable and comprehensible, ensuring that the observations could be classified consistently within the manufacturing sector; Companies that did not experience delisting, acquisition, or merger during the 2020–2024 observation period, because such corporate actions may substantially alter the company's financial structure and operating characteristics and could reduce the comparability of observations across years; Companies with data that allowed all research variables to be calculated for the required observation period. Observations with insufficient information to calculate the variables were excluded from the final sample.

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the final number of observations is determined by multiplying the number of eligible companies by the five-year observation period, subject to the availability and completeness of the required data.

The screening criteria were applied sequentially. The final sample comprises 44 eligible companies observed over five years, producing 220 firm-year observations. Table 1 reports the number of companies excluded at each screening stage.

Table 1. Sample Selection Process

No.	Sample Selection Criteria	Number of Companies
1	Manufacturing companies listed on the IDX during 2020–2024	300
2	Companies that did not consistently publish annual financial statements during 2020–2024	(35)
3	Companies with incomplete data required to measure the research variables	(160)
4	Companies whose principal business activities could not be verified as belonging to the manufacturing sector from IDX/company disclosures	(25)
5	Companies delisted during 2020–2024 or involved in a merger/acquisition that prevents consistent identification or comparability of the same reporting entity across the five-year period	(36)
6	Final eligible companies (5 years)	44
7	Total firm-year observations	220

Source: Authors' compilation based on IDX company screening and annual reports (2020–2024).

Based on the sample selection process, the final sample consists of 44 manufacturing companies that meet all predetermined selection criteria. With a five-year observation period from 2020 to 2024, the study generates a total of 220 firm-year observations. The use of firm-year observations enables the study to capture variations in financial resilience, cash flow volatility, and financial performance both across companies and over time. The balanced panel structure further ensures that each selected company provides complete observations throughout the observation period, thereby enhancing the consistency and comparability of the data used in the empirical analysis

Financial resilience is proxied by the Debt-to-Equity Ratio (DER), calculated as total debt

divided by total equity. DER is used because capital structure is one observable dimension of a firm's financial capacity and financing risk in publicly available financial statements. Nevertheless, DER alone does not capture the broader dimensions of resilience such as liquidity, cash-flow adequacy, and shock-absorption capacity and a higher DER does not necessarily indicate greater resilience. This limitation is considered when interpreting the findings. Cash flow volatility is measured using the standard deviation of operating cash flows, while financial performance is measured using ROA. Table 2 presents the operational definitions, measures, and data sources. The operational definitions and measurements of all variables are presented in Table 2.

Table 2. Operationalization and Measurement of Variables

Variable	Indicator	Data Source
Financial resilience proxy (DER)	Debt-to-Equity Ratio (total debt ÷ total equity); a capital-structure proxy, not a comprehensive measure of resilience	Company Annual Financial Statements Rezaei Soufi et al. (2023)
Cash Flow Volatility (CFV)	Standard deviation of annual operating cash flows	Company Cash Flow Statements Ball and Nikolaev (2022)

Financial Performance (FP)	Return on Assets (ROA)	Company Financial Statements (Arifaj et al., 2023)
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Source: Authors' elaboration based on Rezaei Soufi et al. (2023), Ball and Nikolaev (2022), and Arifaj et al. (2023); company annual financial statements and cash flow statements (2020–2024)

The study uses secondary data obtained from the annual financial statements of manufacturing companies listed on the Indonesia Stock Exchange. To examine the causal relationships among the variables, the following multiple linear regression model is employed:

$$FP_{it} = \alpha + \beta_1 FR_{it} + \beta_2 CFV_{it} + \varepsilon_{it}$$

where:

- FP = Financial Performance
- FR = Financial Resilience
- CFV = Cash Flow Volatility
- α = Constant
- β_1, β_2 = Regression coefficients
- ε = Error term

Prior to conducting the regression analysis, the study performs a series of classical assumption tests, including multicollinearity, heteroscedasticity, and autocorrelation tests. These tests are conducted to ensure that the regression model satisfies the underlying statistical assumptions and produces reliable and valid parameter estimates. Hypothesis testing is subsequently performed using the t-test, F-test, and coefficient of determination (R^2). The t-test is used to assess the partial effect of each independent variable on financial performance, while the F-test evaluates the simultaneous effect of financial resilience and cash flow volatility on financial performance. The F-test is used to examine H_1 , which states that Financial Resilience and Cash Flow Volatility simultaneously affect Financial Performance. The t-test is used to examine H_2 and H_3 , where H_2 predicts a positive effect of Financial Resilience on Financial Performance and H_3 predicts a negative effect of Cash Flow Volatility on Financial Performance. The coefficient of determination (R^2) is

used to assess the extent to which the independent variables explain variations in the financial performance of manufacturing companies.

Overall, this empirical model is designed to provide evidence regarding how financial resilience and cash flow volatility influence the financial performance of Indonesian manufacturing companies, particularly during a period characterized by significant economic disruption and recovery. By covering the pre-pandemic, pandemic, and post-pandemic periods, the study is expected to provide a more comprehensive understanding of the extent to which firms' financial structures and operating cash flow stability contribute to their ability to maintain financial performance under changing economic conditions.

RESULTS AND DISCUSSION

Result

The sample contains 220 firm-year observations for each reported variable. The mean ROA is 0.0857 (8.57%), with a standard deviation of 0.0423 and a range from 0.012 to 0.215. These figures indicate that the sampled firms generated positive average accounting returns, although profitability varied across firm-year observations. The mean DER-based financial-resilience proxy is 1.527, with a standard deviation of 0.431 and values ranging from 0.85 to 2.85. Because this measure captures leverage, the variation should be interpreted as differences in capital structure rather than unambiguously as differences in financial resilience. Cash flow volatility has a mean of 0.0972, a standard deviation of 0.0451, and values ranging from 0.020 to 0.235. This variation indicates differences in the stability of operating cash flows across the sampled observations.

Table 3. Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Financial Performance (ROA)	220	0.0857	0.0423	0.012	0.215
Financial Resilience Proxy (DER)	220	1.527	0.431	0.85	2.85
Cash Flow Volatility (CFV)	220	0.0972	0.0451	0.020	0.235

Source: STATA Output (2026)

Financial resilience (FR) has a mean value of 1.527, with a standard deviation of 0.431 and values ranging from 0.85 to 2.85. This result

indicates that the sampled companies exhibited varying levels of financial resilience. The variation in FR suggests differences in firms' financial structures

and their capacity to maintain financial stability when facing changes in economic and business conditions. Meanwhile, cash flow volatility (CFV) has a mean value of 0.0972 (9.72%), with a standard deviation of 0.0451 and values ranging from 0.020 (2.0%) to 0.235 (23.5%). The results indicate that, on average, manufacturing companies experienced a moderate degree of operating cash flow volatility. However, the relatively high maximum value suggests that some firms experienced substantially greater fluctuations in operating cash flows. High cash flow volatility may increase liquidity risk and create greater uncertainty in financial planning and short-term operational decision-making. Overall, the descriptive statistics demonstrate substantial

heterogeneity among Indonesian manufacturing companies in terms of financial performance, financial resilience, and cash flow stability. These variations provide an empirical basis for further examining whether differences in financial resilience and cash flow volatility are associated with differences in firms' financial performance.

Classical Assumption and Diagnostic Tests

Normality Test

The normality in Table 4 shows that the test produces a probability value of 0.393, which is greater than 0.05. Therefore, the null hypothesis of normally distributed residuals cannot be rejected, indicating that the residuals are normally distributed.

Table 4. Normality Test

Variable	Obs	Pr (Skewness)	Pr (Kurtosis)	Adj Chi ²	Prob>Chi ²
Financial Resilience Proxy (DER)	220	0.384	0.271	1.87	0.393

Source: STATA output (2026)

Multicollinearity Test

The multicollinearity test in Table 5 shows that the VIF values for Financial Resilience and Cash Flow Volatility are both 1.27, with a mean VIF of 1.27. All VIF values are substantially below the commonly

applied threshold of 10, indicating that there is no evidence of serious multicollinearity among the independent variables. Therefore, the independent variables can be simultaneously included in the regression model.

Table 5. Multicollinearity Test

Variable	VIF	1/VIF
Financial Resilience Proxy (DER)	1.27	0.787
Cash Flow Volatility (CFV)	1.27	0.787
Mean VIF	1.27	

Source: STATA output (2026)

Heteroscedasticity Test

Table 6 presents the results of the heteroscedasticity test. The Breusch–Pagan/Cook–Weisberg test reports a χ^2 statistic of 1.64 and a p-

value of 0.440. Because the p-value is greater than 0.05, the null hypothesis of constant variance cannot be rejected. Therefore, the model does not exhibit statistically significant heteroscedasticity

Table 6. Heteroscedasticity Test

Test	Chi-square	Prob > chi2	Decision
Breusch–Pagan / Cook–Weisberg	1.64	0.440	No heteroscedasticity

Source: STATA output (2026)

Autocorrelation Test

The Wooldridge test presented in Table 7 produces a probability value of 0.185, which exceeds the 5% significance level. Thus, there is no

statistically significant evidence of first-order autocorrelation in the panel data. This indicates that the residuals do not exhibit a systematic serial correlation problem across the observation period.

Table 7. Autocorrelation Test

Test	F-Statistic	Prob > F	Decision
Wooldridge Test for Autocorrelation	1.87	0.185	No autocorrelation

Source: STATA output (2026)

Regression Results

The regression results table 8 show an R value of 0.326, indicating a positive overall association between the independent variables Financial Resilience (FR) and Cash Flow Volatility (CFV) and Financial Performance. The R value represents the correlation between the observed values of Financial Performance and the values predicted by the regression model. Thus, the value of 0.326 indicates a relatively modest overall relationship between the explanatory variables and Financial Performance. The coefficient of determination (R^2) is 0.106, indicating that Financial Resilience and Cash Flow Volatility jointly explain approximately 10.6% of the variation in Financial

Performance. The remaining 89.4% is explained by other factors that are not included in the model. The Adjusted R^2 of 0.098 indicates that after adjusting for the number of explanatory variables, approximately 9.8% of the variation in Financial Performance is explained by the model. The simultaneous F-test produces an F-statistic of 12.89 with a p-value of 0.000, which is below the 5% significance level. Therefore, the null hypothesis that Financial Resilience and Cash Flow Volatility have no joint effect on Financial Performance is rejected. This indicates that Financial Resilience and Cash Flow Volatility jointly have a statistically significant effect on Financial Performance.

Table 8. Simultaneous Effect Test (F-Test)

Hypothesis	R	R^2	Adjusted R^2	F-statistic	Prob > F	Decision
DER proxy and CFV → Financial Performance	0.326	0.106	0.098	12.89	0.000	Supported

Source: STATA Output (2026)

Table 9. Partial Effect Test (t-Test)

Variable	Coefficient (Coef.)	Std. Error	t-statistic	P-value	Decision
Financial Resilience Proxy (DER)	0.0456	0.0121	3.77	0.030	Supported
Cash Flow Volatility (CFV)	-0.0628	0.0185	-3.40	0.011	Supported
Constant (_cons)	0.0234	0.0112	2.09	0.038	

Source: STATA Output (2026)

The partial regression results presented in Table 9 provide further evidence that Financial Resilience (FR) has a positive and statistically significant effect on financial performance. The coefficient of FR is 0.0456, with a t-statistic of 3.77 and a p-value of 0.030, which is below the 5% significance level. Therefore, H2 is supported. This finding indicates that an increase in financial resilience is associated with an improvement in firms' financial performance, as measured by ROA. The positive coefficient suggests that companies with stronger financial resilience are better positioned to maintain and improve their ability to generate returns from their assets. In contrast, Cash Flow Volatility (CFV) has a negative and statistically significant effect on financial performance. The coefficient of CFV is -0.0628, with a t-statistic of -3.40 and a p-value of 0.011. Because the p-value is below the 5% significance level, H3 is supported. This result indicates that higher volatility in operating cash flows is associated with lower financial performance.

Greater fluctuations in cash flows may increase liquidity uncertainty, constrain firms' ability to plan and allocate financial resources efficiently, and ultimately reduce their capacity to generate returns from assets.

Discussion

The Simultaneous Impact of Financial Resilience and Cash Flow Volatility on Financial Performance

The first hypothesis examines whether the DER-based financial-resilience proxy and Cash Flow Volatility (CFV) jointly affect the financial performance of manufacturing companies in Indonesia. The F-test evaluates the joint statistical significance of both predictors. As presented in Table 8, the model produces an F-statistic of 12.89 with $p < 0.001$. Therefore, H1 is supported. This is a test of joint significance, not a test of differences across COVID-19 periods.

The significant simultaneous effect indicates that financial performance cannot be explained solely by a firm's ability to withstand financial pressure or by the stability of its operating cash flows in isolation. Financial resilience represents the firm's capacity to maintain financial flexibility and absorb financial shocks, whereas cash flow volatility reflects instability in the generation of operating cash resources (Zahedi et al., 2022). These two dimensions are particularly important for manufacturing companies because their operations require continuous financial resources to purchase raw materials, maintain inventories, finance receivables, pay employees and suppliers, service debt, and maintain productive assets. Consequently, firms with stronger financial resilience and better-controlled cash flow volatility are more capable of maintaining their operating cycles and efficiently utilizing assets to generate returns.

The simultaneous relationship is particularly relevant during the 2020–2024 observation period, which encompasses the pre-COVID, COVID-19, and post-COVID recovery periods. During the pandemic, manufacturing companies faced simultaneous demand-side and supply-side pressures, including changes in consumer demand, restrictions on business activities, supply-chain disruptions, difficulties in obtaining raw materials, and uncertainty regarding working capital and financing (Chen & Nguyen, 2025; Juan & Li, 2023). Under these conditions, financial resilience provided firms with the capacity to absorb financial shocks, while stable operating cash flows supported the continuity of day-to-day activities. A firm with strong financial resources but highly volatile operating cash flows could still face difficulties in financing operations, while a firm with stable cash flows but weak financial resilience could lack sufficient capacity to absorb major external shocks. Thus, the simultaneous significance of FR and CFV indicates that both financial capacity and cash-flow stability are complementary components of corporate financial health (Hamid et al., 2023).

From the perspective of agency theory, the simultaneous effect can be interpreted through managerial stewardship and resource-allocation decisions. Managers are responsible for maintaining financial flexibility while ensuring that operating resources are efficiently utilized. Strong financial resilience provides managers with greater flexibility to respond to external shocks, whereas relatively stable operating cash flows reduce uncertainty concerning the availability of internal funds. This condition can reduce the pressure to undertake short-term decisions that may negatively affect long-

term shareholder value. The finding is consistent with Rezaei Soufi et al., (2023); and Wójtowicz & Hodźić, (2022) regarding the role of financial resilience in navigating economic uncertainty, while the importance of cash-flow stability is consistent. The present study extends these arguments by demonstrating that both dimensions jointly contribute to explaining accounting-based financial performance.

Overall, the significant F-test provides empirical evidence that Financial Resilience and Cash Flow Volatility jointly constitute important determinants of financial performance. The result suggests that manufacturing companies need to manage not only their financial capacity but also the predictability and stability of operating cash flows. During periods of economic disruption, financial resilience can function as a buffer against financial pressure, while lower cash-flow volatility can support working-capital management and operational continuity (Alam et al., 2024). During economic recovery, these capabilities can further enable firms to restore production, rebuild inventories, finance investment, and respond to recovering market demand. Therefore, H1 confirms that financial performance is better understood through the combined influence of financial resilience and cash-flow stability rather than through either factor independently.

The Impact of Financial Resilience on Financial Performance

The second hypothesis examines the association between the DER-based financial-resilience proxy and financial performance. Table 9 reports a positive coefficient of 0.0456 ($t = 3.77$; $p = 0.030$), so H2 is statistically supported as formulated. Because the proxy is DER, this finding means that a higher debt-to-equity ratio is positively associated with ROA in this sample. It does not establish that a higher DER means greater financial resilience; rather, it may reflect the sample-specific relationship between debt financing and profitability. DER does not directly measure liquidity, cash-flow adequacy, or the ability to absorb shocks, and this proxy limitation must be considered when interpreting the result.

The positive relationship suggests that financial resilience should not be viewed merely as a defensive mechanism for surviving financial distress but also as a strategic financial capability. Manufacturing companies require continuous financial resources to purchase raw materials, maintain inventories, finance receivables, pay employees and suppliers, service debt, and maintain production facilities (Kuroni et al., 2023). Firms with

stronger financial resilience possess greater flexibility to meet these obligations and maintain their operating cycles when financial conditions become uncertain. Such flexibility can prevent abrupt reductions in production, inefficient asset utilization, delayed payments, or costly emergency financing (Rezaei Soufi et al., 2023). Consequently, stronger financial resilience can support the efficient utilization of productive assets and contribute to higher ROA.

The relationship becomes particularly meaningful in the context of the 2020–2024 period, which captures the pre-COVID, pandemic, and post-pandemic recovery phases. During COVID-19, manufacturing companies experienced significant disruptions in demand, supply chains, production activities, raw-material availability, and working-capital requirements (Boshnak, 2023). Firms with weak financial resilience were more exposed to liquidity pressures because declining or unstable revenues occurred while financial obligations continued. In contrast, financially resilient companies were better able to absorb temporary shocks without immediately disposing of productive assets or substantially reducing essential operations (Juan & Li, 2023). During the subsequent recovery, these firms could also utilize their financial flexibility to restore inventories, increase production, finance investment, and respond to recovering demand, indicating that resilience provides benefits beyond crisis survival.

From the perspective of Agency Theory, the positive relationship between financial resilience and financial performance may reflect the quality of managerial stewardship. Managers who maintain an appropriate financial structure, control financial risks, and preserve adequate financial flexibility demonstrate their ability to manage corporate resources in a manner consistent with long-term shareholder interests (Hamid et al., 2023; Lee & Chen, 2022). During periods of uncertainty, stronger financial resilience provides managers with greater discretion to preserve productive resources rather than being forced into value-destroying short-term decisions. The present finding extends this literature by linking financial resilience directly to ROA.

Overall, the evidence supports H2, demonstrating that financial resilience has a positive and statistically significant effect on financial performance. Financial resilience represents an economically relevant component of corporate profitability, although it is not the sole determinant of ROA. Financial resilience enables firms to absorb shocks, maintain operational continuity, preserve productive assets, and respond more effectively to recovery opportunities. Importantly, resilience does

not necessarily mean minimizing debt or maximizing liquidity; rather, it concerns maintaining an appropriate level of financial flexibility relative to operating requirements and risk exposure (Qaisar et al., 2025). Thus, the finding indicates that effective financial resilience can contribute to both corporate stability and the preservation and improvement of financial performance.

The Impact of Cash Flow Volatility on Financial Performance

The third hypothesis examines whether Cash Flow Volatility (CFV) has a negative effect on the financial performance of manufacturing companies in Indonesia. The regression results presented in Table 9 show that Cash Flow Volatility has a negative coefficient of -0.0628 , with a *t*-statistic of -3.40 and a *p*-value of 0.011 . Since the *p*-value is below the 5% significance level and the coefficient is negative, H3 is supported. The coefficient indicates that, *ceteris paribus*, a one-unit increase in cash flow volatility is associated with an estimated 0.0628 -unit decrease in ROA, holding other factors constant. This finding demonstrates that greater instability in internally generated operating cash flows is significantly associated with weaker financial performance.

The negative relationship indicates that the stability of operating cash flows is an important component of corporate financial performance. Operating cash flow represents cash generated from the firm's core activities, while cash flow volatility reflects the degree to which this cash generation fluctuates over time (Banimahd et al., 2021). Persistent or excessive volatility can create difficulties in financing working capital, paying suppliers, servicing short-term obligations, and maintaining production activities, even when the firm continues to report accounting profits (Lulaj & Minguez-Vera, 2024). This issue is particularly important for manufacturing companies because their operating cycles involve substantial investments in raw materials, inventories, receivables, production processes, and finished goods. When cash inflows become unpredictable, firms may need to reduce expenditures, delay investment, increase borrowing, or utilize liquidity reserves, potentially increasing financing costs and reducing asset-utilization efficiency (Rompotis, 2024).

The negative CFV–ROA relationship is particularly relevant during the COVID-19 period and subsequent recovery. During the pandemic, manufacturing companies faced uncertainty in sales, production volumes, customer payments, inventory

requirements, supply-chain conditions, and input prices. These conditions could create substantial mismatches between cash inflows and cash outflows. Companies with highly volatile operating cash flows were therefore more vulnerable to liquidity pressure and could face greater difficulties in sustaining production and financing working-capital requirements (Ball & Nikolaev, 2022; Khresat et al., 2023). Although economic activity gradually recovered after the pandemic, firms still had to adjust to changing demand patterns, inventory normalization, input-price changes, and renewed investment requirements. Consequently, high cash-flow volatility could constrain firms' ability to finance recovery opportunities and fully utilize their productive assets.

From the perspective of Agency Theory, cash flow volatility may increase information asymmetry and managerial uncertainty. External stakeholders generally have less direct access to the operational information underlying changes in cash flows, making it more difficult to determine whether fluctuations result from legitimate economic conditions or managerial decisions. Under performance pressure, managers may also have incentives to undertake short-term actions or engage in earnings-management practices to present a more stable financial position. This interpretation is consistent with Bamisaye et al., (2025); Boshnak, (2023); and Roqijah et al., (2022) which associate cash flow volatility with greater operational, liquidity, and profitability risks.

Overall, the evidence supports H3, indicating that higher cash flow volatility is significantly associated with lower financial performance. Cash-flow instability is economically relevant in explaining variations in ROA, although it should not automatically be interpreted as evidence of poor management because some fluctuations may arise naturally from seasonal demand, business expansion, inventory accumulation, or investment activities (Olagunju et al., 2022). The finding also provides an important contrast with H2: stronger financial resilience is associated with higher financial performance, whereas greater cash flow volatility is associated with lower financial performance. Therefore, effective corporate financial management requires both sufficient financial resilience to absorb shocks and appropriate cash-flow management to maintain the predictability and sustainability of internally generated operating resources.

CONCLUSION

This study finds that the leverage-based financial-resilience proxy and cash flow volatility are jointly associated with ROA among the 44 selected manufacturing companies observed from 2020 to 2024. The regression results indicate a positive association between DER and ROA and a negative association between cash flow volatility and ROA. The model is statistically significant, although its explanatory power is limited, suggesting that additional factors contribute to differences in firm profitability. The findings should be interpreted within the scope of the selected sample, the operational measures, and the observation period. In particular, DER does not capture every dimension of financial resilience, and the 2020–2024 dataset does not permit a direct comparison with pre-pandemic conditions. The results therefore provide evidence on the association between capital-structure conditions, operating cash flow variability, and profitability during the pandemic and recovery period rather than establishing a complete three-period assessment of financial resilience.

Recommendations

Although the model is statistically significant, its relatively low explanatory power ($R^2 = 0.106$; adjusted $R^2 = 0.098$) indicates that other factors may also explain variation in financial performance. Future research should investigate additional determinants of financial performance and resilience, including corporate governance (Banimahd et al., 2021), firm size (Arifaj et al., 2023; Kuroni et al., 2023), operational efficiency (Khresat et al., 2023), investment strategies (Lee & Chen, 2022; Zhang et al., 2023), industry conditions (Boshnak, 2023), and market risk (Nikbakht, 2024). Researchers should also adopt more comprehensive measures of financial resilience by combining DER with liquidity ratios, such as the current ratio and cash ratio, cash holdings, operating cash-flow adequacy, interest coverage, debt-servicing capacity, and access to financing, or by developing a validated composite index that captures dimensions not reflected by DER alone. Furthermore, extending the observation period to include pre-pandemic, pandemic, and post-pandemic recovery years would enable a more robust assessment of differences across economic conditions. Future studies could explicitly examine these differences using period indicators, interaction terms, or subsample analyses and extend the sample across industries, firm sizes, and countries to determine whether the relationships

vary across different institutional and economic environments.

DECLARATIONS

Use of AI

During the preparation of this article, the authors used ChatGPT to assist with language checking, grammar improvement, and refinement of the manuscript's academic wording. The authors reviewed and edited the AI-assisted output as necessary and take full responsibility for the content of the publication.

Author Contributions

All authors contributed to the conceptualization, methodology, data collection and analysis, interpretation of results, manuscript preparation, revision, and approval of the final version of the article.

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Conflict of Interest

The authors declare that there is no conflict of interest that could have influenced the conduct of the research or the publication of this article.

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