Volatility Dynamics of Islamic and Conventional Equity Portfolios During COVID-19: Evidence from Fama-French and GARCH Models

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Abstract. This paper examines the performance and volatility of Islamic equity portfolios in contrast to their conventional counterparts during the pre-pandemic, COVID-19 pandemic, and post-pandemic periods. Using daily data gathered from February 2019 to December 2023, this study employs the Fama-French factor models alongside GARCH-type models to evaluate risk-adjusted returns and volatility of portfolios. Furthermore, shariah screening rules, particularly those related to debt ratios, are integrated into the portfolio construction process to assess their influence on performance. The results show that while Islamic equity portfolios generally deliver lower returns, they demonstrate significantly lower volatility. This relation implicitly suggests a trade-off between risk and return, which are amplified further during periods of market stress. These findings contribute to the growing literature on Islamic finance by demonstrating the stability provided by shariah-compliant equity portfolios. Future research may explore sector-specific performance or extend the framework to other economies.

Key words: Fama-French model, GARCH, Indonesia, Islamic equity portfolios, volatility.

Abstrak. *Penelitian ini mengkaji kinerja dan volatilitas portofolio saham syariah yang berbeda dengan portofolio konvensional selama periode pra-pandemi, pandemi COVID-19, dan pasca-pandemi. Dengan menggunakan data harian yang dikumpulkan dari Februari 2019 hingga Desember 2023, studi ini menggunakan model faktor Fama-French bersama model tipe GARCH untuk mengevaluasi pengembalian yang disesuaikan dengan risiko dan volatilitas portofolio. Lebih jauh, aturan penyaringan syariah, khususnya yang terkait dengan rasio utang, diintegrasikan ke dalam proses konstruksi portofolio untuk menilai pengaruhnya terhadap kinerja. Hasilnya menunjukkan bahwa meskipun Portofolio Ekuitas Islam umumnya memberikan pengembalian yang lebih rendah, mereka menunjukkan volatilitas yang jauh lebih rendah. Hubungan ini secara implisit menunjukkan adanya* trade-off *antara risiko dan pengembalian, yang semakin diperkuat selama periode tekanan pasar. Temuan-temuan ini berkontribusi pada literatur yang berkembang tentang keuangan Islam dengan menunjukkan stabilitas yang diberikan oleh portofolio ekuitas yang sesuai dengan syariah. Penelitian di masa mendatang dapat mengeksplorasi kinerja sektor-sektor tertentu atau memperluas kerangka kerja ke ekonomi lain..*

Kata Kunci: *GARCH, Indonesia, model Fama-French, portofolio saham syariah, volatilitas.*

INTRODUCTION

Throughout the years, the rapid development of financial markets and institutions, including stock markets, has been cited as a significant catalyst in promoting positive economic growth (Levine and Zervos, 1998; Grbić, 2020). In addition to their contribution, stock markets offer investment opportunities with the highest return potential compared to others. However, investing in the stock market is considered one of the riskiest instruments and does not guarantee certain returns. This risk is primarily due to the high volatility of stock prices, which are sensitive to various economic, political,

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and global events. Volatility reflects the degree of uncertainty and fluctuation in stock returns, making it a central concern for investors.

Moreover, since its inception, the stock market has repeatedly experienced extreme declines or crises caused by various factors, both endogenous and exogenous, including the recent crisis ignited by the COVID-19 pandemic. As documented by BBC on February 29, 2020, leading global stock indices collectively experienced year-to-date (YTD) declines, with FTSE 100 suffering the most severe drop, observed at a shocking -13.2%. The sudden drop in stock values occurred in response to economic uncertainty following the declaration of COVID-19 as a global health emergency on January 30, 2020 by the World Health Organization (WHO). Additionally, the pandemic significantly impacted market stability and investor sentiment, with the Volatility Index (VIX) experiencing a jump of 43% in a single day, reaching its highest point since the Great Recession of 2008. This surge in volatility underscored how systemic shocks can drastically alter risk perceptions and asset pricing.

Posing as a global threat, the COVID-19 pandemic also affected the Indonesian stock market. According to Sugianto (2020), the market reacted negatively, as the Composite Index (IHSG) closed with a 6.5% decline on March 9, 2020, just one day after President Joko Widodo announced the first confirmed case of COVID-19 in Indonesia, despite a temporary 1.67% hike on the day the case was announced. Furthermore, the IHSG reportedly depreciated by 16.76% month-on-month in March 2020, marking its worst monthly performance in 12 years at that time, per reports of Bareksa (2020). This period was characterized not only by declining returns but also by heightened volatility, which reflected greater uncertainty in the market. Fluctuations became more frequent and pronounced, illustrating the need to understand how different types of stocks respond to such shocks.

Source: Yahoo Finance, 2020.

Figure 1 Indonesian composite stock index (IHSG) January 2019 to December 2023

In response to repeated financial crises, Islamic finance has emerged as a potential alternative to conventional systems. Rooted in principles that prohibit excessive risk-taking and interest-based financing, Islamic finance offers unique structural safeguards—such as screening for high debt levels—which may influence both return patterns and volatility. Despite the pandemic's global shock, the Islamic financial sector continued its upward trajectory. According to the Indonesian Islamic Finance Development Report (Financial Services Authority, 2022), global Islamic financial assets reached USD 4 trillion in 2021 and are projected to reach USD 5.9 trillion by 2026. In Indonesia,

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shariah-compliant assets totaled IDR 2,375.84 trillion, with the Indonesian Shariah Stock Index (ISSI) growing 20.14% YoY in 2022. Such performance raises critical questions about the relative resilience of Islamic stocks, particularly in terms of their volatility during crisis periods.

Thus far, Islamic finance in Indonesia has undergone significant development. As reported in the Financial Services Authority (2022), total Islamic financial assets in Indonesia have reached IDR 2,375.84 trillion. Furthermore, the growth of Islamic stocks has been remarkable. According to the same source, as of December 30, 2022, the Islamic stock market in Indonesia recorded a year-on-year growth of 20.14%, with a market capitalization of IDR 4,786.02 trillion, as measured by the Indonesian Islamic Stock Index (Indeks Saham Syariah Indonesia, ISSI), which includes all shariah-compliant public companies in Indonesia. The index also recorded a year-on-year appreciation of 15.19%, indicating that the aggregate market value of Islamic stocks has increased over time. However, these impressive return figures tell only part of the story. Understanding the risk dynamics of Islamic stocks, one of them being volatility, is also crucial for evaluating their risk-adjusted performance.

Given its substantial growth and the distinct characteristics of Islamic finance, it is increasingly regarded as a viable alternative to the existing financial system, particularly in the context of capital markets and stock investments. This claim is based on specific financial criteria that must be met by companies classified as Islamic-compliant issuers, which may imply consequences in risk management. For instance, under Indonesia's regulatory framework, the debt-to-asset ratio of an Islamic-compliant company must not exceed a predetermined threshold, i.e., 45%. Thus, firms adhering to Islamic financial principles tend to exhibit lower financial leverage ratio. This characteristic enhances their resilience and risk profile, both in terms of stock performance and operational performance, as demonstrated in a prior study by Cheong (2021). The distinct characteristics that separate Islamic and conventional stocks, especially related to financials, might result in differences in performance and volatility, thus making it a valid reason for studies to delve on the market dynamics of Islamic and conventional stocks and compare them.

This claim is further supported by prior research investigating the impact of the COVID-19 pandemic on the performance and/or volatility of Islamic stocks relative to conventional stocks using various different methods. For instance, Shear and Ashraf (2022) found that Islamic stocks outperformed their conventional counterparts based on panel data regression analysis applied to daily stock price data from all companies listed on the KSE-100 index in Pakistan. Similarly, Dharani et al. (2022) examined and compared Islamic and conventional stock indices across multiple sectors, revealing that in certain sectors, Islamic stocks yielded higher returns than conventional stocks. Furthermore, their study reported that Islamic stocks exhibited lower volatility.

This study employed linear regression models, integrating them into the Fama-French five-factor model to predict stock returns, as well as the GARCH model to estimate conditional volatility. However, some studies present contradictory empirical evidence regarding the superior performance of Islamic stocks. For instance, a literature review by Foglie and Panetta (2020) highlights inconsistencies in the findings, suggesting that the superiority of Islamic stocks cannot be assumed unequivocally. These conflicting results, particularly concerning volatility, underscore the need for further investigation in emerging markets like Indonesia, where empirical evidence remains scarce.

This study aims to examine these claims by assessing the returns and volatility of both conventional and Islamic stocks by creating constrained and unconstrained portfolios, assessing their performance before, during, and after the pandemic. Furthermore, it seeks to fill gaps in the existing literature by employing a model capable of elucidating the relationship between COVID-19 and the daily performance and volatility of stocks in Indonesia, along with a strong theoretical framework explaining this relationship. This study aspires to evaluate the viability of Islamic stocks as an alternative investment to conventional stocks, thereby contributing to the advancement of Islamic finance in Indonesia and enriching the academic literature in capital markets.

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To achieve this objective, the study will construct an Islamic stock portfolio based on the Kompas-100 Index, which comprises the 100 most liquid and largest market capitalization stocks in Indonesia. Moreover, an additional portfolio containing exclusively non-shariah-compliant equities is formed as a control variable and the discrepancies in performance of the two portfolios will be the main interest of this study. To assess stock returns and volatility across the pre-pandemic, pandemic, and post-pandemic periods, observations will be conducted over the period from February 2019 to December 2023. This time frame encompasses the pre-pandemic phase, the initial outbreak, the peak of the pandemic, the transition phase, and the post-pandemic period. By focusing on both performance and volatility dynamics, the study offers a more comprehensive understanding of Islamic equities' behavior under different market conditions.

LITERATURE REVIEW

Review on Stocks and Shariah-Compliant Stocks

Stocks are among the financial instruments traded in the capital market. According to the definition provided by OJK, a stock is a type of security that signifies capital participation by an individual or entity in a company or a limited liability corporation. Ownership of stocks grants shareholders rights to a portion of the company's ownership, earnings, and assets in proportion to their holdings, as well as the right to attend a shareholders' meeting.

Meanwhile, shariah-compliant stocks are defined as equity securities that do not violate shariah principles, as they meet specific predetermined criteria. As a product of *ijtihad* (Islamic jurisprudential reasoning), the screening of shariah-compliant stocks in various countries is typically conducted in two steps: business activity screening and financial ratio screening. In Indonesia, regulations concerning shariah-compliant stocks were initially established by the Indonesian Ulema Council (Majelis Ulama Indonesia, MUI) through a *fatwa* issued by the National Shariah Board (DSN-MUI, a special division in the MUI which typically handles economic and financial-related *fatwas*) in 2003 (Fatwa No. 40) and by OJK, initially through Regulation IX.A.13 in 2006. Currently, the selection of shariah-compliant stocks is governed by OJK Regulations No. 35/POJK.04/2017 and No. 17/POJK.04/2015. These regulations ensure that, to be classified as sharia-compliant, issuers must adhere to specific rules related to business activities and financial structure.

The key restrictions that must be met include the prohibition of business activities that contravene Islamic law, such as gambling, the production and sale of alcoholic beverages (*khamr*), interest-based financial services such as conventional banking and insurance which involves usurious (*ribawi*) transactions, and the trade of unlawful (*haram*) goods and services or those deemed harmful (*mudarat*). From a financial perspective, issuers must comply with regulations stipulating that the debt-to-asset ratio should not exceed 45%, and non-halal income must not exceed 10% of total revenue.

How do Pandemics Affect Stock Market Returns and Volatility?

The COVID-19 pandemic has had a significant impact on stock markets worldwide, adversely affecting returns and volatility. The global uncertainty triggered by the pandemic led to sharp declines in stock returns across many countries, particularly during the initial waves of virus transmission and the implementation of lockdown policies. Studies indicate that increased negative investor sentiment during the pandemic generally resulted in declining stock returns, whereas positive sentiment, though less frequent, was able to boost returns, particularly in developed markets (Baker et al., 2020; Al-Awadhi et al., 2020).

Stock market volatility also rose sharply during the pandemic, exhibiting more pronounced spikes compared to other financial crises, including the Great Recession. Research suggests that COVID-19-related news, including case numbers and government policies, contributed to both short-term and long-term volatility. This heightened volatility was driven by investor reactions to economic and

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health uncertainties, as well as fiscal and monetary policies implemented by governments (Liu et al., 2020).

Implications of Shariah-Screening Criteria on Stock Performance

Recent literature has begun to distinguish between the impacts on Islamic and conventional stocks. Islamic equity markets, due to their structural characteristics—such as lower leverage, exclusion of speculative industries, and asset-backing requirements—showed relatively greater resilience during the pandemic. In the Indonesian context, shariah-compliant stocks are subject to regulatory filters by the Financial Services Authority (OJK), which limit the level of permissible debt and restrict involvement in non-compliant sectors. These structural constraints imply that Islamic stocks often have more conservative financial structures, particularly lower debt ratios.

Such characteristics are relevant when evaluating firm-level responses to systemic shocks like COVID-19. For instance, Ding et al. (2021) found that firms with higher leverage were more severely impacted during the crisis, experiencing sharper stock price declines due to increased concerns over liquidity and solvency. This finding aligns with Acharya et al. (2024), who documented that leveraged firms, including banks, experienced heightened volatility, especially before fiscal and monetary interventions stabilized markets.

In this light, the lower leverage of Islamic stocks may have acted as a buffer against extreme downside risks. These firms, due to more conservative capital structures and limited exposure to interest-based liabilities, appeared more resilient not only in terms of return preservation but also in terms of containing volatility. Consequently, the inherent financial discipline embedded in Islamic screening criteria may have mitigated the adverse impact of the pandemic shock on shariah-compliant stocks, particularly in markets like Indonesia where Islamic equity screening is stringently enforced.

A study by Ding et al. (2021) examined the key characteristics of firms categorized into five groups, one of which focused on how these characteristics influenced stock price responses to COVID-19. One of the study's main findings was that companies with higher debt ratios (leveraged firms) tended to be more vulnerable to the pandemic's impact. Highly leveraged firms faced greater liquidity and solvency pressures, leading to sharper declines in stock prices during crisis periods.

In this context, although highly leveraged firms generally achieve higher returns in stable market conditions, the findings indicate that high leverage increases their susceptibility to economic shocks, including those induced by the pandemic. This study underscores that while leverage can be beneficial during periods of economic expansion, in crisis situations such as the COVID-19 pandemic, firms with high leverage levels are more vulnerable to liquidity constraints and solvency risks, reducing their resilience to economic turmoil.

Given the profound impact of the COVID-19 pandemic on stock markets, the empirically significant market anomalies observed in shariah-compliant portfolios, and the distinctive characteristics of shariah stocks that influence their risk profiles, the intersection of these three areas has been extensively explored in prior research. Several studies, both in the Indonesian context and internationally, have examined the implications of shariah investment restrictions on stock and portfolio returns and risks. Consequently, previous research serves as an inspiration for this study, which seeks to provide updates by applying existing concepts and frameworks to current conditions.

For instance, a study by Ashraf et al. (2017) analyzed stock markets in the United States, Europe, and Japan, further distinguishing shariah-compliant stocks from the broader market within these three regions to assess the impact of shariah-based investment restrictions on the performance of Islamic equity portfolios (IEP). This research expanded upon a prior study, which also coined the term, by Derigs and Marzban (2009) concerning IEPs. To better explain shariah stock returns, the study formulated two key factors associated with these stocks—leverage and the proportion of investments in real assets. The findings revealed that shariah-compliant portfolios systematically exhibited lower

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risk (as measured by market beta) compared to unconstrained portfolios. However, the negative coefficients on leverage and real asset investment factors suggested that investors faced a return trade-off when imposing shariah investment restrictions. This study serves as a key reference for the research.

Additionally, a similar study focusing on Indonesia was conducted by Qoyum et al. (2021), which examined the performance of conventional, shariah, Socially Responsible Investments (SRI), and Islamic-SRI (ISRI) portfolios. The study utilized 302 consistently listed stocks with complete financial reports on the Indonesia Stock Exchange over the 2011–2019 period. Similar to Ashraf et al. (2017) and the present study, this research classified all consistently listed firms as an unconstrained portfolio, while ISSI (151 firms), SRI (17 firms), and ISRI (11 firms) were categorized as constrained portfolios. To evaluate portfolio performance, the study employed the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, the Carhart four-factor model, and the Fama-French five-factor model, with the latter two models demonstrating higher adjusted R-squared values. The study concluded that the ISRI portfolio outperformed even under bearish market conditions. Moreover, the ISRI portfolio exhibited lower sensitivity to the SMB factor.

This research also references Ghouse et al. (2023), which analyzed the asymmetric impact of COVID-19 waves on the volatility and performance of the KMI-30 index in Pakistan. The study found that each COVID-19 wave caused significant structural changes, as evidenced by structural break tests, with the first wave having the most substantial impact. The GJR-GARCH model was employed to capture leverage and asymmetric effects on volatility, demonstrating that negative shocks had a greater impact on volatility. The EGARCH model indicated a decline in asymmetric effects in subsequent waves. The study also found that the spillover effect of COVID-19 returns was significant in the first three waves but diminished in the fourth and fifth waves. A 60-day ahead forecast of KMI-30 variance suggested a declining conditional variance, reflecting the reduced impact of the pandemic over time.

METHOD

Data

The sample for this study consists of stocks consistently listed as constituents of the Kompas-100 (K100) index from the first major evaluation (constituent determination) in 2019, recorded on February 6, 2019, through the last trading day of the 2023 calendar year, December 29, 2023. Within this period, 52 stocks met the criteria and were selected as the sample representing the population of stocks listed on the Indonesia Stock Exchange. Market capitalization calculations reveal that the selected sample represented 65.44% of the total market capitalization of the Indonesia Stock Exchange at the beginning of the sampling period, declining to 46.8% by the end. From the sample with 52 stocks in total, a shariah portfolio consisting of 32 stocks is constructed alongside a conventional-only portfolio with 20 member equities.

Portfolios in this study are constructed using the equal weighting method, where each component in the portfolio is assigned an equal weight, irrespective of market capitalization or fundamental weighting. This approach is based on findings by Raza and Ashraf (2019), who demonstrated that equal-weighted shariah portfolios outperformed those using other weighting methods, as evidenced by statistically significant positive alpha values. Similarly, Qoyum et al. (2021) found that shariah portfolios measured using ISSI constituents exhibited higher alpha compared to value-weighted portfolios, although the results were not statistically significant.

To refine the analysis, daily risk-free returns are required to calculate excess returns for both shariah and conventional benchmark portfolios. This study uses the Bank Indonesia 7-Day Reverse Repo Rate (BI7DRR) as a proxy for the risk-free return, representing the yield from purchasing a 7-day Bank Indonesia Certificate (SBI). The daily risk-free return is derived by dividing the BI7DRR by 7,

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resulting in a daily rate of 0.008571 or 0.8571%. Excess returns are then calculated by subtracting this daily risk-free return from the portfolio's daily returns.

Methods

To model the comparison of returns between shariah and conventional stocks, this study employs the Capital Asset Pricing Model (CAPM) and its extension, the Fama-French three-factor model (Sharpe, 1964; Lintner, 1965; Fama and French, 1992). In these models, the performance of shariah portfolios or abnormal returns is explained using the alpha variable, as formulated by Jensen (1968). The CAPM, the first model in this study, is defined as follows:

$$R_{pt} - R_f = \alpha_t + \beta_1 MKT_t + \epsilon_t \quad (1)$$

where R_{pt} represents the return at time t, R_f is the daily risk-free return as defined earlier, α (as defined by Jensen, 1968) denotes abnormal returns, which are positive if the asset (in this case, the shariah portfolio) outperforms the market or its benchmark. MKT represents the market return, here the conventional portfolio return minus the risk-free return, and ϵ_t denotes the residual at time t, defined as white noise with a mean of 0 and constant variance. This literature will use two R_{pt}, utilizing both shariah portfolio and a portfolio with only non-shariah equities as its constituents, which would be referred to as a conventional portfolio in the upcoming sections.

The CAPM assumes that market returns are the sole predictor of an asset's returns. However, this assumption is challenged by findings from Fama and French (1992; 1993) and other literature, such as Basu (1983) and Bhandari (1988), which identify market anomalies linked to specific firm characteristics that explain returns. Fama and French observed that stocks with small market capitalization and high book-to-market ratios consistently outperform the market. Consequently, they developed the Fama-French three-factor model as an enhancement to the CAPM, defined as:

$$R_{pt} - R_f = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_t \quad (2)$$

Here, the SMB factor represents the difference in returns between the bottom 50% and top 50% of stocks by market capitalization, while the HML factor represents the difference in daily returns between the top and bottom quartiles (or 30%, depending on the sorting method) of stocks by book-to-market ratio. Thus, the SMB factor captures the size effect, and the HML factor captures the value effect. However, this model is insufficient to account for the impact of shariah restrictions, which prohibit a 100% shariah portfolio from investing in highly leveraged stocks, as per the criteria for shariah-compliant stocks in Indonesia. To address this, the study incorporates a leverage variable from Ashraf et al. (2017), used to model the impact of shariah restrictions on leveraged stocks on investment style or factor exposure. The equation is as follows:

$$R_{pt} - R_f = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 LEV_t + \epsilon_t \quad (3)$$

The LEV factor is calculated similarly to the HML factor, derived by subtracting the average returns of the bottom quartile of high-leverage firms from the top quartile. This factor reveals the exposure or correlation of shariah portfolios to the LEV factor and/or the sacrifice cost of avoiding leveraged stocks in shariah portfolio investments, particularly if the coefficient is negative.

The study also includes a COVID-19 pandemic dummy variable in the above equation for analysis across the entire sample period. Subsample testing is conducted using the three models above without the COVID-19 variable. For brevity, subsample analysis is not included in this concise manuscript.

The study considers both unconditional and conditional volatility, employing different methods for each. Unconditional variance is calculated using a 10-day rolling volatility to assess the volatility level over a two-week trading period. The unconditional variance equation is defined as:

$$\sigma^2 = \sum \frac{(x_i - x_\mu)^2}{N} \quad (4)$$

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This method represents a form of realized volatility, where the calculated volatility is based solely on past events. Consequently, sufficient data availability is required, and the results cannot predict future volatility. In financial data, volatility is often conditional, varying over time, a phenomenon known as time-varying volatility. Mandelbrot (1967) further identified volatility clustering, where periods of high (low) volatility are followed by similar periods.

To address these findings, Engle (1982) developed the Autoregressive Conditional Heteroskedasticity (ARCH) methodology, which uses exponential weighting of historical returns to forecast volatility. This approach assigns greater influence to more recent returns compared to older ones. The ARCH(1,1) model is defined as:

$$r_t = \mu + \epsilon_t \quad (5)$$

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 \quad (6)$$

$$\epsilon_t \sim N(0, \sigma_t^2) \quad (7)$$

Here, ϵ_t represents the residual from the mean equation r_t, and the residual at $t-1$ is used to model the variance at time t . However, the basic ARCH model is not optimal for volatility estimation due to the need to include all significant lags, which can number in the hundreds. Additionally, the model relies solely on the error term as a predictor of volatility, which is stochastic and time-dependent. Bollerslev (1986) addressed these limitations by developing the Generalized ARCH (GARCH) model, which incorporates past variances in addition to residuals. The GARCH(1,1) model is defined as:

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad (8)$$

This model resolves the lag selection issue in ARCH by using the variance at $t-1$ to estimate the variance at time t.

Despite its advancements, the GARCH model has limitations, particularly in modeling the asymmetric effects of negative shocks on volatility. Black (1976) observed that negative returns today correlate with higher future volatility. This means that there are certain impacts of adverse return innovations towards conditional volatility. To address this, Nelson (1991) proposed the Exponential GARCH (EGARCH) model, which captures the asymmetric impact of positive and negative shocks. The EGARCH(1,1) model is expressed as:

$$\log(\sigma_t^2) = \omega + \alpha_1 \frac{\epsilon_{t-1}}{\sigma_{t-1}} + \gamma_1 \left(\left| \frac{\epsilon_{t-1}}{\sigma_{t-1}} \right| - E\left(\left| \frac{\epsilon_{t-1}}{\sigma_{t-1}} \right| \right) \right) + \beta_1 \log(\sigma_{t-1}^2) \quad (9)$$

In this model, the coefficient γ_1 measures the asymmetric effect of shocks on conditional volatility. A key distinction of the EGARCH model is its use of the logarithmic form of conditional volatility, ensuring positive volatility values without parameter restrictions. Another model capable of capturing shock asymmetry is the GJR-GARCH model, proposed by Glosten et al. (1993). The GJR-GARCH(1,1) model is defined as:

$$\sigma_t^2 = \omega + \alpha_1\epsilon_{t-1}^2 + \gamma_1\epsilon_{t-1}^2 I_{t-1} + \beta_1\sigma_{t-1}^2 \quad (10)$$

Unlike the EGARCH model, the GJR-GARCH model uses a dummy variable conditional on the previous period's error term to measure the impact of negative shocks on conditional volatility, while the EGARCH model employs a logarithmic transformation. This way, the EGARCH model and the GJR-GARCH model both have similar intentions, but have different methods and thus, different mathematical implications.

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RESULTS AND DISCUSSION

Descriptive Analysis

Table 1 Descriptive statistics for shariah and conventional portfolios and factor returns

	Shariah	Conventional	Market	SMB	BTM	LEV	Covid
Mean	-0.00862	-0.00868	-0.00864	-0.00058	-0.0008	8.92E-05	0.666944
Median	-0.00828	-0.00829	-0.00824	-0.00094	-0.00108	0	1
Maximum	0.09335	0.107505	0.098795	0.048096	0.068205	0.051296	1
Minimum	-0.10377	-0.12795	-0.11307	-0.04592	-0.09332	-0.05284	0
Std Dev	0.013578	0.015403	0.013931	0.009479	0.015717	0.010198	0.471502
Skewness	-0.42702	-0.38234	-0.46306	0.165639	-0.13955	0.067184	-0.70843
Kurtosis	9.496116	9.385655	10.30224	2.60671	1.764546	2.023241	-1.49813
Jarque-Bera	4560.431	4448.542	5367.521	346.3849	160.1082	206.2632	213.3024
Probability	0	0	0	6.07E-76	1.71E-35	1.62E-45	4.81E-47
Sum	-10.3731	-10.4451	-10.4007	-0.70111	-0.96353	0.107419	803
SSE	0.311173	0.376027	0.323306	0.108488	0.297945	0.125118	803
Nr Obs	1204	1204	1204	1204	1204	1204	1204

Source: Authors, 2024 (processed data).

The Table 1 presents the descriptive statistics of excess returns for the shariah-compliant and conventional (non-shariah) portfolios, the market benchmark, as well as the factor returns (SMB, BTM, and LEV) and the Covid dummy variable, over a sample of 1,204 trading days. At first glance, both shariah and conventional portfolios recorded negative average daily excess returns, with the shariah portfolio showing a slightly smaller loss. Interestingly, although the shariah portfolio has a higher mean return, its median is slightly lower, suggesting a distribution influenced by a few positive outliers.

The most interesting part, however, is how the returns are spread in shariah equity returns compared to conventional ones. Initial findings also reveal that return volatility, as measured by standard deviation, was lower for the shariah portfolio compared to the conventional one, indicating that the former may offer a more stable return profile. This is noteworthy, as lower volatility is often associated with reduced risk. However, all return series show significant departures from normality, as evidenced by high skewness, leptokurtosis, and the Jarque-Bera test results—likely influenced by the turbulent COVID-19 period. It is also worth noting that the conventional equity portfolio returns yield higher extreme values on both sides of the spectrum, another way to suggest higher volatility. This, alongside the possible effects of shariah screening, could be attributed to the smaller portfolio size, hinting at a diversification limitation—an aspect we acknowledge but do not explicitly account for in this study.

Regarding the factor returns, both SMB and BTM factors exhibit negative mean and median values, suggesting that, over this period, small-cap stocks and value stocks (those with high book-to-market ratios) tended to underperform their large-cap and growth counterparts. The LEV (leverage) factor has a very modest positive mean, indicating that firms with higher leverage did not consistently outperform or underperform. These early observations provide some insight into market behavior, suggesting that traditional size and value premiums may not have materialized during the sample period.

The Covid dummy variable, with a mean of 0.667, confirms that roughly two-thirds of the sample period fell within the pandemic phase. This likely had a strong impact on the data distributions, amplifying market volatility and influencing return dynamics.

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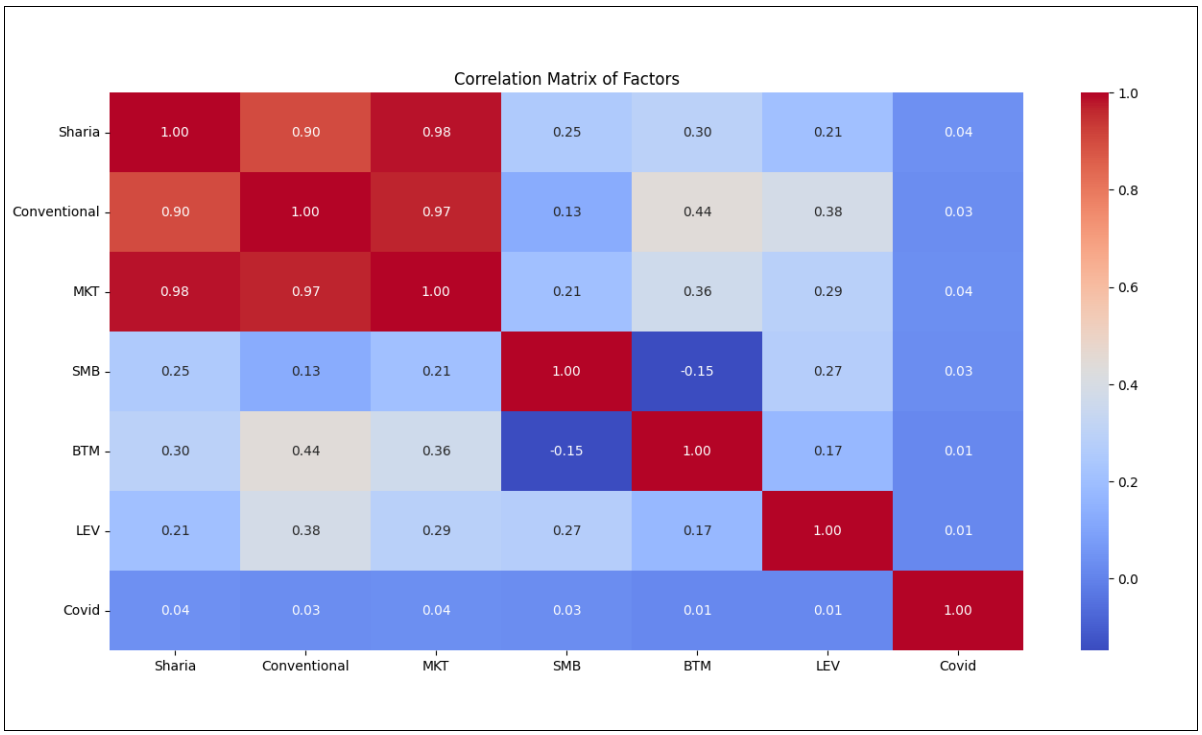
Overall, these descriptive results offer an initial view of the differences between shariah and conventional portfolios in terms of return characteristics and risk exposures. They suggest that shariah-compliant stocks may offer slightly more resilience in volatile markets. Later sections will explore whether these differences persist under more formal econometric modeling, particularly when accounting for market factors and macroeconomic shocks like COVID-19.

Correlation of Factors



Source: Authors, 2024 (processed data).

Figure 2 Correlation matrix of factors/variables in the research of volatility dynamics of Islamic and conventional equity portfolios during covid-19: Evidence from Fama-French and GARCH Models

The correlation matrix above shows that the two portfolios (conventional and shariah) move in the same direction, with a 0.90 correlation coefficient. Both portfolios are also highly correlated with market returns, indicating that market excess returns can explain variations in returns with a considerably high degree of accuracy. This aligns with the notion that both types of portfolios, despite differing in screening criteria, are still exposed to the broader market risk, and therefore tend to co-move with general market trends. Furthermore, there is a low-to-moderate correlation between certain factor pairs, such as SMB (correlation of portfolio and the excess returns/losses of small stocks compared to larger stocks), BTM (correlation of portfolios with the excess returns/losses of high book-to-market ratio), and LEV (leverage factor with same logic as SMB and BTM). These relationships suggest that size, value, and leverage characteristics share, albeit insignificant, some overlapping information, which could potentially influence portfolio returns when analyzed within a multifactor framework such as factor investing models.

The COVID-19 factor appears to have a very low correlation with the other factors, suggesting that it may have a more independent influence compared to the other factors in this dataset. This low correlation may reflect the exogenous and idiosyncratic nature of pandemic-related shocks, which do not necessarily align with the systematic risk captured by traditional asset pricing factors. It is also worth noting that the high correlation between the shariah and conventional portfolios may lead to a high R-squared value in linear models such as the CAPM and Fama-French factor models, as observed in previous studies (Ashraf and Khawaja, 2016; Ashraf et al., 2017). This further

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underscores the limited diversification potential between the two portfolios in terms of exposure to systematic risk. However, any observed differences in sensitivity to specific factors may still provide valuable insights into how Islamic screening criteria shape the risk-return profiles of shariah-compliant investments.

Factor Model Analysis – Shariah Portfolio Against Market Excess Returns

Table 2 Regression analysis of factor models – Shariah portfolio

Regression	CAPM	FF3F w/o LEV	FF3F w/ LEV	FF3F w/ LEV + COV
Coefficients (*Alpha*)	-0.00034***	-0.00022**	-4.17612E-05	-6.2144E-05
Coefficients (MKT)	0.95788***	0.97289***	0.98935***	0.989326***
Coefficients (SMB)		0.05329***	0.08730***	0.087262***
Coefficients (BTM)		-0.05462***	-0.0431***	-0.04316***
Coefficients (LEV)			-0.1236***	-0.12368***
Coefficients (Covid)				3.01509E-05
R-Squared	0.96576	0.97160	0.97897	0.97897
Adj. R-Squared	0.96574	0.97153	0.97890	0.97889

Note: *, **, *** denote significance level at 10%, 5%, and 1%, respectively.
Source: Authors, 2024 (processed data).

The regression results for the shariah portfolio returns using various models indicate that market, size, value, leverage, and pandemic period factors have differing impacts. The CAPM model shows that the shariah portfolio returns are largely explained by market movements, with a beta of 0.9579, close to 1, indicating that the portfolio moves almost in tandem with the market. The negative Jensen's alpha suggests underperformance of the shariah portfolio relative to the conventional portfolio, with an adjusted R-squared of 0.9657, indicating that the model explains 96% of the return variability.

The Fama-French three-factor model adds the size (SMB) and value (BTM) factors. The positive SMB beta (0.0533) indicates that small-cap stocks significantly influence the portfolio, while the negative BTM beta (-0.0546) suggests a negative correlation between high book-to-market stocks and portfolio returns. This model has a higher adjusted R-squared compared to the CAPM, indicating improved explanatory power. These findings align with previous studies by Girard and Hassan (2008) and Hoepner et al. (2011), which found that shariah portfolios tend to tilt toward small-cap and low book-to-market stocks.

The addition of the leverage (LEV) factor in the Fama-French three-factor model provides insights into the impact of capital structure. The statistically significant negative LEV beta (-0.1237) indicates that the shariah portfolio has a negative correlation with high-leverage stocks, reflecting the avoidance of leveraged stocks characteristic of shariah-compliant portfolios. However, the positive factor returns for LEV combined with a negative coefficient suggest a sacrifice cost associated with investing in shariah portfolios. The increase in adjusted R-squared indicates that this model better explains portfolio returns.

The impact of COVID-19 is modeled using a dummy variable, with a coefficient of 3.01509E-05 that is not statistically significant. This suggests that the pandemic did not significantly affect the daily movements of the shariah portfolio, which were more influenced by market factors and firm characteristics. The inclusion of the COVID-19 variable actually reduced the adjusted R-squared, indicating that this model is less suitable than the previous ones. Overall, the performance of the shariah portfolio reflects a trade-off between risk and return influenced by shariah restrictions and market characteristics.

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Factor Model Analysis – Non-Shariah Portfolio Against Market Excess Returns

Table 3 Regression analysis of factor models – Non-shariah portfolio

Regression	CAPM	FF3F w/o LEV	FF3F w/ LEV	FF3F w/ LEV + COV
Coefficients (*Alpha*)	0.00055***	0.00036**	0.00007	0.00010
Coefficients (MKT)	1.06737***	1.04335***	1.01702***	1.01706***
Coefficients (SMB)		-0.08524***	-0.13966***	-0.13960***
Coefficients (BTM)		0.08738***	0.06903***	0.06904***
Coefficients (LEV)			0.19792***	0.19791***
Coefficients (Covid)				-0.00005
R-Squared	0.96576	0.97160	0.97897	0.97897
Adj. R-Squared	0.96574	0.97153	0.97890	0.97889

Note: *, **, *** denote significance level at 10%, 5%, and 1%, respectively.
Source: Authors, 2024 (processed data).

The regression results for the conventional portfolio highlight some notable contrasts with the shariah portfolio. In the CAPM model, the conventional portfolio appears more sensitive to market movements, with a higher market beta. It also shows a positive and statistically significant alpha, suggesting a degree of outperformance relative to the market. On the other hand, the shariah portfolio has a slightly lower beta and a negative alpha, indicating that it slightly underperforms the market, possibly due to the constraints imposed by shariah screening.

When additional factors are included in the Fama-French three-factor model, the differences become clearer. The shariah portfolio has a positive loading on the size factor, meaning it is more exposed to small-cap stocks. In contrast, the conventional portfolio has a negative size coefficient, suggesting a tilt toward larger firms. For the value factor, the conventional portfolio shows a strong positive relationship, indicating a preference for value stocks. The shariah portfolio, however, has a negative loading, reflecting more exposure to growth-oriented companies. These patterns are consistent with the idea that shariah-compliant portfolios tend to avoid distressed or undervalued firms, which often have higher debt levels.

Adding the leverage factor further highlights the portfolios' distinct profiles. The conventional portfolio has a strong positive response to leverage, meaning it benefits from exposure to highly leveraged firms. In contrast, the shariah portfolio shows a negative and significant relationship with leverage, reinforcing its avoidance of debt-heavy companies in line with Islamic investment principles.

Finally, the COVID-19 dummy variable is not statistically significant in either model. While the conventional portfolio shows a slight negative coefficient and the shariah portfolio a slight positive one, neither suggests a meaningful impact of the pandemic period on daily portfolio returns. Interestingly, the inclusion of this variable does not improve the model fit for either portfolio.

Overall, while both portfolios are strongly explained by the models, their different exposures—especially to size, value, and leverage—reflect the impact of shariah screening. The conventional portfolio benefits more from large, value, and leveraged stocks, whereas the shariah portfolio tends to favor smaller, growth-oriented, and less leveraged companies. These differences help explain the performance gap between the two.

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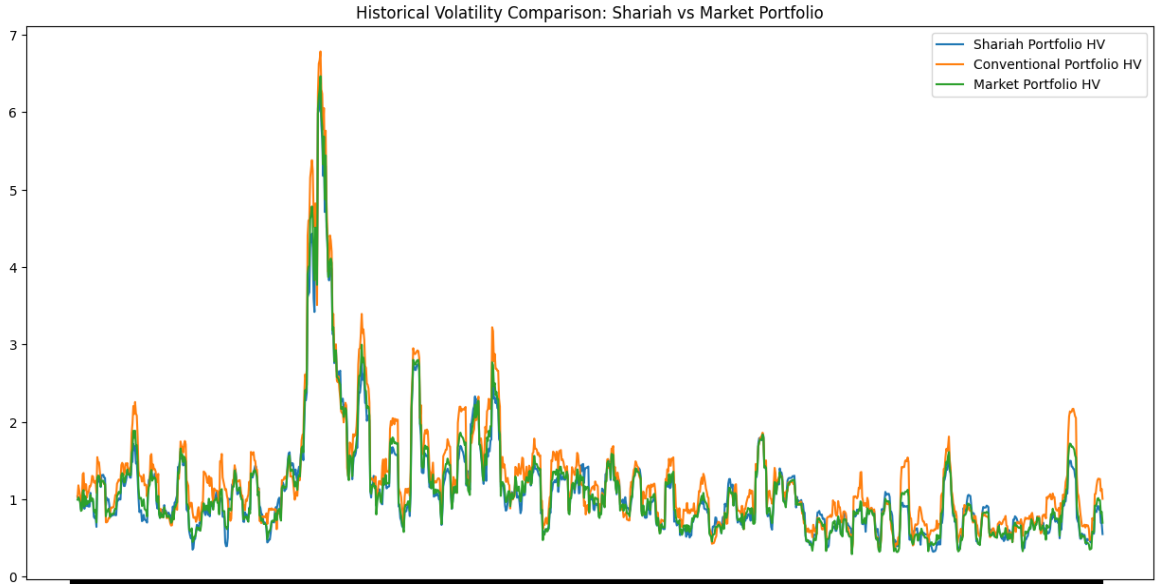
Volatility Modelling



Source: Authors, 2024 (processed data).

Figure 3 10-days rolling volatility of shariah and conventional portfolio and market returns

The 10-days variance (two-weeks trading period) of the market excess returns alongside with conventional and shariah portfolio returns allows this study to compare the unconditional variance of the two portfolios. In summary, the shariah portfolio exhibits a 10-days variance that is not significantly different from that of the conventional portfolio. However, there are notable differences during periods of high volatility. When market volatility tends to rise, the shariah portfolio tends to show lower volatility compared to both the conventional portfolio and market excess returns, indicating that shariah compliant equities offer stability benefits. This phenomenon can be attributed to the defensive nature of shariah-compliant stocks, which avoid high-risk sectors such as banking and highly leveraged industries. Thus, the shariah portfolio appears more stable during periods of high uncertainty, although the overall difference is not substantial. The unconditional variance also shows evidence of volatility clustering, but further modeling, such as ARCH or GARCH models, is needed to explain this phenomenon.

This study employs the Glosten-Jagannathan-Runkle (GJR-GARCH)(1,1) model developed by Glosten et al. (1993). The model was selected based on the Bayesian Information Criterion (BIC), to model the conditional volatility of conventional and shariah stock portfolios. This model is chosen for its ability to capture volatility asymmetry compared to the standard GARCH and EGARCH models. For each portfolio, a simple mean model is used to obtain the residuals of the returns.

Table 4 GJR-GARCH parameter estimations on market excess returns

	Coefficient	Std_Error	Z_value	P_value
mu	0.00017839	0.00027064	0.65912383	0.50981625
omega	4.143E-06	4.3774E-06	0.94644951	0.34391936
alpha1	0.06539786	0.02601147	2.51419263	0.01193052
beta1	0.86393897	0.04651809	18.5721093	5.4038E-77
gamma1	0.0886381	0.03735714	2.37272175	0.01765756
shape	5.86018396	1.01871948	5.75250017	8.7933E-09

Source: Authors, 2024 (processed data).

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The results for the market excess returns indicate strong volatility persistence and asymmetric response to shocks. The ARCH term ($\alpha = 0.0654$) is statistically significant, implying that volatility responds to recent market innovations. The GARCH term ($\beta = 0.8640$) is highly significant and large in magnitude, confirming that shocks to volatility decay slowly over time. Importantly, the leverage effect captured by the asymmetry parameter ($\gamma = 0.0886$, $p < 0.05$) confirms that negative shocks exert a stronger influence on volatility than positive ones—consistent with the stylized fact of "bad news" causing greater market turbulence. The shape parameter (≈5.86) further suggests that return distributions are fat-tailed, indicating a non-negligible probability of extreme price changes.

Table 5 GJR-GARCH parameter estimations on Shariah-compliant portfolio

	Coefficient	Std_Error	Z_value	P_value
mu	0.00014922	0.000269	0.5547301	0.57907929
omega	3.2623E-06	6.4791E-06	0.5035195	0.61459908
alpha1	0.0562586	0.04357072	1.29120188	0.19663368
beta1	0.88538975	0.07557216	11.7158188	1.0576E-31
gamma1	0.07179439	0.04273388	1.68003454	0.0929506
shape	6.12892353	1.1389827	5.38105057	7.4052E-08

Source: Authors, 2024 (processed data).

Compared to the market, the shariah portfolio shows a more stable volatility structure. The ARCH term ($\alpha = 0.0563$) is smaller and statistically insignificant, suggesting limited sensitivity to immediate past shocks. However, the GARCH term ($\beta = 0.8854$) remains large and significant, indicating high volatility persistence, even slightly exceeding that of the market portfolio. The asymmetry term ($\gamma = 0.0718$) is positive but only marginally significant ($p \approx 0.093$), suggesting a weaker leverage effect. This indicates that while the shariah portfolio still reacts more strongly to negative news than positive, the magnitude of this asymmetry is more muted than in the market or conventional portfolio. Notably, the shape parameter is higher (≈6.13), indicating slightly thinner tails than the market, thus reducing the risk of extreme return events.

Table 6 GJR-GARCH parameter estimations on non-shariah-compliant (conventional) portfolio

	Coefficient	Std_Error	Z_value	P_value
mu	0.00016355	0.00037335	0.4380499	0.6613501
omega	5.59E-06	1.30E-05	0.4304112	0.6668965
alpha1	0.05830822	0.03619188	1.6110857	0.107161
beta1	0.8690841	0.06500486	13.3695242	9.11E-41
gamma1	0.08679579	0.04030842	2.1532915	0.03129578
shape	6.21297	2.043746	3.0399918	0.00236585

Source: Authors, 2024 (processed data).

The conventional portfolio sits between the market and the shariah portfolio in terms of volatility characteristics. The ARCH effect ($\alpha = 0.0583$) is similar to the shariah portfolio but also statistically insignificant. The GARCH term ($\beta = 0.8691$) again confirms high persistence in volatility. However, the leverage term ($\gamma = 0.0868$) is significant ($p \approx 0.031$), highlighting a stronger asymmetric response to negative shocks—more in line with the market portfolio. This suggests that the conventional portfolio, like the overall market, is more vulnerable to volatility spikes triggered by adverse news. The shape parameter (≈6.21) indicates that the distribution of returns is fat-tailed, though the difference from the shariah portfolio is minimal.

Across all three portfolios, the volatility dynamics reveal a consistent pattern of high persistence, as evidenced by the significant and large GARCH coefficients. However, the asymmetric volatility response differentiates the portfolios. The market and conventional portfolios both exhibit a statistically significant leverage effect, reinforcing their sensitivity to negative shocks. In contrast, the

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shariah portfolio displays a weaker and statistically marginal asymmetry, suggesting a more dampened volatility response in times of market stress. These results align with the fundamental characteristics of Islamic finance, which prohibits highly leveraged and speculative investments. By avoiding firms with excessive debt or financial instability, the shariah portfolio exhibits relatively greater volatility stability and lower downside risk sensitivity compared to its conventional counterpart. Despite this, all portfolios show fat-tailed return distributions, underscoring the presence of extreme movements—though slightly less pronounced in the shariah portfolio.

The GJR-GARCH(1,1) model effectively captures the heteroskedastic and asymmetric nature of volatility in both shariah and conventional portfolios. The conventional portfolio is more reactive to negative market developments, indicating higher vulnerability to sentiment-driven risk. The shariah portfolio, while not immune to volatility clustering, demonstrates greater resilience to shocks, supporting its appeal for risk-averse or ethically driven investors.

Building on these volatility findings, the earlier asset pricing regressions reinforce the distinctive risk and return characteristics of shariah-compliant portfolios. Compared to conventional portfolios, the shariah portfolio consistently shows lower and often insignificant intercepts, indicating that its returns are more fully explained by systematic risk factors. Both portfolios are strongly influenced by the market factor, but the shariah portfolio exhibits more moderate exposure to size and value effects, and a clear negative association with leverage. This reflects the exclusion of highly indebted firms under Islamic screening, which helps reduce risk during financial downturns. In contrast, conventional portfolios, with greater exposure to leverage and systematic risks, may offer higher return potential but are more susceptible to market shocks.

Taken together, the results from the regression models and GARCH estimation suggest that shariah-compliant portfolios are more suitable for investors seeking long term stability with lower downside risk. Their structural restrictions, which filter out speculative and financially unstable firms, contribute to their more resilient performance during periods of elevated uncertainty. While conventional portfolios may remain attractive for those pursuing higher returns through broader risk exposure, the defensive nature of shariah portfolios strengthens their role as a viable strategy in a well diversified investment approach. However, it is important to note that these findings are based on historical performance, and actual future outcomes may differ due to evolving market conditions.

CONCLUSION

This study analyzes the performance and volatility dynamics of Islamic equity portfolios with respect to those of conventional portfolios and market returns within the Indonesian stock market from February 2019 to December 2023. Using the Fama-French factor model and GARCH-type models to assess return drivers and time-varying volatility and its determinants, the analysis reveals a clear risk–return trade-off: Islamic portfolios tend to deliver slightly lower returns but exhibit more stable behavior, particularly during periods of market turbulence.

Descriptive statistics reveal that both Islamic and conventional portfolios generated negative average daily returns over the sample period, though the Islamic portfolio exhibited a marginally higher mean return and lower standard deviation. These initial findings suggest relatively better downside protection and higher stability in price movements. Regression results from the CAPM and Fama-French models indicate that Islamic equity portfolio returns are significantly explained by market, size, and value factors, while the addition of the leverage factor reinforces the structural avoidance of highly indebted firms—an innate characteristic of shariah-compliant portoflio construction. The COVID-19 dummy variable, while not statistically significant, aligns with the broader observation that Islamic portfolios experienced less pronounced disruptions of returns performance during the pandemic. Volatility analysis using GJR-GARCH further supports these findings: Islamic portfolios display more stable and symmetric volatility behavior, with reduced sensitivity to past shocks and

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negative innovations. In contrast, conventional portfolios demonstrate greater volatility clustering and stronger asymmetric responses, highlighting their vulnerability during periods of market stress.

The findings of this paper suggest that Islamic equity portfolios might be a suitable alternative for those seeking defensive investment strategies, given their relatively stable risk–return dynamics. This stability is largely attributed to shariah screening, which excludes equities with high gearing, speculative activity, and non-compliant sectors. By limiting exposure to leveraged firms, which are financially risky, Islamic portfolios reduce downside risk, which can be beneficial during bear markets. While these findings may inform investment considerations, they are intended solely for academic purposes and should not be interpreted as specific financial advice.

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