Asymmetric Effects of Shariah ESG Indices on Islamic Volatility: A QARDL Approach

Ayyüce Memiş Karataş[1]

[1] Department of Banking and Finance, Niğde Ömer Halisdemir University, Niğde, Türkiye; amemis@ohu.edu.tr

ABSTRACT

This study examines the evolving dynamics of volatility in Islamic financial markets by exploring how Shariah-compliant ESG indices from developed and emerging markets influence the Islamic Volatility Index (IVIX) over different quantiles. Covering the period from April 30, 2015, to May 23, 2025, the analysis is situated within a theoretical framework that examines the interactions between volatility and ethical investment instruments aligned with Islamic principles. The key economic variables include the Dow Jones Islamic Market World Low Volatility Index as the dependent variable and two independent indices: the S&P Developed LargeMidCap ESG Shariah Index and the S&P Emerging LargeMidCap ESG Shariah Index. To capture the potential asymmetric and nonlinear relationships in different market regimes, the study employs the QARDL model. This allows for a decomposition of short- and long-run effects at different points in the conditional distribution of the dependent variable. Results presented in this study yield insights of a statistically significant positive influence of both ESG indices on IVIX at all quantiles. Stronger long-term effects are visible in low regime periods. On the contrary, short-term effects are more prominent in the high regime. Results discovered in this study, warrant the need for location-based methods in detecting asymmetries in Islamic financial markets. Moreover, it suggests that ESG investments under Shariah principles have a stabilizing market regime in the Shariah-compliant finance literature. This study further added to the material studying the relationship between volatility and ethics in Islamic finance under different regimes.

Keywords: Islamic Finance, ESG Investing, Volatility, QARDL Model.

1. INTRODUCTION

Currently, with the increase in environmental degradation, social problems, and governance crises, financial markets are also experiencing an ethical transformation. This transformation has not only emerged as a response to reputational risk or stakeholder pressure; it indicates a radical change in the understanding of financial value. The main purpose of investment is now shaped not only by financial return but also by sustainability and social responsibility. In this context, Environmental, Social and Governance (ESG) principles come to the forefront not only as evaluation criteria but also as normative suggestions on what constitutes a "good" investment. At the same time, Islamic finance has a value system that places moral integrity, social justice, and risk sharing at the center of financial activities, based on the ethical rules of Sharia. An important question arises at the intersection of these two approaches: Can ESG and Sharia-compliant investments provide resilience against economic fluctuations? If so, how can this resilience be measured? There is evidence in the literature that ethical investment strategies perform better in market crises. For example, Erragragui and Revelli (2015, 2016) found that Sharia-compliant portfolios did not perform worse than conventional portfolios, indicating that ethical restrictions may not result in financial costs.

More recently, Prati et al. (2024) found that ESG-compliant ETFs outperformed conventional ETFs during the COVID-19 crisis. These findings suggest that ethical values do not conflict with financial value creation. Furthermore, Sharia law's rules such as interest (riba), excessive uncertainty (gharar), and the prohibition of investing in harmful sectors are consistent with ESG's goals of supporting sustainable and socially responsible economic activities (Ansari & Alanzarouti, 2020).The public interest (maslahah), one of the fundamental principles of Sharia, supports both religious and stakeholder-focused governance approaches within the scope of Maqasid al-Shariah. ESG is the secular counterpart of these values. Therefore, there is not only a superficial similarity between Sharia and ESG, but a deep structural alignment.

However, despite this alignment, volatility has not been sufficiently focused on, especially in the context of Islamic finance. The Islamic indices have been found to have lower volatility in systemic crises, but the dynamics through which such robustness occurs are not well articulated. Most studies have used traditional measures of volatility that do not account for the complex and time-varying nature of market behavior. Therefore, finer analysis methods have to be brought to bear to get a clearer picture of market behavior in different stress conditions. The convergence between ESG principles and Sharia-compliant finance has been embodied with the emergence of specialized indices such as the S&P Advanced and Emerging ESG Sharia Indices. These indices institutionalize the ethical commitments of Islamic finance and ESG investments, offering financial instruments that comply with both religious and international ESG standards. This situation shows a structural change in how ethical investment is implemented in different regions. Alhowaish (2025) stated that being included in such indices is an incentive for companies to increase their ESG performance, thus improving sustainability practices.

Despite this, existing studies generally conduct analyses on average values and ignore differences in market reactions. However, in variable market conditions such as volatility, analysis models that are sensitive to different market regimes are needed. In this context, the Quantile Autoregressive Distributed Lag (QARDL) model is a suitable method in terms of examining long-term and short-term relationships according to market conditions on the entire data distribution (Godil et al., 2020).

However, the use of the QARDL model in the field of Islamic finance is quite limited. Widarjono et al. (2020), for instance, explore risk differentiation between Islamic and conventional products but do not deploy quantile-sensitive models. This study aims to develop a deeper understanding in the field of ethical finance by examining how volatility in Sharia-compliant and ESG-integrated investments changes depending on market regimes using the QARDL method. As a result, financial resilience is not only a technical issue, but also a concept shaped by ethical values. Although ESG and Sharia-compliance have different origins, they share common ethical values such as sustainability and

justice. This study aims to better understand how ethical investment strategies provide resilience against market volatility and, in this direction, integrate financial stability with ethical values.

2. LITERATURE REVIEW

The nexus between Islamic finance and Environmental, Social and Governance (ESG) just accounted for the newfound academic interest accruing to the subject called global finance reorientation with ethical, sustainable, and resilience-related investments. These investment strategies are rule-based on common normative values of justice (adl), responsibility (mas'uliyyah), and trusteeship (khilafah), which can challenge instrumental rationality in conventional finance. ESG considerations are usually viewed from corporate social responsibility and risk-adjusted return perspectives, but in Islamic finance, such considerations are religiously required as a responsibility and posit material outcomes concerning ethics. This academic interest has not been well covered so far on the performance of Islamic financial products in varying market conditions, the level of ESG metric integration, and the integration resilience in turbulent markets. As ethical investment is to become the central issue in the financial world, the real question is not whether or not ESG and Islamic finance can be aligned, but how this alignment can be measured, modelled, and managed in a way that preserves both the ethical and financial integrity.

The studies in the literature are categorized under the following headings and presented in Table 1: ESG and Shariah-Compliant Finance Resilience and Performance Analysis, Transparency, Governance, and Ethical Dimensions of ESG and Shariah-Compliant Finance, Financial Models and Methods: Regime Switching, QARDL, and Market Responses and Resilience: ESG and Shariah-Compliant Investments During Crisis Periods.

Table 1: Literature Review Categorized by Themes in ESG and Shariah-Compliant Finance

Author(s)	Year	Study Title	Methodology	Key Findings
ESG and Shariah-Compliant Finance Resilience and Performance Analysis				
Hashmi et al.	2022	Islamic equity indices: A focus group discussion	Focus group discussion	ESG integration enhances governance and resilience in Islamic indices. Supports regime-switching models.
Prati et al.	2024	Shariah vs. Non-Shariah ETFs: Performance Comparison	ETF comparative study	Shariah ETFs can perform competitively; useful for ethical investors managing volatility.
Erragragui & Revelli	2016	Is it costly to be both Shariah compliant and socially responsible?	Financial analysis; SRI integration	Combining SRI and Shariah is feasible and may enhance transparency and stability.
Ariff et al.	2023	ESG Performance and Cash Holdings	Panel data; 9,244 observations	Shariah-compliant firms with high ESG scores hold more cash—proxy for downside protection.
Transparency, Governance, and Ethical Dimensions of ESG and Shariah-Compliant Finance				
Muneer et al.	2025	Environmental Disclosure in Islamic Banks	Empirical analysis	Strong governance via SSBs improves sustainability and resilience.
Azizah & Haron	2024	ESG Performance & Firm Value in Indonesia	ESG disclosure analysis	Strong ESG improves performance and investor trust; relevant for volatility resilience.
Financial Models and Methods: Regime Switching, QARDL				
Heydari et al.	2023	Quantile-based Spillover in ESG, Islamic and Conventional Markets	Quantile VAR (QVAR)	Captures time-varying volatility spillovers; supports QARDL in ethical finance modeling.
Mansour & Vadell	2023	Islamic Sustainable Finance, Law and Innovation	Panel data (2008–2021)	ESG scores lower systematic risk in Islamic firms; supports regime-switching analysis.
Elnahas et al.	2021	Revisiting Dow Jones Shariah Compliance Measures	Instrumental variable + PSM	Islamic label ≠ higher ethics; selection bias must be considered.

Mansour & Vadell	2023	Islamic Sustainable Finance, Law and Innovation	Panel data (2008–2021)	ESG scores lower systematic risk in Islamic firms; supports regime-switching analysis.
Katterbauer et al.	2022	ESG Compliance in Shariah Firms: A Data-Driven Analysis	Machine learning (RF, DL)	ESG-Shariah alignment is measurable; transparency fosters investor confidence.
Elnahas et al.	2021	Revisiting Dow Jones Shariah Compliance Measures	Instrumental variable + PSM	Islamic label ≠ higher ethics; selection bias must be considered.
Market Responses and Resilience: ESG and Shariah-Compliant Investments During Crisis Periods				
Singh	2020	COVID-19 and Safer Investment Bets	Event-based volatility analysis	ESG investments received higher capital flow during crisis; confirms volatility resilience thesis.

Source: Author

When the existing literature is examined, it is seen that the number of studies investigating the overlaps between Sharia-compliant finance and Environmental, Social and Governance (ESG) principles is increasing. Some of the early studies (Erragragui & Revelli, 2016; Yesuf & Aassouli, 2020) presented the issue at a more theoretical level. They argued that the two systems have identical ethical structures, and they do not concentrate on the operational convergence, which is not empirically supported. Most of the literature review only applies the ethical-financial alignment of investment performance to the changing economic regimes without a proper in-depth analysis.

Although the number of empirical studies has increased over time, there are serious limitations in terms of the methods used. Many studies use classical models such as GARCH or panel regression (Ilyas et al., 2022; Hasyim et al., 2024; Azizah & Haron, 2024). Such models are generally based on the assumption that market reactions are homogeneous, and behaviours are linear, which fails to capture the regime-sensitive and non-linear nature of markets affected by both ethical norms and macroeconomic uncertainties. In contrast, only a limited number of studies (Godil et al., 2020; Heydari et al., 2023) have utilized quantile-based models, such as QARDL or QVAR, which are more adept at examining extreme risk behaviours and asymmetric responses.

Another shortcoming is the lack of sufficient research on the diverse ways ESG principles are applied in the context of Islamic finance. There is, however, relatively little research into the question of whether ESG has transformative effects in the Islamic financial world or operates as a nominal strategy, even in terms of legal and cultural disparities between nations, or the variation in the criteria for Sharia compliance from one region to the other (Pinto, 2020). Although there are studies that have brought to light the positive effects of ESG on governance and transparency, these should also be measured in terms of how these principles take shape through different legal and cultural systems, or the degree of variation within criteria for Sharia compliance, respectively (Muneer et al., 2025; Gati et al., 2024).

Though the issue of resistance to volatility is much discussed in the literature, the behavioral mechanisms behind such resistance are not well defined. Some studies, like those of Singh (2020) and Ariff et al. (2023), suggest that in a crisis, investors turn to assets that are ESG compliant, hence indicating ethical risk aversion. The motivation for ethics in this behavior, for example, whether it is based on religion or on cognitive dissonance, is not elaborated. This leads to the perception of Islamic finance as consisting of only a number of filters and ratios; however, this system has its own unique information logic and investor psychology.

In addition, studies that address the integration of the concept of Maqasid al-Shariah (the high goals of Shariah) into the ESG framework (Seman et al., 2023) usually offer conceptual suggestions, but these principles cannot be made empirically measurable. Therefore, although the Maqasid framework has a strong normative basis, it remains limited in terms of analytical performance.

The difference between ethical labelling and actual ethical performance has also not been sufficiently examined in the literature. Although ESG and Shariah-compliant labels have rapidly spread in global

markets, it is often not questioned whether these labels make a significant difference in terms of governance quality or resilience to volatility. While some researchers, such as Elnahas et al. (2021), have begun to show that the Islamic label does not automatically represent higher ethical behavior, critical studies on this subject are still lacking.

Finally, existing studies often focus only on single crisis periods (e.g., COVID-19); however, the cumulative effects of sequential and overlapping shocks are rarely addressed. The lack of long-term studies examining how ESG-Sharia portfolios perform under multiple stressors such as geopolitical risks, inflation pressures, and environmental threats is striking.

In summary, there is a general consensus in the literature that the combination of Islamic finance and ESG principles makes sense at a normative level. However, the methodological depth and contextual sensitivity required to reveal how this fit works in the real world are not yet sufficiently developed. Future research needs to proceed with a more comprehensive and critical methodology that includes not only conceptual fit but also multi-layered dimensions such as performance, governance, and investor behavior.

3. MODEL SPECIFICATION AND DATA

3.1. Data

This study utilized the daily return data to examine the dynamics of volatility within Islamic financial markets over the period from April 30, 2015, to May 23, 2025. The primary indices analyzed include the Dow Jones Islamic Market World Low Volatility 300 Index (lnIVIX), which serves as a benchmark for global Islamic market volatility, alongside two Shariah-compliant ESG indices: the S&P Developed LargeMidCap ESG Shariah Index (USD) (lnDEVESG) and the S&P Emerging LargeMidCap ESG Shariah Index (USD) (lnEMERGESG), representing developed and emerging market segments, respectively. All data were retrieved from the official S&P Global website. (https://www.spglobal.com/spdji/en/). Initially, the original price series were converted into logarithmic return series, followed by tests to assess their descriptive analysis and stationarity. Table 2 describes the variables.

Table 2: Description of the Variables

Index	Symbol	Variable Name	Term
Dow Jones Islamic Market World Low Volatility 300 Index (USD)	DJIML3UP	lnIVIX	
S&P Developed LargeMidCap ESG Shariah Index (USD)	SPDLESUP	lnDEVESG	
S&P Emerging LargeMidCap ESG Shariah Index (USD)	SPEXESUP	lnEMERGESG	30.04.2015-23.05.2025 daily data

The temporal dynamics of the raw data series are illustrated in Figure 1. This figure shows the historical evolution of three key Shariah-compliant indices over the period from April 2015 to May 2025: the Dow Jones Islamic Market World Low Volatility 300 Index (IVIX), the S&P Developed LargeMidCap ESG Shariah Index (DEVESG), and the S&P Emerging LargeMidCap ESG Shariah Index (EMERGESG). The dependent variable "IVIX" indicates a fairly stable rise that is consistent with a low-volatility nature. Of the independent variables, the "DEVESG" variable imbibes rather strong momentum, especially after 2020, indicating growing interest from investors in ESG-compliant equities that are also Shariah compliant in developed markets.

In contrast, "EMERGESG" reflects more volatile gyrations, with significant downfalls seemingly around 2020 and 2022, which have been based on the economic turmoil of emerging markets. A gradual rebound is observed towards the end of the sample, indicating a partial recovery.

Overall, the trajectories of these indices highlight the distinct impact of market maturity and ESG integration levels on the performance dynamics of Islamic financial instruments.

Figure1: Graphical depiction of the raw data

4. METHODOLOGY

The QARDL (Quantile ARDL) model has become one of the prominent methods in recent years, especially in the analysis of financial and macroeconomic time series. Financial and macroeconomic series are mostly non-stationary, which can cause problems such as spurious regression. The QARDL model offers a significant advantage over traditional models such as Granger by allowing both short-term and long-term relationships to be examined simultaneously, and by including the lagged terms of internal and external variables in the model, it ensures that the estimates are not biased even if the exogeneity condition is not fully met (Odhiambo, 2009; Attiaoui and Boufath, 2019; Ren et al., 2023).

The QARDL (Quantile ARDL) model is one of the prominent methods, especially in the analysis of financial and macroeconomic time series, against problems such as deviation from normality, heteroskedasticity and outlier observations, which are frequently encountered in financial and macroeconomic data. These series are mostly non-stationary, which can cause problems such as spurious regression. Granger's theorem states that if there is a cointegration relationship between two or more non-stationary variables, an error correction model can be established. In this context, the QARDL model offers a significant advantage over traditional models by allowing both short-term and long-term relationships to be examined simultaneously. By including the lagged terms of endogenous and exogenous variables in the model, it makes it possible to obtain unbiased estimates even if the exogeneity condition is not fully met (Odhiambo, 2009; Attiaoui and Boufath, 2019; Ren et al., 2023).

The QARDL model is more resistant to problems such as deviation from normality, heteroskedasticity and outlier observations, which are frequently encountered in financial data. In this respect, it is widely preferred in studies on financial and energy markets (Guo et al., 2021; He et al., 2021). The quantile-based structure of the model can reveal non-linear and asymmetric relationships between variables in different distribution slices, which increases the explanatory power of the model, especially in extraordinary conditions such as crisis periods or geopolitical shocks (Shahbaz et al., 2018; Wei et al., 2022; Ren et al., 2023).

In this study, the QARDL approach developed by Cho et al. (2015), and the standard ARDL model is presented in Equation 1 as follows:

$$\ln\text{IVIX}_t = a + \sum_{i=1}^{p} \pi_i \ln\text{IVIX}_{t-i} + \sum_{i=0}^{q} \omega_i \ln\text{DEVESG}_{t-i} + \sum_{i=0}^{r} \lambda_i \ln\text{EMERGESG}_{t-i} + \varepsilon_t \quad (1)$$

Where lnIVIX ,lnDEVESG, lnEMERGESG represent the logarithm of "IVIX, DEVESG,EMERGESG" respectively. π_i, ω_i, and λ_i shows the estimation coefficients, $\mathcal{E}_t$ is the error term and p, qand r show the optimal lag order selected through SIC (Schwarz Information Criterion).

The ARDL model is converted into a QARDL model by applying regression across different quantiles, as illustrated in Equation 2.

$$\ln IVIX_t = a(\tau) + \sum_{i=1}^{p} \pi_i(\tau)\ln IVIX_{t-i} + \sum_{i=0}^{q} \omega_i(\tau)\ln DEVESG_{t-i} + \sum_{i=0}^{r} \lambda_i(\tau)\ln EMERGESG_{t-i} + \mathcal{E}_t \quad (2)$$

In there, the quantile is specified as follows: 0< τ<1 (Troster, 2018). For analytical this work uses the quantile range sequence {0.05, 0.10, 0.20, ..., 0.90, 0.95}. While $a(\tau)$, $\pi_i(\tau)$, $\omega_i(\tau)$ and $\lambda_i(\tau)$ shows the coefficient values at various quantiles. To eliminate the sequence correlation of $\mathcal{E}_t$ in the sample, the existing mathematical formula is modified as shown in Equation 3.

$$\Delta lnIVIX_t = a(\tau) + \rho(\tau)lnIVIX_{t-1} + \beta_1(\tau)lnDEVESG_{t-1} + \beta_2(\tau)lnEMERGSG_{t-1} \sum_{i=1}^{p-1} \pi_i(\tau)\Delta lnivix_{t-i}$$

$$+ \sum_{i=0}^{q-1} \omega_i(\tau)\Delta lnDEVESG_{t-i} + \sum_{i=0}^{r-1} \lambda_i(\tau)\Delta lnEMERGESG_{t-i}$$

$$+ \nu_t(\tau) \quad (3)$$

where the character Δ denotes the difference between the present variable market performance and previous period variables market performance, e.g. $\Delta lnivix = lnivix_t - lnivix_{t-1}$. The QARDL-ECM model is formed with Equation 4.

$$Q_{\Delta lnIVIX_t}(\tau|.) = a(\tau) + \rho(\tau)(lnIVIX_{t-1} - \beta_{lndevesg}(\tau)lnDEVESG_{t-1}$$

$$- \beta_{lnemergesg}(\tau)lnEMERGESG_{t-1} + \sum_{i=1}^{p-1} \pi_i(\tau)\Delta lnIVIX_{t-i}$$

$$+ \sum_{i=0}^{q-1} \omega_i(\tau)\Delta lnDEVESG_{t-i} + \sum_{i=0}^{r-1} \lambda_i(\tau)\Delta lnEMERGESG_{t-i} + \nu_t(\tau) \quad (4)$$

$$\text{where } \beta_{lndevesg} = -\frac{\beta_1}{\rho}, \beta_{lnemergesg} = -\frac{\beta_2}{\rho}$$

In formula the error correction coefficient "ρ" needs to be negative, and significant. $\beta_{lndevesg}$ and $\beta_{lnemergesg}$ parameters are long-term cointegration coefficients among "IVIX" and independent variables in each quantile. "π∗=∑ π$_i$" shows the cumulative impact of the past changes of "IVIX" on the current changes of "IVIX". ω∗=∑ω$_i$, λ∗=∑λ$_i$ represent the cumulative short-term impact of current and past changes of the independent variables on the current changes of dependent variable. The Wald Test used to evaluate the long-term cointegration relationship is based on the Chi-Square distribution. Within the scope of this test, hypotheses established for the long-term and short-term coefficients ω∗, λ*, β∗ and cumulative β∗ and Ω* were tested. The Wald test is also an effective tool in determining whether the relationship between variables has a linear or nonlinear structure. This is important in terms of the scope of adjustments made in the calculation of short- and long-term relationships. Finally, parameter estimates at both the group and individual levels are included in the next section.

5. EMPIRICAL RESULTS AND DISCUSSION

5.1 Descriptive Statistics and Unit Root Test Results

Descriptive statistics for the three main Shariah-compliant indices included in the study are presented in Table 3. According to the table, the average values suggest significant investor interest in ESG-compliant Shariah instruments within "DEVESG", which has the highest mean (161.29). The "IVIX" and "emerges" values follow, with respective averages of 135.50 and 111.99. Median values indicate relatively symmetric distributions, and they are closely aligned with the means. "DEVESG" has a maximum of 277.90, highlighting sharp rises that are likely driven by favourable market sentiment towards ESG investments. The "EMERGESG" index shows wider fluctuations, an expected feature of emerging markets due to their higher risk and uncertainty. In terms of variability," DEVESG" records the highest standard deviation (55.19), pointing to greater instability compared to "IVIX" (22.18) and "EMERGESG" (21.25), which show relatively lower levels of dispersion. While the "DEVESG" and "emerges" values are positively skewed, the "IVIX" value has a slight negative skew. The "EMERGESG" distribution is almost normal; however, other kurtosis values indicate that it is platykurtic (flatter than normal). The Jarque-Bera test statistics results for the three variables show that the null hypothesis of a normal distribution at the 1% significance level is rejected.

Table3: Descriptive Statistics

	IVIX	DEVESG	EMERGESG
Mean	135.497	161.294	111.997
Median	137.560	148.530	107.510
Maximum	175.600	277.900	178.780
Minimum	89.400	85.040	72.210
Std. Dev.	22.187	55.188	21.256
Skewness	-0.278	0.447	0.834
Kurtosis	1.933	1.970	3.180
Jarque-Bera	189.039	243.162	367.460
Probability	0.000	0.000	0.000
Sum	424512.8	505336.1	350888.1
Sum Sq. Dev.	1541811	953921	1415141
Observations	3133	3133	3133

Note: This table reports the statistics of each variable after segmented and logarithm is taken.

The traditional Augmented Dickey-Fuller (ADF) and Phillips & Perron (PP), unit root tests are employed to test the stationary of each variable. According to unit root test results in Table 4 , unit roots at the level have been found in the variables. It was seen that all the variables were stationary in their first differences. Consequently, the level of stationarity for all the variables was determined as I(1).

Table 4. Unit Root Test Results

	lnIVIX	lnDEVESG	lnEMERGESG
ADF	-3.114	-3.580	-1.808
ADF(△)	-26.325***	-29.880***	-54.063***
PP	-2.698	-3.347*	-1.888
PP(△)	-52.152***	-58.241***	-54.090***

Note: stationary test results of ADF method and PP Method (with constant & trend). △ represents the stationary test of difference series.

***, **, and * indicate significance level at 1%, 5%, and 10%, accordingly.

Source: Authors' estimations.

5.2. Wald Test Results

Results of the Wald test for the constancy of parameters result of the Wald test are illustrated in Table 5. The Wald test can be used to determine whether a parameter remains consistent across all quantiles.

The results indicate that in the model containing "IVIX" as the dependent variable, the Wald tests for long-run asymmetries demonstrate that all the independent variables have a nonlinear contemporaneous impact on the dependent variable. And, in the short run, the independent variables have an asymmetric impact on "IVIX".

Table 5: Results of the Wald test for the constancy of parameters.

Variables	Wald-statistics [IVIX]
ECM (ρ*)	6.418** (0.0113)
β_1(DEVESG)	151.65*** (0.000)
β_2(EMERGESG)	46.11*** (0.000)
ω_0 (DEVESG)	41.67*** (0.000)
λ_0(EMERGESG)	14.99*** (0.000)
Cumulative effect	
β*	136.832*** (0.000)
Ω*	577.37*** (0.000)

Note: ***, **, and * indicate significance level at 1%, 5%, and 10%, accordingly.

Source: Authors' estimations.

5.3. QARDL Estimation Results

Table 6 presents the results of the Quantile Autoregressive Distributed Lag (QARDL) model estimating the relationship between the Islamic Volatility Index (IVIX) and Shariah-compliant ESG indices from developed and emerging markets across various quantiles.

The findings indicate a clear quantile-dependent asymmetry in both short-term and long-term dynamics. $\beta 1$ shows the long-term coefficient of the DEVESG variable and results show that $\beta 1$ is positive and statistically significant for all quantiles. But there was a notable decline in higher quantiles (from 0.414 at the 10th quantile to 0.337 at the 90th quantile). This suggests that the long-term effect of developed ESG markets on IVIX is stronger in low volatility periods and weakens as volatility increases. Like DEVESG the coefficients ($\beta 2$) for the Shariah emerging market ESG index ($\beta 2$) also has statistically significant and positive for all quantiles. Yet, the notable declines for higher quantiles (from 0.247 at the 10th quantile to 0.165 at the 90th quantile). This trend suggests that emerging market ESG indices exert a decreasing influence on IVIX at higher levels of volatility.

When we evaluate short term dynamics and speed of adjustment coefficient, ρ*, it is statistically significant for all quantiles and negative. This shows that, existence of the reversion to the equilibrium among the chosen variables. "ω_0", shows that the short run effects for the DEVESG, this coefficient increase across quantiles modestly, from 0.468 at the 10th quantile to 0.501at the 90th, and all coefficient value for every quantile is significant. It shows that, sensitivity of dependent variable to changes in developed Shariah ESG index is more obvious in high regimes. "μ_0", shows the short run effects for the EMERGESG, this remains relatively stable and statistically significant across all quantiles. The short-run coefficients for the emerging ESG index (μ_0) remain relatively stable and statistically significant across all quantiles, indicating a consistent short-term influence regardless of the conditional distribution level of IVIX. The level of IVIX is irrelevant to the consistent short-term influence.

In summary, this result shows that the relationship between dependent variable IVIX and independent variables DEVESG and EMERGESG varies depending on the quantile and that short-term and long-term effects differ according to volatility levels. In particular, it was found that long-term effects are stronger in periods of low volatility, while short-term effects increase in periods of high volatility.

Table 6: QARDL estimation results for IVIX

Quantile	10th	20th	30th	40th	50th	60th	70th	80th	90th
	Long-term								
Constant (α_*)	1.592	1.704	1.764	1.869	1.897	1.962	2.132	2.267	2.474
	(111.900)	(81.490)	(120.413)	(127.328)	(94.641)	(58.333)	(47.609)	(52.995)	(53.414)
β_1 (DEVESG)	0.414	0.417	0.422	0.421	0.417	0.404	0.382	0.371	0.337
	(97.961)	(94.009)	(127.358)	(151.276)	(151.652)	(131.478)	(125.711)	(115.304)	(50.907)
β_2	0.247	0.225	0.209	0.190	0.191	0.193	0.183	0.169	0.165
	(37.124)	(35.438)	(51.721)	(53.384)	(46.108)	(31.206)	(23.449)	(23.678)	(19.055)
	Short-term								
ECM (ρ_*)	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001
	(-4.596)	(-3.350)	(-3.048)	(-2.703)	(-2.533)	(-2.347)	(-2.244)	(-2.485)	(-3.099)
ω_0 (DEVESG)	0.468	0.475	0.481	0.484	0.486	0.489	0.492	0.496	0.501
	(53.412)	(49.635)	(46.360)	(42.814)	(41.675)	(42.644)	(45.795)	(50.646)	(62.005)
μ_0 (EMERGESG)	0.122	0.120	0.119	0.119	0.118	0.117	0.118	0.116	0.116
	(24.678)	(19.375)	(16.786)	(15.505)	(14.996)	(15.168)	(16.449)	(18.766)	(24.728)

Source: Authors' estimations.
Note: ***, **, and * indicate significance level at 1%, 5%, and 10%, accordingly.

The long-term coefficients of the DEVESG and EMERGESG variables are determined according to quantiles and are shown in Figure 2. The long-term coefficient of the DEVESG variable increases between quantile 0.0–0.5 and decreases significantly after 0.5. This situation shows that the DEVESG variable has a stronger positive long-term effect at low IVIX levels, while its effect decreases or weakens at high IVIX levels. The long-term coefficient of the EMERGESG variable shows a decreasing trend as the quantile increases. In other words, it shows that the long-term effect of EMERGESG gradually weakens at high IVIX levels.
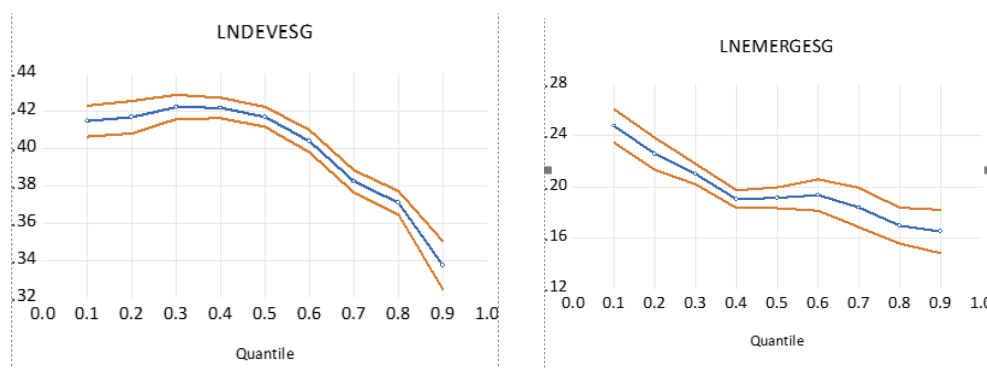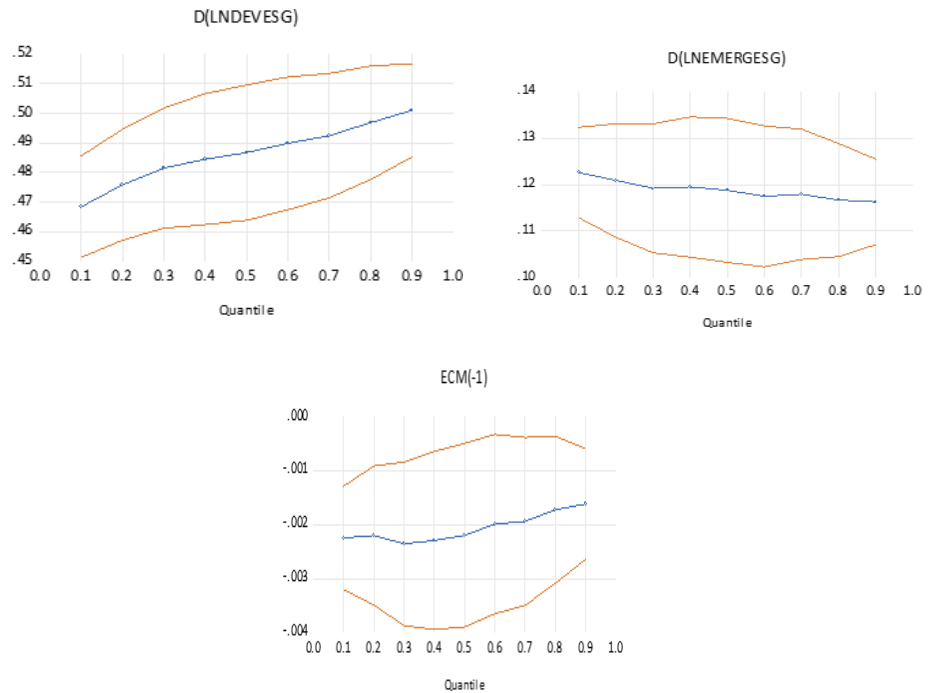

Figure 2: Long-run parameters of QARDL model for IVIX

Figure 3 shows the changes in the short-term coefficients of the DEVESG and EMERGESG variables according to quantiles. When the figure is examined, it is seen that the short-term effect of the DEVESG variable on IVIX is increasing as the quantile increases. This situation shows that the effect of the DEVESG variable is limited at low IVIX levels, but the changes in the DEVESG variable are stronger and have short-term effects at high IVIX levels. This visual can show that the DEVESG variable factors are more reactive when market stress levels increase. When Figure 3 is examined, it is observed that the short-term coefficient of the EMERGESG variable is more stable. This situation shows that the short-term coefficient of the EMERGESG variable does not change significantly according to quantiles; its effect is relatively stable. It is seen from the figure that the coefficient of the ECM(-1) variable is negative for all quantiles and becomes more negative as the quantile increases. This situation means that deviations from the long-term equilibrium are corrected faster at higher volatility levels. That is, at high IVIX levels, the system has more short-term adjustment capacity.

Figure 3: Short-run parameters of QARDL model with 90% confidence intervals for IVIX

These findings clearly show that the effects of DEVESG and EMERGESG factors are heterogeneous according to the quantiles of IVIX.These results are in line with Islamic finance literature. Because Islamic finance doctrine is based on avoiding uncertainty (garar), speculation (maysir) and interest (riba), it is often emphasised that Sharia-compliant businesses have a risk-averse structure. Hilary and Hui (2009) note that religious companies are more cautious in taking risks due to the influence of religion on individuals' risk perceptions. This situation is demonstrated by Katper et al. (2017), who show that Sharia-compliant companies have shorter borrowing terms than traditional companies, and by Bugshan et al. (2021) that these firms secure financing with more liquid assets. Additionally, Khaw et al. (2019) found that Sharia-compliant firms borrow less and invest more in current assets compared to traditional firms.

In this context, the increase in short-term market reactions as volatility rises can be seen as consistent with the cautious approach of Islamic investors. Especially during periods of high volatility, investors develop shorter-term reflexes to changes in advanced ESG indices, which is also consistent with the increase in short-term coefficients in the QARDL model.

6. CONCLUSION

In this study, the relationship between the Islamic low volatility index and Sharia-compliant ESG indices of developed and developing markets using the quantile-based QARDL model has revealed important findings regarding the integration of Islamic finance and ESG. The analyses reveal that the effects of independent variables on the Islamic volatility index vary according to volatility conditions, and that these effects are associated with volatility levels in both the short and long term.

In long-term relationships, it was noted that the effects of the Islamic developed markets ESG index factors on the Islamic low volatility market were stronger and more recognizable during the periods of low volatility. This supports the role of ESG elements in market stability and is also in line with most findings in financial literature where ESG factors have a positive effect on investors' risk perception in periods of crises. In addition, it has been found that the Islamic emerging markets ESG index exhibits positive effects in the long term, but this effect decreases in periods of high volatility. This result suggests that ESG practices and regulatory infrastructure in emerging markets may be more fragile compared to developed markets and that the ESG effect may be relatively weaker in

periods of high volatility. For instance, Agustin et al. (2025) found that ESG practices, particularly in governance and social dimensions, helped reduce volatility in Islamic markets during the COVID-19 pandemic, supporting their stabilizing effect.

In the short-run dynamics, it has come to light that the ESG index on Islamic developed markets is more responsive and efficient about the Islamic Volatility Index. In the presence of high volatility, these results are being observed. ESG acts as a buffer on market volatility in the short term. It has also supported the earlier studies in the literature that ESG investments stabilize capital flows at the time of the crisis. On the other hand, the short-term effects of the Islamic emerging markets ESG index factors remained consistent and stable regardless of the volatility level; this shows that ESG practices in these markets are more stable and effective in the short term (Katper et al. 2017; Bugshan et al. 2021).

One of the important findings of the study is that there is a balance relationship between the independent variables and the Islamic volatility index in the long term. This balance reveals that the system tends to adapt and return to balance despite short-term fluctuations in the markets. This situation is parallel to previous studies supporting the positive effect of the structural features of Islamic financial markets and risk management mechanisms on volatility (Zhao et al., 2022).

Considering these results, it can be said that ESG factors play a critical role in volatility management in Islamic financial markets, providing resistance to market volatility in both the short and long term. As emphasized in the literature, ESG integration is not only an ethical choice, but also a strategic tool that increases financial stability and reduces risks (Muneer et al., 2025; Ariff et al., 2023). However, it is concluded that ESG practices are effective in separate ways depending on market conditions and volatility levels, therefore it is important for policy makers and investors to adapt ESG strategies according to market dynamics.

In line with the study findings, some policy recommendations can be developed to increase the effectiveness of ESG integration in Islamic finance markets. First of all, it is of great importance to strengthen ESG standards, especially in emerging markets, and to implement Sharia-compliant criteria in a common, consistent and harmonious manner by investors, companies, and regulators. In this way, the volatility-reducing effect of ESG can be made sustainable during crisis periods. Transparency and reporting standards need to be increased so that market actors can better monitor ESG performance (Muneer et al., 2025; Gati et al., 2024). In addition, the models used in the integration of ESG and Islamic finance should be constantly updated, taking into account the practices in developed markets.In addition, the adoption of volatility-sensitive methods such as Regime-switching and quantile-based models will enable the development of more accurate risk management strategies during financial crisis periods (Heydari et al., 2023; Linares et al., 2008).

In addition, products and services that integrate the moral and financial objectives of investors are expected to play as important a role in sustaining market liquidity and stability by boosting the demand for Islamic ESG investments in the investment fad state, as postulated by Singh (2020) and Ariff et al. (2023). This study contributes significantly to the effects of ESG factors on Islamic low volatility in Islamic finance markets. However, there are several areas of research that need addressing in the future. In future studies, the authors can deepen the existing knowledge by analyzing the effects of ESG and Sharia compliance on volatility dynamics in different geographical regions by considering regulatory differences, cultural factors and application diversity in the markets (Peng & Isa, 2020; Azizah & Haron, 2024). In addition, they can contribute to the existing literature with studies that provide concrete and measurable criteria for integrating the Maqasid al-Shariah concept into ESG performance measures.

Finally, the long-term and complex effects of multiple crises such as pandemics, economic fluctuations and geopolitical risks on the integration of ESG with Islamic finance can be investigated using panel data analysis. Such studies will provide more comprehensive inferences for the development of portfolio resilience and risk management strategies.

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