

Garch-Based Sector Rotation on the Indonesia Stock Exchange: A Systematic Review

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ABSTRACT

The number of retail investors on the Indonesia Stock Exchange, mostly from younger generations, has grown rapidly, yet many of them still lack a structured, data driven investment strategy. This study aims to identify, evaluate, and synthesize the literature on multivariate generalized autoregressive conditional heteroskedasticity models, specifically Glosten Jagannathan Runkle and dynamic conditional correlation frameworks, for sector rotation strategies and portfolio backtesting on the Indonesia Stock Exchange Industrial Classification sectoral indices. A systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta Analyses two thousand twenty protocol. Records were retrieved from Semantic Scholar through Publish or Perish, and two hundred sixty two records were screened down to one hundred forty six studies using inclusion and exclusion criteria derived from the Population Intervention Comparison Outcome Context framework. Five research questions guided the thematic synthesis. The results show that the leverage effect is consistently present in the Indonesian market and is well captured by the Glosten Jagannathan Runkle framework, that inter sectoral correlations are time varying and strengthen during economic crises, and that active model based strategies tend to outperform standard buy and hold approaches. Crucially, no reviewed study integrates Glosten Jagannathan Runkle models, dynamic conditional correlation frameworks, and a multifactor rotation score into a single walk forward backtesting framework for the eleven sectoral indices. This gap directly guides future research and the practical design of investment information systems that translate complex quantitative outputs into clear, actionable signals for individual investors.

Keywords: DCC-GARCH, GJR-GARCH, IDX-IC, Sector Rotation, Systematic Literature Review

INTRODUCTION

The Indonesia Stock Exchange (IDX) has grown rapidly. Trading no longer requires a visit to a securities office, because most securities firms now provide online trading systems that serve both domestic and foreign investors. Using data from the Financial Services Authority (OJK), Azizah and Ridho (2023) report that the number of investors grew by 2.2 million from 2020 to 2021, reaching 6.1 million, with Millennials and Gen Z as the main drivers. Shares have also moved from physical certificates (*warkat*) to a scripless format, so ownership is recorded digitally and transactions can be completed online without face-to-face interaction, although over-the-counter (OTC) and cash markets remain available.

As of 2026, approximately 900 stocks are listed on the IDX and form the Composite Stock Price Index (IHSG), commonly referred to as the COMPOSITE. The IDX publishes 32 indices, including the COMPOSITE, DBX, MBX, KOMPAS100, INFOBANK15, LQ45, JII, BISNIS-27, IDXHIDIV20, IDXSMC-

COM, IDX30, Investor33, IDXBUMN20, SRI-KEHATI, IDXSMC-LIQ, MNC36, SMInfra18, ISSI, I-GRADE, JII70, PRIBANK10, ID XV30, ID XESGL, ID XG30, ID XQ30, ESGKEHATI, ESGQKEHATI, ID X80, ID XLQ45LCL, ECONOMIC30, ID XSHAGROW, and ID XMESBUMN. The IDX also maintains a dedicated industrial classification, the IDX Industrial Classification (IDX-IC), which replaced the Jakarta Stock Industrial Classification (JASICA) under circulars No. Peng-00012/BEI.POP/01-2021 and No. Peng-00105/BEI.POP/04-2021 (PT Bursa Efek Indonesia, 2021a, 2021b). The IDX-IC comprises 11 sectoral indices: ID XENERGY, ID XBASIC, ID XINDUST, ID XNONCYC, ID XCYCLIC, ID XHEALTH, ID XFINANCE, ID XPROPERT, ID XTECHNO, ID XINFRA, and ID XTRANS.

Stock market movements are closely linked to external factors such as macroeconomic conditions, which directly influence capital inflows and outflows from domestic and foreign investors. Inflation, interest rates, and the rupiah exchange rate shape market sentiment and give rise to leverage effects, in which negative news can trigger asymmetric volatility. The leverage effect refers to the different reactions of the market to positive shocks (good news) and negative shocks (bad news) (Maulana, 2022) and is closely linked to asymmetric volatility. Santoso et al. (2019) describe asymmetric volatility as a phenomenon in which volatility increases significantly more after negative shocks than after positive shocks. Recent economic fluctuations have created uncertainty that affects investor psychology, particularly in the Indonesian market. An understanding of macroeconomic conditions is therefore essential for investors to develop structured strategies and avoid impulsive reactions to market fluctuations.

Investors can choose among several techniques. Technical analysis uses historical price movements to predict future price trends (Triana & Yuliah, 2024), while value (fundamental) investing relies on indicators such as book value, intrinsic value, and market value, so that stock valuation is calculated from financial data and compared with the prevailing market price (Sitohang & Hutabarat, 2023). A third approach uses statistical models or algorithms, implemented in programming languages and tested on historical time-series data, a process commonly referred to as backtesting. Backtesting results provide valuable information on the effectiveness of strategies with equal short and long positions (hedging), long positions exceeding short positions, and short positions exceeding long positions (Ahmed, 2023). Because the Indonesian stock market does not yet allow short selling for this purpose, short strategies are not considered in this study.

Many investors do not yet have a strategic investment plan and are easily influenced by parties that offer strategies without a sound basis in technical analysis or stock valuation. One example is the “pump and dump” scheme, an illegal practice in which manipulators accumulate shares in advance, influence other investors, and sell (“dump”) once prices have soared, effectively turning unsuspecting retail investors into exit liquidity (Rasikha et al., 2022).

As a result, many retail investors have suffered losses after being used as exit liquidity, which shows why structured investment strategies matter for decision-making. Algorithmic strategies that are backtested on historical data offer one way to support such decisions, but the evidence on how these strategies, particularly those based on multivariate GARCH models, apply to the IDX-IC sectoral indices has not been systematically mapped. This study therefore conducts a systematic literature review (SLR) to identify, evaluate, and synthesize studies on the use of GJR-GARCH and DCC-GARCH models for sector rotation

and portfolio backtesting in the context of the IDX-IC, guided by five research questions (RQ1–RQ5) formulated in the Methods section.

METHODS

Review Protocol and Data Source

A systematic literature review (SLR) is a research method for collecting, critically evaluating, integrating, and presenting findings from studies related to a specific research question or topic (Sari et al., 2023). This review followed the PRISMA 2020 guidelines. Data were retrieved on March 25, 2026, from the Semantic Scholar database. Semantic Scholar was chosen as the primary information source because it returned a larger number of relevant journal articles for the selected keywords and provides open-access PDFs. The search results on multivariate GARCH were exported to a BibTeX file using the Publish or Perish (PoP) software and then screened using the PRISMA procedure.

Research Questions

The research questions were formulated using the PICOC (Population, Intervention, Comparison, Outcomes, Context) framework, which keeps the questions focused and within the defined scope (Wijaya, 2024). The components and elements of the PICOC framework used in this study are presented in Table 1.

Table 1. Components and Elements of the PICOC Framework

Component	Element	Description
Population (P)	Research object	Indonesia Stock Exchange (IDX): IDX-IC sectoral indices (11 sectors) from 2021 onward, following the transition from the JASICA classification to the IDX-IC
Population (P)	Unit of analysis	Daily returns of IDXENERGY, IDXBASIC, IDXINDUST, IDXCYCLIC, IDXNONCYC, IDXHEALTH, IDXFİNANCE, IDXPROPERTY, IDXTİCHNO, IDXINFRA, and IDXTRANS
Intervention (I)	Univariate volatility model	GJR-GARCH(1,1,1) to capture the asymmetric leverage effect (bad news > good news) on the return volatility of each sector
Intervention (I)	Correlation model	DCC-GARCH to estimate time-varying, cross-sector dynamic correlation matrices
Intervention (I)	Rotation Score strategy	Weighted composite score $w_1 \times \text{Volatility} + w_2 \times \text{Correlation} + w_3 \times \text{Leverage} + w_4 \times \text{Momentum}$ as the signal for optimal sector rotation
Comparison (C)	Baseline strategy	Buy & Hold: a passive, equal-weighted investment in all IDX-IC sectors throughout the period
Comparison (C)	Model comparison	Symmetric GARCH (without leverage effect), standalone GJR-GARCH (without DCC), and standalone DCC-GARCH (without momentum)
Comparison (C)	Alternative strategy	Rotation Score with varying weights w_1 – w_4 ; equal-weight vs. rotation-weight; walk-forward vs. in-sample
Outcomes (O)	Performance metrics	Sharpe ratio, Sortino ratio, Calmar ratio, and information ratio against the benchmark (COMPOSITE)
Outcomes (O)	Risk metrics	Maximum drawdown, Value at Risk (VaR 95%/99%), Expected Shortfall (CVaR), and portfolio volatility

Component	Element	Description
Outcomes (O)	Return metrics	Cumulative return, annualized return (CAGR), alpha against the COMPOSITE, and hit rate of rotation signals
Context (C)	Research setting	252-day (one-year) walk-forward rolling backtest simulating a sector rotation strategy on the IDX-IC
Context (C)	Market context	Emerging market with strong volatility clustering, significant leverage effects, and dynamic cross-sector correlations in the post-COVID-19 era

Based on the PICOC elements, the research questions of this study were formulated as follows:

- RQ1:** How does the GJR-GARCH model capture the leverage effect on the return volatility of the IDX-IC sectoral indices, and does bad news generate greater volatility than good news (asymmetry)?
- RQ2:** How does the DCC-GARCH model identify time-varying inter-sectoral correlation dynamics, and which sectors offer the best diversification opportunities?
- RQ3:** How effective is the Rotation Score ($w_1 \times \text{Volatility} + w_2 \times \text{Correlation} + w_3 \times \text{Leverage} + w_4 \times \text{Momentum}$) in identifying the best sectors for rotation compared with the Buy & Hold strategy?
- RQ4:** How does the walk-forward backtesting performance of the four strategies (Buy & Hold, GARCH, GJR-GARCH + DCC, and Rotation Score) compare on risk-adjusted metrics (Sharpe, Sortino, Calmar, and maximum drawdown)?
- RQ5:** What characteristic patterns of sector-specific volatility and correlation in the IDX-IC distinguish it from other emerging stock markets, and what factors influence them?

Search Strategy and Study Selection

The search combined keywords with Boolean operators as follows: ("GARCH" OR "GJR-GARCH" OR "DCC-GARCH") AND ("market volatility" OR "Indonesia Stock" OR "Indonesia Index" OR "time series analysis" OR "risk-adjusted metrics" OR "performance metrics"). The search was run in PoP on the Semantic Scholar database, and the results were analyzed quantitatively to map trends in the field. The selection procedure followed the PRISMA 2020 flow shown in Figure 1.

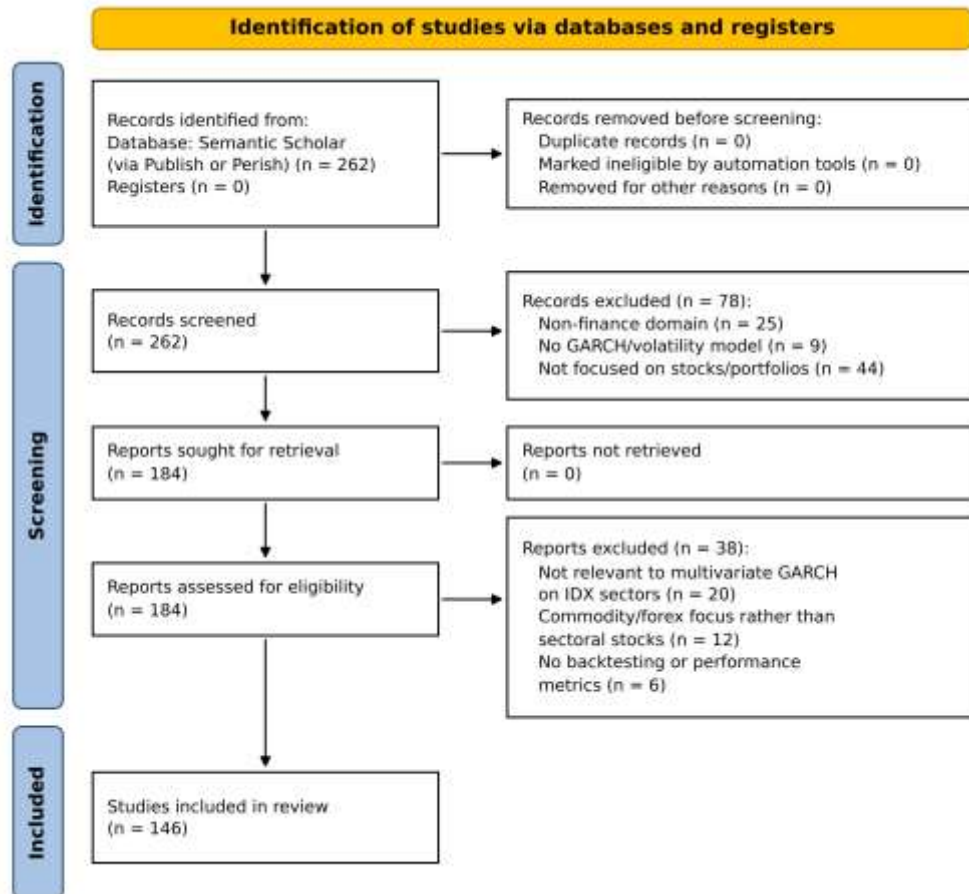


Figure 1. PRISMA 2020 Flow Diagram of Study Selection

The search identified 262 records, and no duplicates were found during the initial check. In the screening stage, 78 records were excluded as irrelevant to the research questions: 25 belonged to domains other than finance, 9 did not involve GARCH modeling or volatility analysis, and 44 were unrelated to stocks or portfolios. All of the remaining 184 reports could be retrieved in full. In the eligibility stage, 38 reports were excluded for three reasons: 20 were not relevant to multivariate GARCH modeling of IDX sectors, 12 focused on commodities rather than sectoral stocks, and 6 did not include backtesting or performance metrics. A total of 146 studies were therefore included in the synthesis. Because a single study could address more than one research question, the numbers of studies per RQ reported below overlap.

RESULT AND DISCUSSION

This section answers each research question based on the 146 included studies and then summarizes the research gaps that emerge from the synthesis.

RQ1: Leverage Effect and GJR-GARCH

RQ1 examines how GJR-GARCH identifies the leverage effect in market volatility and whether this effect is accompanied by asymmetric volatility. Of the 38 studies addressing RQ1, the literature consistently shows that symmetric GARCH models cannot fully capture the actual volatility behavior of the stock market.

Maulana (2022) directly tested ten sectoral indices on the IDX and found that the GJR-GARCH(1,1,1) model captures volatility behavior effectively in the finance, agriculture, and mining sectors, confirming a significant leverage effect in which bad news (negative shocks) increases volatility more than good news (positive shocks). Danila et al. (2023) applied a similar GJR-GARCH(1,1) model to the Indonesian stock market and also found a leverage effect, indicated by a positive and significant asymmetry coefficient ($\gamma > 0$).

Wahyudi and Rahmawati (2025) reinforce the sectoral context by showing that sectoral returns in Indonesia respond asymmetrically to oil price shocks, with negative shocks raising volatility more than positive ones. Ponziani (2022), who compared ARCH, GARCH, and GJR-GARCH models on the LQ45 and SRI-KEHATI indices, reached the same conclusion, with both indices showing asymmetric return distributions. Using an EGARCH model, which is closely related to GJR-GARCH, Dewi et al. (2023) confirmed that both negative and positive shocks consistently affected volatility during the pandemic. Overall, the literature provides evidence that the leverage effect is a real and consistent phenomenon in the Indonesian stock market and that GJR-GARCH is widely used to capture it.

RQ2: Dynamic Correlation and DCC-GARCH

Of the 59 studies addressing RQ2, the literature indicates that correlations among financial assets are dynamic and change significantly with market conditions, particularly during crises. Yadav et al. (2023) applied DCC-GARCH to analyze volatility spillovers from the Chinese market to emerging economies, including Indonesia, and found that dynamic correlations rose sharply during crisis periods, implying that the benefits of diversification shrink precisely when they are most needed. Robiyanto et al. (2023) applied DCC-GARCH to the ASEAN-5 markets and found different levels of integration across countries; Indonesia showed relatively lower correlations than Singapore and Malaysia, suggesting potential for regional diversification.

Atahau et al. (2023) examined the co-movement of state-owned enterprise (SOE) stocks on the IDX using O-GARCH and found that 11 of 17 SOE stocks moved in a significantly similar way, particularly during periods of high fiscal deficits. Oktavianto et al. (2025) compared DCC with asymmetric DCC (ADCC) and found ADCC superior in capturing the asymmetric correlation response to negative shocks. Christian and Handoyo (2025) applied DCC-GARCH to compare the dynamic correlations of Bitcoin, the S&P 500, and gold with the LQ45 index in normal and crisis periods. Their results confirm that correlations involving IDX assets are time-varying and depend on market conditions, with Bitcoin providing a hedging effectiveness of 36.61% during the crisis period.

RQ3: Rotation Score Versus Buy & Hold

Of the 28 studies addressing RQ3, the literature supports the view that active strategies based on quantitative models can generate higher returns than the passive Buy & Hold strategy, provided that strict methodological requirements are met. Vo and Ślepaczuk (2022) showed on the S&P 500 index that a hybrid ARIMA-GARCH algorithmic strategy consistently outperformed passive strategies over the long term, with a significant improvement in the Sharpe ratio. In the Indonesian stock market, Yunita et al. (2025) showed that statistical arbitrage strategies produced better risk-adjusted returns than passive strategies.

Similarly, Oktavianto et al. (2025) found that DCC-GARCH-based portfolio weighting yields a more conservative risk-return profile than equal weighting. Koutsouri et al. (2021) showed that volatility-based dynamic rebalancing offers an advantage, particularly in detecting unstable market regimes, and Yasmin et al. (2025) confirmed that a mean-VaR model with ARIMA-GARCH inputs produces a more optimal portfolio than conventional approaches.

RQ4: Walk-Forward Backtesting Performance

Of the 18 studies addressing RQ4, the literature consistently emphasizes out-of-sample and walk-forward validation for a realistic evaluation of investment strategies. Kaito et al. (2025) applied the walk-forward method to LQ45 stocks and found that it produced a more realistic model evaluation than in-sample testing. Syahaza and Kirani (2026) reported that an ARIMA-GARCH model with a 180-day rolling window achieved a MAPE of 0.58% on the IHSG, demonstrating the effectiveness of rolling estimation in the Indonesian market. Syalsabila et al. (2025) compared hybrid GARCH-EVT and standard VaR models for a portfolio of 11 IDX sectors. Wulandari (2021) compared portfolio performance using the Sharpe, Treynor, and Jensen measures across Indonesia, Malaysia, China, and the United States, making it one of the few studies that use several risk-adjusted metrics simultaneously. Pardomuan et al. (2025) compared the performance of the IDX Value30 and IDX Growth30 indices using the Sharpe ratio, with the arbitrage pricing theory (APT) model as a benchmark.

RQ5: Sectoral Volatility Characteristics of the IDX-IC

Of the 80 studies addressing RQ5, the literature portrays Indonesia as an emerging market with distinctive volatility characteristics. Maulana (2022) found that the finance, manufacturing, and mining sectors exhibit a dominant leverage effect with high volatility persistence (β approaching 1). Endri et al. (2021) showed that the IHSG experienced much higher volatility during the COVID-19 pandemic than in normal periods, with persistent clustering. Nugroho and Robiyanto (2021) found that volatility on the IDX is significantly influenced by domestic and global macroeconomic variables simultaneously, while Panjaitan and Novel (2021) found that it is influenced more by Asian markets (Japan, Singapore, and South Korea) than by the United States market. Syalsabila et al. (2025), who used the 11 IDX-IC sectors directly as the unit of analysis, found that risk profiles differ significantly across sectors, with the energy and finance sectors showing high volatility.

Research Gaps

The answers to the five research questions reveal the research gaps summarized in Table 2.

Table 2. Research Gaps by Research Question

Research Question	Research Gap
RQ1: Leverage effect captured by GJR-GARCH	The leverage effect has been shown to exist consistently for the IDX as a whole and for thematic indices, but no study has systematically mapped the asymmetry coefficient (γ) for all 11 IDX-IC sectors simultaneously within a single integrated framework.
RQ2: Dynamic inter-sectoral correlation with DCC-GARCH	Existing DCC-GARCH studies focus on cross-country, cross-asset (stocks, cryptocurrencies, and gold), or cross-thematic-index correlations. No study applies DCC-GARCH specifically to the dynamic correlations among the 11 IDX-IC sectors to identify sector rotation and diversification opportunities.

Research Question	Research Gap
RQ3: Rotation Score versus Buy & Hold	Existing studies on active rotation or weighting use single-factor scores (volatility, return, or correlation alone). No study has developed a multifactor Rotation Score that combines volatility, dynamic correlation, leverage effect, and momentum for sector rotation in the IDX-IC.
RQ4: Walk-forward comparison of four strategies	No study simultaneously compares Buy & Hold, GARCH, GJR-GARCH + DCC, and Rotation Score strategies using walk-forward backtesting with a comprehensive set of risk-adjusted metrics.
RQ5: Sectoral volatility characteristics of the IDX-IC	Many studies examine IHSG volatility in aggregate, but no systematic analysis simultaneously maps volatility characteristics, leverage effects, and correlations across all 11 IDX-IC sectors in the post-reclassification period (2021–2024).

Taken together, these findings show that the individual building blocks of a GARCH-based sector rotation strategy are well supported in the literature, but they have not yet been combined and tested on the IDX-IC sectors. The evidence on leverage effects (RQ1) and dynamic correlations (RQ2) justifies the use of asymmetric and time-varying models, while the evidence on active strategies (RQ3) and walk-forward validation (RQ4) indicates how such a strategy should be evaluated. The scarcity of sector-level studies on the IDX-IC (RQ5) remains the main limitation of the current evidence base. This review is itself limited by its reliance on a single database (Semantic Scholar), which may have omitted relevant studies indexed elsewhere.

CONCLUSION

This systematic literature review identified 146 studies from 262 records using the PRISMA 2020 protocol, covering publications from 2019 to 2026. Research that combines multivariate GARCH models, sector rotation strategies, and portfolio backtesting remains very limited, particularly in the context of the Indonesia Stock Exchange.

Methodologically, the literature consistently shows that asymmetric models such as GJR-GARCH outperform symmetric GARCH models in capturing the actual volatility behavior of financial markets. The leverage effect has been observed across many markets, including Indonesia, and ignoring it in symmetric models leads to biased risk estimates. DCC-GARCH has proven effective in measuring dynamic correlations that change with market conditions, and several studies confirm that these correlations strengthen during crises. The IDX is described as an emerging market with high volatility persistence, vulnerability to regional Asian spillovers, and high sensitivity to global macroeconomic shocks. However, nearly all existing studies examine the IHSG in aggregate or thematic indices such as the LQ45 and JII, and analyses of the 11 IDX-IC sectors in effect since January 2021 remain scarce.

Quantitative, model-based strategies tend to outperform Buy & Hold, especially when supported by realistic walk-forward validation, yet no study has developed a multifactor rotation score that integrates volatility, correlation, leverage, and momentum for sector rotation in the IDX-IC. These findings support a research design that uses GJR-GARCH to capture sector-level leverage effects, DCC-GARCH to model dynamic correlations, and a multifactor Rotation Score evaluated through walk-forward backtesting with a rolling 252-trading-day window, which is consistent with current best practice.

Future research should prioritize a sector rotation framework that is updated in real time and can be integrated directly into investment information systems. For practitioners and investors, the findings suggest that sectoral strategies guided by dynamic volatility models can outperform passive strategies in the long term, particularly in emerging markets such as Indonesia, where volatility characteristics differ substantially across sectors. Implementing such strategies requires a sound understanding of model parameters and limitations, which calls for information systems that translate model outputs into investment signals that retail investors can understand.

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