

## RESILIENCE OF ISLAMIC STOCK INDEXES TO ECONOMIC UNCERTAINTY: QUANTILE-ON-QUANTILE INSIGHTS

Ozair Siddiqui<sup>1\*</sup> and Naveed Khan<sup>2</sup>

<sup>1,2</sup> International Islamic University Islamabad, Pakistan

### ABSTRACT

This paper examines the impact of country specific EPU on Islamic stock indexes of developed, emerging, and frontier markets using Quantile on Quantile Regression (QQR). For robustness, we employ causality in mean and variance. We gather Islamic stock indexes and country specific EPU data from nine markets, classified as developed, emerging, and frontier, from January 2010 to November 2024. Our findings demonstrate that EPU exhibits predictive power for Islamic stock indexes across different quantiles (lower to higher). Additionally, the effect of EPU on respective Islamic stock indexes is asymmetric. Finally, we also show that country specific EPU negatively (positively) impacts Islamic stocks during bearish (bullish) periods of economic activity. These findings add to our understanding of and contribute to the limited literature on Islamic stock markets, highlighting their unique characteristics and responses to policy-driven uncertainties.

*Keywords:* Economic policy uncertainty, Islamic stocks, Quantile on quantile regression, Economic activity.

**JEL classification:** C4; D89; G1; G10; G14.

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\* **CONTACT** Ozair Siddiqui: [ozairsiddiqui.acca@gmail.com](mailto:ozairsiddiqui.acca@gmail.com); International Islamic University Islamabad, H-10, Islamabad, 44000, Pakistan

## I. INTRODUCTION

Comprehension of risk has always been a fundamental factor in the study of asset pricing in financial economics. Arguably, asset prices reflect expected risks in investments (Fama, 1965, 1970). Among the numerous risk drivers, policy uncertainty is most notable at least recently. Literature shows that policy uncertainties influence economic decisions of investors, impacting asset prices and their returns (Ashfaq et al., 2020; Duan et al., 2023). While it is rather difficult to quantify such uncertainties in a holistic manner, Baker et al. (2016) has developed the Economic Policy Uncertainty (EPU) Index to capture uncertainty surrounding government policy, economic decisions, and regulations. The literature further shows evidence that this uncertainty bears association with volatility of returns of different asset classes. As such, it is important to understand how this uncertainty is transmitted and priced by investors, especially in modern, connected markets.

Additionally, the relationship between EPU and Islamic indexes holds unique significance, as Islamic finance is seen as an emerging substitution for conventional finance (Mukhibad et al., 2022; Siddiqui et al., 2022b). Islamic economic theory, centered on *Maqasid-al-Shariah*, forms the basis of this distinctive financial and economic system that places additional prohibitions to ensure distributive and social justice (Mas'ud, 1975). More specifically, Islamic economic system emphasizes risk-sharing, transparency, and asset-backed transactions, promoting a stronger connection with real economy. Such a framework should theoretically reduce speculation, lowering market-driven volatility (Usmani, 2005). Despite such built-in stabilizing frameworks, Islamic economic systems remain integrated with the overall global economy. Therefore, it is interesting to examine if adherence of *Shariah* principles makes Islamic indexes more resilient to policy uncertainties. Investigating this association of Islamic stock returns and EPU gives valuable insights into the risk-return trade-off in Islamic financial and economic systems.

While immense literature is available on the impact of EPU and conventional financial markets (Akdag et al., 2023; Lean et al., 2024; Li et al., 2023), studies specifically focusing on Islamic stock indexes remain scarce. Additionally, limited available literature considering Islamic financial markets mainly focus on developed markets alone (Aslam et al., 2023; Kazak et al., 2025). From the literature, the relationship between EPU and stock returns is dynamic, quantile-specific, non-linear, and time-varying depending on numerous institutional and market-specific factors (Rehman et al., 2024; Saeed Meo et al., 2023). Considering these factors, there appears to be a dire need to perform a comparative analysis of Islamic markets across different classes (developed, emerging, and frontier), to assess how these markets respond to EPU. In this paper, we address this by assessing the impact of EPU on three classes of Islamic financial markets (developed, emerging, and frontier), employing two advanced mythologies, Quantile-on-Quantile Regression (QQR) approach and causality tests in mean and variance.

The analysis is timely given that Islamic finance is quickly gaining popularity as an alternative financial system. Understanding how Islamic stocks respond to risks and uncertainties is essential for enhancing our understanding of the risk-return dynamics in these markets. This is specifically relevant for policymaking and standard-setting institutions that place reliance on the stability of the Islamic financial markets in the periods of uncertainty. Additionally, understanding

the differences in the market responses of developed, emerging, and frontier economies provides comparative insights on how institutional and market factors influence EPU-return relationship in Islamic markets.

Acknowledging the complex and time-varying relationship between economic uncertainty and stock returns, we employ QQR approach of Sim & Zhou (2015) to examine the state-dependent impact of EPU on Islamic stock indexes in developed, emerging and frontier markets. The QQR has several advantages over other classical economic methods such Ordinary Least Square (OLS) and Quantile Regression (QR). First, it addresses a more complex and interesting relation, which traditional OLS and QR fail to, that is assessing impacts across quantiles of both dependent and independent variables. Second, the QQR allows a non-linear association in ad hoc fashion via a thorough examination under different states of uncertainties (Bekiros et al., 2016). Finally, the QQR offers better insights on state-dependent and conditional distributions of Islamic stock indexes and EPU by focusing on certain parts of the distributions (Bekiros et al., 2017). Considering the mentioned advantages, we use QQR to investigate state-dependent and tail effect of EPU on Islamic stock indexes.

Our findings corroborate the asymmetric impact of EPU on Islamic stocks indexes. For the USA and European markets, we find that at higher quantiles EPU negatively affects stock returns, while at lower quantiles the effect is positive. By contrast, for the Australian market, there is a negative association between EPU and Islamic stocks returns at low, middle and high quantiles. Focusing on emerging markets, the Chinese Islamic stock returns at lower and middle quantiles are negatively associated with EPU at middle-higher quantiles. While in India we observe that at higher quantiles, EPU negatively affect the stock returns at higher quantiles. Further, we observe that at middle-higher quantiles, EPU negatively affects the Islamic stock indexes of Pakistan at lower, middle and middle-higher quantiles. Finally, in Nigeria the findings indicate that at middle-higher quantiles, EPU negatively impacts the index returns at lower, middle and middle-higher quantiles. Additionally, our findings report that EPU has a time varying impact on Islamic stock indexes of all three market classes examined in the study. For robustness, causality in mean and variance technique shows that the association between EPU and Islamic indexes of developed, emerging, and frontier markets varies at higher, lower, middle and upper quantiles during extreme markets conditions (bearish and bullish). Further, these findings also reveal that the effect of EPU on Islamic stock indexes is time-varying across developed, emerging, and frontier markets. Our findings provide valuable insights to policymakers and market regulators by illustrating how Islamic stock indexes respond to EPU across varying market conditions.

The rest of the paper is sequenced as follows: Section 2 covers theoretical foundations and recent literature. Section 3 elaborates on research design. Sections 4 and 5 show estimation results and discussion, respectively. Section 6 concludes the study and highlights key implications.

## II. REVIEW OF THE LITERATURE

Conventional wisdom argues that information available to the investors gets reflected in the prices of those investments. Fama (1965, 1970) explains that more transparent the market is, more quickly the information gets reflected in the prices of the assets, referred to as the Efficient Market Hypothesis (EMH). In other words, informed investors are better at assessing risks associated with the investments. This enhanced risk quantification influences their expectations for returns, shaping the prices of the assets in the markets (Lee & Lee, 2023; Yousaf et al., 2024). Conventional finance also emphasizes that investors are inherently risk averse and usually associate higher return for higher risks (Fama & French, 2015; Markowitz, 1952). Recently, with globalization of the world economy, the definition of risk has substantially changed, where Kwilinski et al. (2023); Meng et al. (2020); and Tang et al. (2021) show that risks from one market have a ripple effect on assets of the other markets. This transmission of risk is beyond geographical and temporal boundaries. For example, Sawarn & Dash (2023) show that economic policy uncertainty impacts discount rates, liquidity, and expected cash flows in financial markets. Therefore, literature argues that this economic uncertainty acts as a transmission channel, where higher economic uncertainty will get translated into higher expected return in the markets (Ashfaq et al., 2020; Duan et al., 2023).

Additionally, it is interesting to note that market efficiency from the conventional wisdom is advocated by Islamic economic theory as well. The concept of *Maslaha* (or public good), as highlighted by Mas'ud (1975), strives for a transparent market to ensure effective achievement of *Maqasid-al-Shariah*<sup>1</sup> (or Objectives of *Shariah*, where *Shariah* means Islamic law). Further, market efficiency also gets support from Usmani's (2005) identified major prohibitions in *Shariah*, where *jahl* (or ignorance) is prohibited in an Islamic economic system. As such, Islamic economic philosophy supports a system where all transacting parties have the same information available at the time of entering a contract. Therefore, both Islamic and conventional wisdom agree on the importance of transparent and efficient markets. However, it can be argued that the manner in which *Shariah* promotes market efficiency is different from its conventional counterpart. For example, *Shairah* compliant companies are required to adhere to additional regulations, such as prohibition of *jahl* (ignorance) and *gharar* (excessive uncertainty, discouraging speculation), to count a few (Siddiqui et al., 2022a). A popular mode of financing used by Islamic Financial Institutions (IFIs) is *Murabahah*, which is a form of trust sale. Under this contract, the selling party discloses the profit from sale, and not the sale price (Siddiqui et al., 2022b). Such a transparent framework of transacting should improve market efficiency, and as such, should be more effective in pricing of assets (Alam et al., 2022). Additionally, *Shariah* also imposes a risk-sharing (or trading) approach, as opposed conventional debt-based financing approach (Siddiqui et al., 2022b). This distributive approach to risk management should theoretically improve the ability of institutions to manage and mitigate risks arising from economic and policy uncertainties (Mukhibad et al., 2022; Siddiqui et al., 2022b).

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1 Identified by Al-Ghazali as protection of: (1) life; (2) faith, (3) progeny, (4) intellect, and (5) property (Ismanto et al., 2021).

Empirically, numerous studies examine the association of EPU and stock returns or commodities. For example, Akdag et al. (2023); Asafo-Adjei et al. (2020); Lean et al. (2024); Li et al. (2023); Dehghanzadeh Shahabad & Balcilar (2022); and Zhu et al. (2020) all examine the impact of EPU on stock prices. The findings show that the impacts of EPU is dynamic, time-varying, and nonlinear. However, these studies predominantly focus on conventional stocks. Focusing specifically on Islamic stocks, Ftiti & Hadhri, (2019) show that EPU and Islamic stock returns show a causal relationship. They provide empirical evidence supporting predictability of Islamic stock returns and further argue that the association between EPU and Islamic stock returns is time-varying. However, they confine their study to nine Dow Jones Islamic Market indexes of developed markets only. Similarly, Shaikh et al. (2020) show that the impact of EPU on Islamic stocks is asymmetric in the short run but they only consider the market of the USA. Furthermore, an interesting comparison of EPU on Islamic versus conventional stock returns is performed by Godil et al. (2020), showing that these responses differ from one another. However, the focus of this study is also restricted to developed markets.

On a slightly different note, Saeed Meo et al. (2023) examine the impact of the overall global uncertainty (referred to as World Uncertainty) on Islamic stock returns. The study employs a QQR approach and provides evidence of a negative association between global uncertainty and the returns of Islamic indexes. Similarly, Aslam et al. (2023) show that EPU of the USA is connected with the Islamic stock returns of the Thai, Indonesian, Pakistani, and Indian markets. As such, the findings advocate a connectedness in these developing and frontier markets. This interconnectedness between Islamic indexes is further confirmed by Naeem et al. (2025), who also show evidence of connectedness of Islamic indexes with conventional indexes. Further, Kazak et al. (2025) show that although Islamic stock returns are negatively impacted by the global uncertainties (EPU being one of them), the adverse impact of these uncertainties is less severe as compared to conventional stock returns. Similarly, Rehman et al. (2024) argue that not all uncertainties should have the same impact on the Islamic or conventional stocks. They compare and examine the transmission mechanism of oil crisis and COVID-19 on Islamic and conventional stocks. Their findings show that impact of COVID-19 is far serious than the oil crises on the global stock, whether Islamic or conventional.

Despite a strong theoretical justification for efficient risk management for *Shariah* compliant entities, it remains understudied in the literature, specifically from the lens of spillover and connectedness. Additionally, the small segment of literature that does focus on this area examines the issue primarily for the developed markets.

### III. RESEARCH METHODOLOGY

#### 3.1. Sampling and Data

For an in-depth comparative analysis, we classify Islamic markets into three categories: (1) Developed; (2) Emerging; and (3) Frontier, following the MSCI criteria (MSCI, 2024). We select countries based on their availability of data

pertaining to the two variables examined in the study, EPU<sup>2</sup> and Islamic index returns<sup>3</sup>. Table 1 shows the selected countries for each of the three markets and their respective Islamic indexes. For the analysis, we collect monthly Islamic index prices and returns for the selected markets from January 2010 to November 2024, subject to data availability (for example, for certain markets, observations for last few months are dropped as the data for EPU are not available. The EPU data and Islamic index returns for Nigeria are available only from April 2016 to June 2023).

**Table 1.**  
**Sample Construction**

No	Country	Market	Islamic Index
1	USA	Developed	Dow Jones Islamic Market US
2	Europe	Developed	Dow Jones Islamic Market Europe
3	Japan	Developed	FTSE Shariah Japan 100
4	Australia	Developed	S&P/ASX 200
5	Canada	Developed	S&P/TSX 60 Shariah
6	China	Emerging	FTSE Shariah China
7	India	Emerging	Nifty 50 Shariah
8	Pakistan	Frontier	All Shares Islamic Index of Pakistan
9	Nigeria	Frontier	NSE Lotus Islamic

Note: This table shows the details of the countries (and their respective Islamic indexes) selected for analysis

### 3.2. Baseline Estimation (Quantile on Quantile Regression (QQR) Approach) and Robustness Check

We examine the effects of different EPU quantiles on the conditional quantile return of Islamic stocks. Since this approach integrates quantile regression and nonparametric estimation, we follow the approach as in Sim & Zhou (2015). To assess the relationship of independent variables on different quantiles of the variable of interest, Koenker & Bassett (1978) present conventional QR. In a similar vein, Stone (1977) and Cleveland (1979) present local linear regression, which looks at the impact of quantiles of exogenous variable on the variable of interest. The QQR technique circumvents the “curse of dimensionality”, an issue that arises when estimating non-parametric models. By determining how an independent variable affects different quantiles of the variable of interest, the QQR methodology addresses the drawbacks of the traditional QR method (Chang et al., 2022; Sim & Zhou, 2015). Furthermore, the potential issue of specification bias (omitted variables) may prevent the conventional binary QR approach from producing accurate outcomes (Ashley et al., 1980). By incorporating the moderating influence of additional exogenous variables in the form of interactions, the QQR technique expands on the binary QR methodology to address this issue via more accurate assessment of association between the variables being examined (Ozkan et al., 2023; Sinha et al., 2023).

2 Collected from: <https://www.policyuncertainty.com/>

3 Collected from: <https://www.investing.com/>

In accordance with the methodology of Raza et al. (2018), the non-parametric regression equation embodies the QQR approach:

$$R_i = \beta^\theta(EPU) + \alpha^\theta r_{i-1} - 1 + \mu_i^\theta \quad (1)$$

where in Equation (1) Islamic stock returns at a time  $i$  are denoted by  $R_i$ ,  $EPU$  is the shock of EPU,  $\mu_i^\theta$  is the quantile error term,  $\alpha^\theta r_{i-1}$  represents the impact of past stock returns on the current returns adjusted for the specific quantile  $\theta$ , and  $\beta^\theta$  is the slope of EPU at  $\theta^{\text{th}}$  quantile. The exact relationship between EPU and Islamic stocks ( $\beta^\theta(\cdot)$ ) is unknown, thus, we use the first-order Taylor series expansion to approximate this function around the quantile of  $EPU$ , which is given as:

$$\beta^\theta(EPU) \approx \beta^\theta(EPU^\tau) + \beta^{\theta'}(EPU^\tau)(EPU - EPU^\tau) \quad (2)$$

In Equation (2),  $\beta^\theta(EPU^\tau)$  represents the function at the quantile ( $EPU^\tau$ ) and  $\beta^{\theta'}(EPU^\tau)$  is the partial derivative (or slope) of the function at ( $EPU^\tau$ ), which shows how sensitive stock returns are to changes in EPU around ( $EPU^\tau$ ). The  $(EPU - EPU^\tau)$  represents the unexpected change in EPU. Furthermore,  $\beta^{\theta'}(EPU^\tau)$  and  $\beta^{\theta''}(EPU^\tau)$  represent functions of  $\theta$  and  $\tau$ , respectively, therefore  $\beta^\theta(EPU^\tau)$  and  $\beta^{\theta'}(EPU^\tau)$  are expressed as  $\beta_0(\theta, \tau)$  and  $\beta_1(\theta, \tau)$ , respectively, to obtain:

$$\beta^\theta(EPU^\tau) \approx \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(EPU - EPU^\tau) \quad (3)$$

We substitute Equation (3) in (1) and obtain:

$$R_i = \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(EPU - EPU^\tau) + \alpha(\theta)r_{i-1} - 1 + \mu_i^\theta \quad (4)$$

Where, in Equation (4) the term  $\beta_0(\theta, \tau) + \beta_1(\theta, \tau)(EPU - EPU^\tau) + \alpha(\theta)r_{i-1}$  represents the  $\theta^{\text{th}}$  conditional quantile of returns. Further, in Equation (4) the conditional quantile describes the actual effect of EPU on returns of asset classes in each quantile. Where the coefficient  $\beta_0$  and  $\beta_1$  are decided and described by the  $\theta$  and  $\tau$ , respectively.

Further, in Equation (4), lower  $\theta$ -quantile of asset returns correspond to turbulent times, whereas the higher  $\theta$ -quantile corresponds to stable market conditions. Similarly, lower  $\tau$ -quantile of EPU imply lower degrees of policy uncertainty, while higher  $\tau$ -quantiles indicate higher uncertainty. The coefficient  $\beta_0$  and  $\beta_1$  contain absolute information about the potential impact.  $\beta_0(\theta, \tau)$  represents the impulsive response of asset returns to a certain level of uncertainty. Meanwhile,  $\beta_1(\theta, \tau)$  represents the extent and effect of unforeseen shocks of EPU on Islamic stocks return.  $\beta_0$  and  $\beta_1$  are obtained through linear regression and the estimated coefficient  $b_0$  and  $b_1$  are obtained from the following equation:

$$\min_{b_0, b_1} \sum_{i=1}^n p_{\theta} [R_i - b_0 - b_1(EPU - \widehat{EPU}^{\tau}) - a(\theta)r_i - 1] K\left(\frac{F_n(\widehat{R}_i) - \tau}{h}\right) \quad (5)$$

In Equation (5),  $\rho_{\theta}$  shows the loss function of quantiles, which is defined as  $\rho_{\theta}(u) = \mu(\theta - I(\mu < 0))$ . An indicator function is represented by the symbol  $I$  while  $K(\cdot)$  represents the Gaussian kernel function with bandwidth  $h$ , employed to balance observations in  $(EPU^{\tau})$ , with weights related to the distance between the empirical distribution function of  $\widehat{R}_i$ , which is represented as  $F_n(\widehat{R}_i) = \frac{1}{n} \sum_{k=1}^n I((\widehat{R}_k) < (\widehat{R}_i))$ . The value of correspondence distribution functions with the quantile of  $EFSI^{\tau}$  is represented by  $\tau$ . Additionally, the final estimate's smoothness and the amount of area evaluated surrounding the target point are determined by the bandwidth  $h$  decision made in Gaussian kernel regression. The estimate will become more accurate if the bandwidth ( $h$ ) is small; if  $h$  is large, the estimate will be smoother but less accurate. Choosing a small bandwidth  $h$  results in higher variance with smaller deviation (Wen et al., 2022). Therefore, following Sim and Zhou (2015), this study employs a bandwidth of  $h=0.05$ .

Finally, we use causality in mean and variance approach as a robustness check of our baseline findings derived from the QQR approach, as explained in the earlier subsection.

## IV. FINDINGS

### 4.1. Descriptive Statistics and Diagnostics

Table 2 shows summary statistics of the variables. The table shows that among developed economies, the US Islamic stock index has the highest return, i.e. 0.0110, while Australian Islamic stock index return exhibits lowest standard deviation (SD), i.e. 0.0389. Japan reports the second highest mean value of 0.0073 with 0.0457 SD. Additionally, the Islamic stock indexes of Europe and Canada report the mean value of 0.0049 and 0.0047, respectively, with highest SD value of 0.0478 and 0.0431, respectively. Among emerging and frontier markets, the table shows that Islamic stock index of Pakistan reports the highest mean value of 0.0139, with SD of 0.0593. Further, the Islamic stock index of Nigeria reports the second highest mean value of 0.0113, with 0.0598 SD. India reports the third highest mean value of 0.0091, with 0.0470 SD. Finally, the Islamic stock index of China reports the lowest mean value of 0.0018 with highest SD value of 0.0639.

Figure 1 shows the return series of Islamic stock indexes and EPU of developed, emerging and frontier markets. The US EPU index sharply increases following such events as the European debt crisis in 2010-2012, referendum of Brexit in 2016, the trade tension between the USA and China in 2018, and the COVID-19. Moreover, we observe that when EPU is at low end, Islamic stock indexes show increased returns and vice versa. Further, the EPU index of Japan shows positive covariance with the Japanese return volatilities. When there are significant changes in leadership and contested national elections, Japan EPU index rises. Further, it peaks during the Asian financial crisis, the 2011 battle to control the USA debt, the Brexit referendum, and Japan's deferral of the 2016 consumption tax hike.

Furthermore, EPU in Canada also shows a time varying nature with Islamic stock index, although the country is still dealing with unstable oil prices, sensitivity to Chinese trade and political conflict. The Canadian economy recently shows stability and experiences a moderate return, as of 2015.

**Table 2.**  
**Descriptive Statistics**

Variable	Country	Obs	Mean	SD	Min	Max	Skew	Kurt
Return	USA	179	0.0110	0.0439	-0.1065	0.1394	-0.2367	0.3100
	Europe	179	0.0049	0.0478	-0.1275	0.1271	-0.1847	0.1493
	Japan	178	0.0073	0.0457	-0.1109	0.1224	-0.3331	0.3492
	Australia	179	0.0038	0.0389	-0.2118	0.0996	-1.1010	4.4741
	Canada	179	0.0047	0.0431	-0.1393	0.1818	-0.0642	1.5213
	China	177	0.0018	0.0639	-0.1479	0.2400	0.3802	1.5075
	India	179	0.0091	0.0470	-0.2088	0.1407	-0.3183	2.1085
	Pakistan	170	0.0139	0.0593	-0.2420	0.2326	-0.0473	2.2919
	Nigeria	87	0.0113	0.0598	-0.1898	0.1478	-0.1591	0.5488
EPU	USA	179	4.89	0.29	4.27	5.86	0.4937	0.2328
	Europe	179	5.38	0.30	4.72	6.07	0.1823	-0.5025
	Japan	178	4.70	0.24	4.16	5.44	0.5501	0.5094
	Australia	179	4.75	0.42	3.61	5.82	0.2379	-0.2003
	Canada	179	5.46	0.38	4.58	6.52	0.1076	-0.4773
	China	177	5.18	0.56	4.08	6.50	0.1409	-0.9362
	India	179	4.48	0.47	3.15	5.65	0.0073	-0.1744
	Pakistan	170	4.48	0.49	3.29	5.89	0.2677	-0.2349
	Nigeria	87	4.57	0.26	4.05	5.30	0.4417	0.0997

Note: This table shows the summary of the descriptive statistics, where 'Obs' shows number of observations, 'SD' is the standard deviation, 'Min' is minimum value, 'Max' is maximum value, 'Skew' is skewness, and 'Kurt' is kurtosis. We collect monthly Islamic index prices and returns for the shown markets from January 2010 to November 2024, subject to data availability (for example, for certain markets observations for last few months had to be dropped as the data for EPU was not available, similarly, the EPU data and Islamic index returns for Nigeria were available from April 2016 to June 2023, making a total of 87 observations for this market).

Table 3 reports the result of preliminary diagnostic tests before employing QQR. The result show stationarity of the variables at level. The Jarque-Bera (JB) statistics for all variables (except for returns series for Japan and Pakistan) are significant at 1%, suggesting that these series are not normally distributed. To check the linear association between EPU and Islamic stock indexes, we employ the BDS test of Broock et al. (1996), and the outcomes reveal that the residuals are not independent and identically distributed, confirming the presence of non-linearity in distribution (see Figure 2 which shows clear deviation from the lines). These diagnostic tests confirm the suitability of QQR to assess the effect of EPU on the Islamic stocks in the selected markets.

**Table 3.**  
**Summary of the Diagnostic Tests**

Variable	Country	Normality		Linearity		Stationarity	
		JB		BDS		PP	
Return	USA	19.7199	***	42.9143	***	-15.373	***
	Europe	12.069	***	42.7757	***	-14.9	***
	Japan	4.12414		41.8215	***	-13.008	***
	Australia	7.89938	**	51.4441	***	-16.019	***
	Canada	23.69	***	37.963	***	-13.711	***
	China	11.0849	***	31.8502	***	-12.985	***
	India	19.9915	***	40.3582	***	-15.437	***
	Pakistan	3.14583		30.0921	***	-13.506	***
	Nigeria	4.67702	*	36.1338	***	-7.0431	***
EPU	USA	155.25	***	13.8977	***	-5.2954	***
	Europe	22.1021	***	16.3084	***	-5.2904	***
	Japan	101.462	***	11.6287	***	-6.0596	***
	Australia	64.9183	***	8.21992	***	-8.2159	***
	Canada	51.5543	***	11.0089	***	-6.9486	***
	China	43.0314	***	15.52	***	-5.5702	***
	India	77.3653	***	13.5111	***	-6.183	***
	Pakistan	182.941	***	14.5156	***	-6.2774	***
	Nigeria	31.1303	***	5.02617	***	-4.9057	***

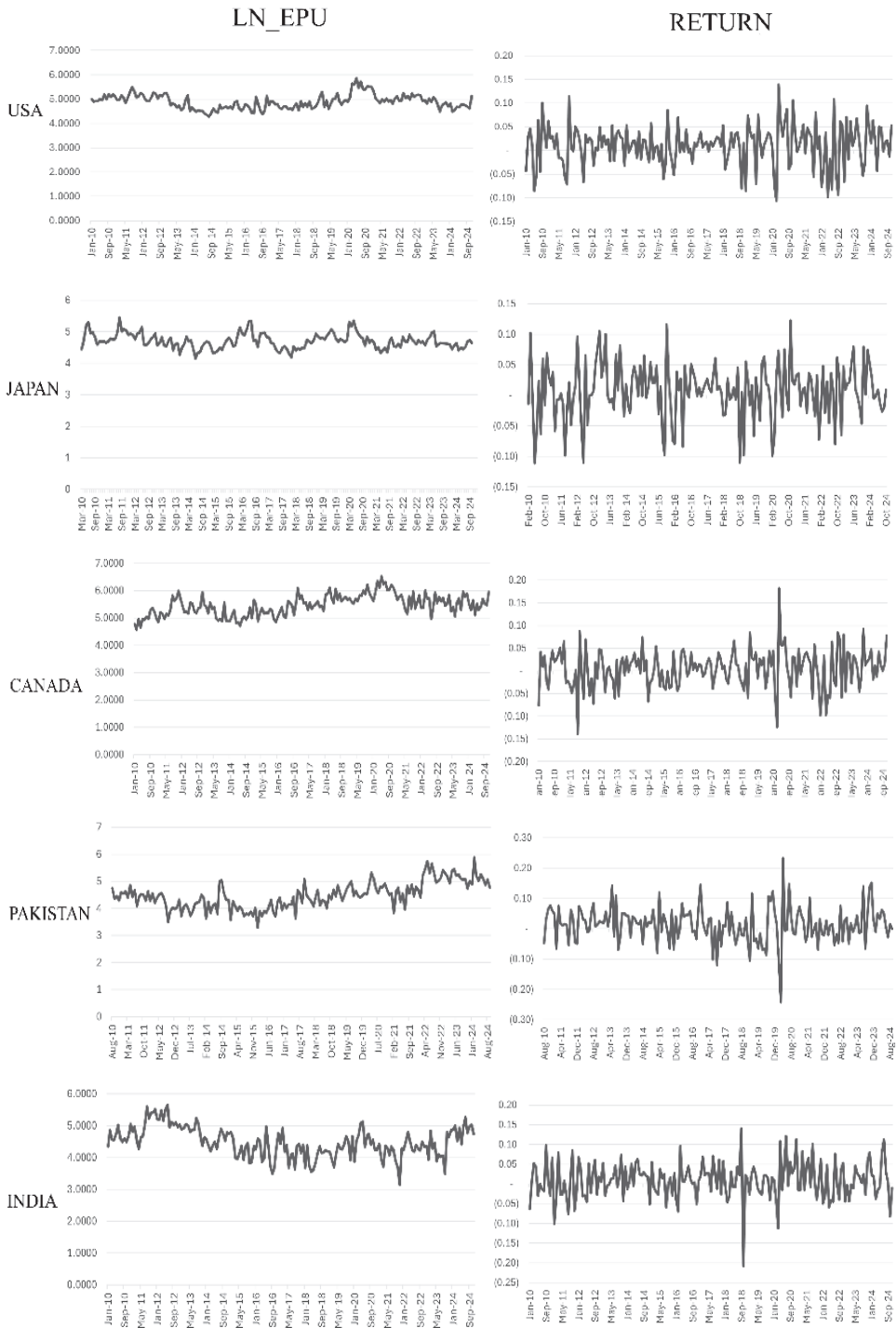
Note: This table shows the summary of three diagnostic tests performed on the data, where (\*\*\*), (\*\*), and (\*) are significant at 1%, 5%, and 10%, respectively. Additionally, JB is the Jarque-Bera test for data normality, BDS test is for linearity, and PP is the Phillips-Perron test for stationarity.

Table 4 shows the correlation among the variables. The result indicates that EPU has significant positive correlation with Islamic stock indexes of Europe, Canada, China, and Pakistan. By contrast, we observe that EPU has negative and significant correlation with Islamic stock indexes of Japan, Australia, and India.

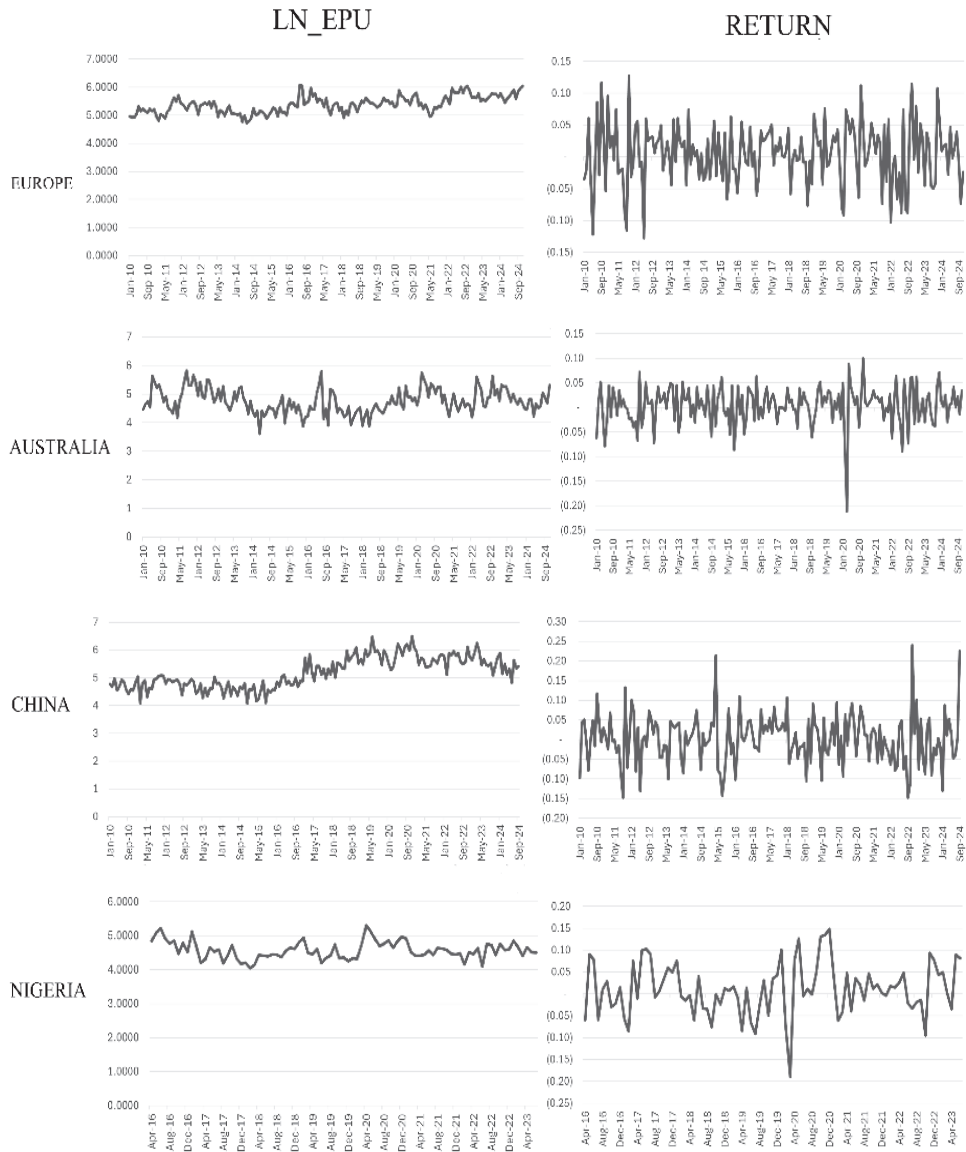
**Table 4.**  
**Correlation**

Country	Correlation (Price vs. EPU)
USA	0.03045
Europe	0.39604 ***
Japan	-0.32338 ***
Australia	-0.14390 *
Canada	0.33452 ***
China	0.42515 ***
India	-0.28706 ***
Pakistan	0.37955 ***
Nigeria	-0.24732 **

Note: This table shows the correlation between Price series of the Islamic indexes and EUP, where (\*\*\*), (\*\*), and (\*) are significant at 1%, 5%, and 10%, respectively.

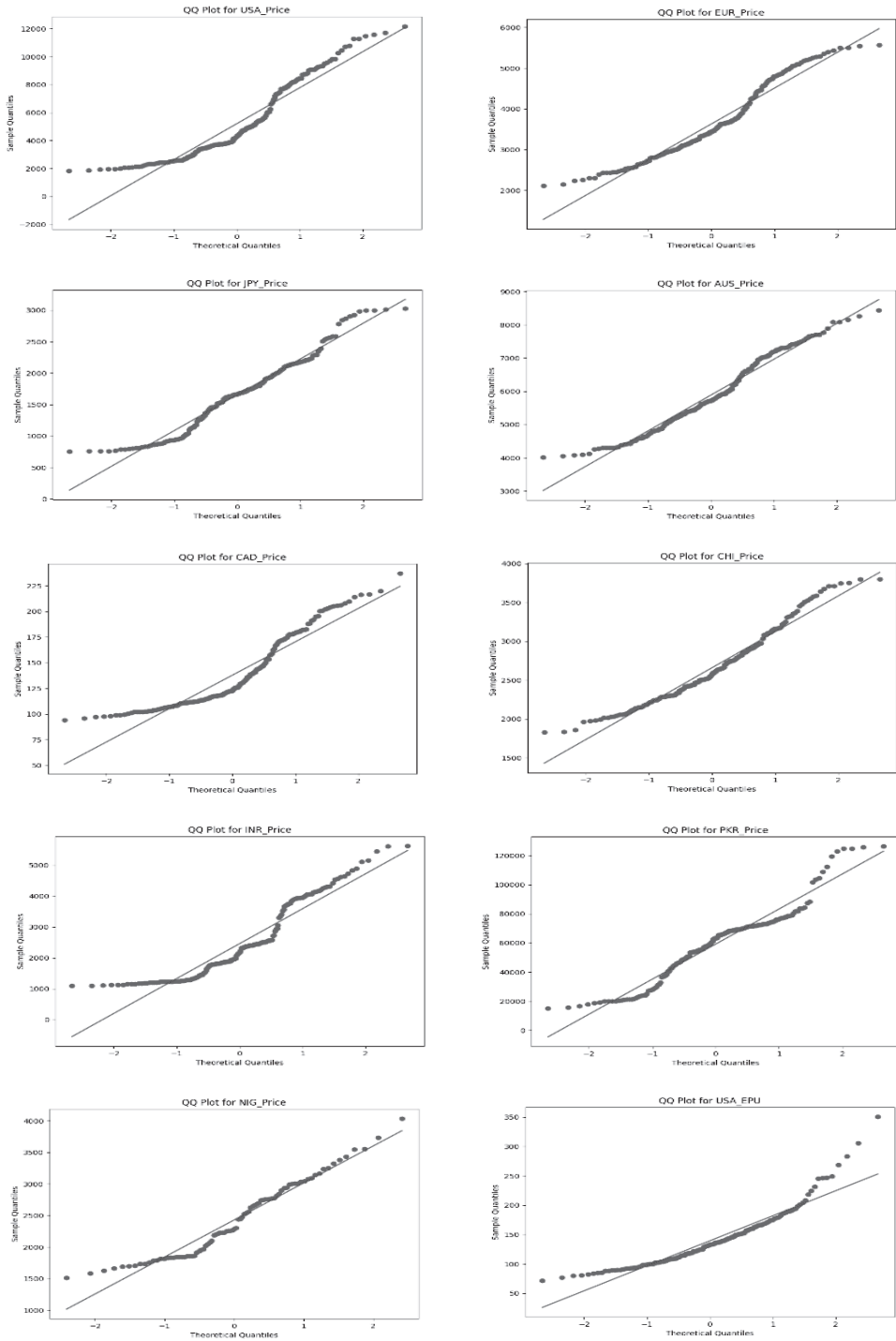


**Figure 1.**  
Graphs for EPU and Return Series

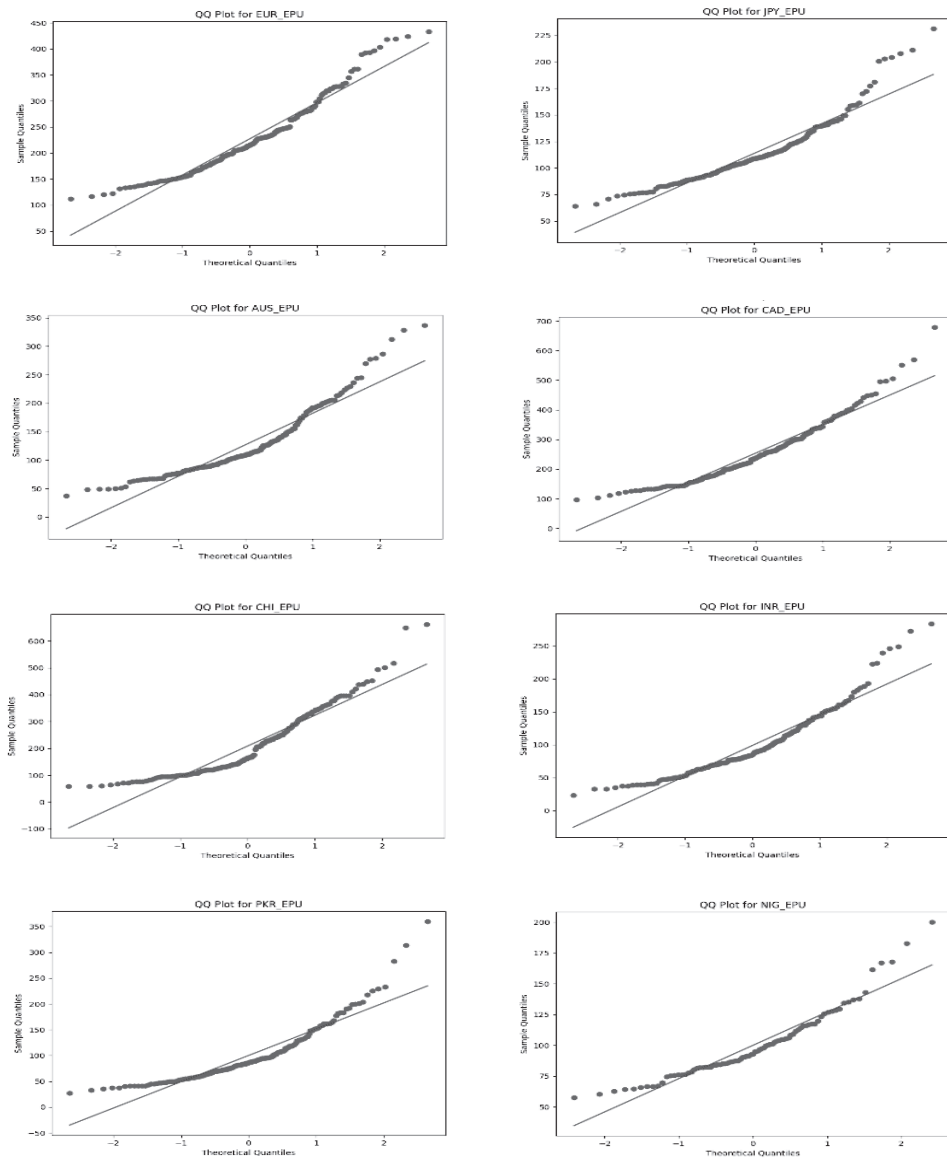


Note: This figure shows the price and log series of EPU for developed, emerging and frontier markets.

**Figure 1.**  
**Graphs for EPU and Return Series (Continued)**



**Figure 2.**  
QQ Plots for Linearity



Note: This figure shows QQ plot for linearity of price and EPU series for all countries.

**Figure 2.**  
**QQ Plots for Linearity (Continued)**

**4.2. Results of QQR Approach for Developed Markets**

Figure 3 shows the three-dimensional (3D) graphs of QQR estimates. Here, the x-axis shows the  $\theta^{th}$  quantile coefficient of EPU and the y-axis demonstrates  $q^{th}$  quantile coefficient of Islamic stock index for developed markets. The color bar represents the strength of the correlation between EPU and Islamic stock indexes with dark blue color showing highest and yellow showing lowest value.

Figure 3, Panel A indicates an asymmetric effect of EPU on the aggregate USA Islamic stock index. In 361(19 x 19) area combinations, the coefficient values range from -0.015 to 0.010. Further, we observe that at higher quantiles of EPU, Islamic stock index of the USA shows negative returns, while at lower quantiles of policy uncertainty, Islamic stock index reports positive returns. Interestingly, we show that EPU has favorable effect on the Islamic stock index of the USA market at medium quantiles, which indicates that a stable economic policy will boost the returns of Islamic stocks by lowering market volatility. Moreover, the impact of the USA EPU is more pronounced on the Islamic stock markets as compared to the Asian stock markets (Figure 4), particularly in the short run, as argued by Hammoudeh et al. (2016).

Figure 3, Panel B also suggests the asymmetric effect of EPU on the aggregate European Islamic stock index. The co-efficient values range from -0.020 to 0.010. As in case of the USA Islamic stock market, at higher EPU quantiles, Islamic stock index of Europe shows negative returns, while at lower quantiles of policy uncertainty, Islamic stock indexes report positive returns. Additionally, we observe that EPU has favorable effect on the Islamic stock indexes of European market at medium-higher quantiles, while at lower quantiles of EPU, the Islamic stock indexes show positive returns. Such findings indicate that steady economic development is usually accompanied by periods of low policy uncertainty, which are advantageous for trade and commercial activities (Yu et al., 2021).

Similarly, in Figure 3, Panel C, the coefficient values range from -0.020 to 0.010 and the results indicate that at higher quantiles of EPU and lower quantiles of returns, the effect is negative. This suggests that during heightened policy uncertainty Islamic stock indexes of Japan reports negative returns. Furthermore, at lower quantile of EPU, the Islamic stock indexes show positive returns. Additionally, we find that at medium-higher quantile, EPU shows favorable effect on returns.

Moving on to Figure 3 Panel D, we also note the asymmetric effect of EPU on the Islamic stock index of Australia. The coefficient values range from -0.015 to 0.005, and we observe that EPU negatively affects the Islamic stock returns at higher quantiles, while at lower quantiles EPU positively affects the returns. Finally, in Figure 3 Panel E, there is also an asymmetric effect of EPU on the Islamic index of Canada. In 361 quantiles, the co-efficient values range from -0.015 to 0.005, and we report a negative association at higher quantiles of EPU with the Islamic stock returns at lower and middle quantiles. Additionally, we show that lower quantiles of EPU positive associate with the returns at middle-higher and upper quantiles.

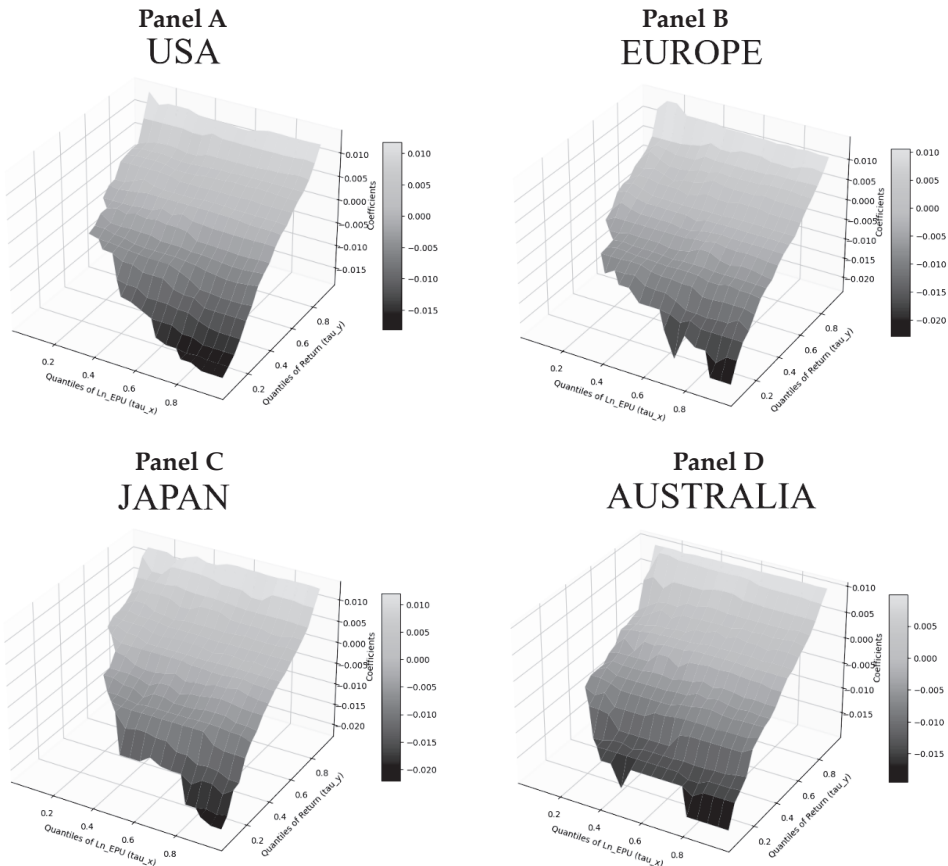
#### **4.3. Results of QQR Approach for Emerging and Frontier Markets**

Figure 4, Panel A shows the effect of EPU on the Islamic stock index of China, where we observe that at middle-higher quantiles, EPU negatively affects the returns of Islamic stock at lower and middle quantiles. Further, we observe that EPU positively affects the returns of Islamic stock indexes at lower to higher quantiles. The findings suggest that EPU has a time varying effect on Islamic stock of China from lower to higher quantiles.

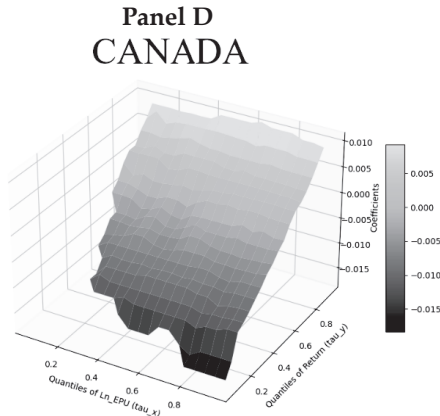
Panel B in Figure 4 shows the impact of EPU on the Indian Islamic stock index. The coefficient values range from -0.020 to 0.015. The results indicate that at higher

quantiles, EPU negatively affects the Islamic stock returns at higher quantiles. Moreover, we observe that at higher quantiles of EPU, the Islamic stock returns show a negative coefficient from lower to middle quantiles. Furthermore, we observe a positive association of EPU with Islamic stock returns at middle-higher and upper quantiles.

Similarly, Figure 4, Panel C shows the impact of EPU on Islamic stock index of Pakistan. In 361 quantiles, the coefficient values range from -0.02 to 0.02. The findings indicate that at middle-higher quantiles, EPU negatively affects the returns of Islamic stock index at lower, middle and middle-higher quantiles (0.05-0.65). Furthermore, we find that at lower quantiles (0.05-0.25), EPU positively affect the Islamic stock returns at middle-higher and higher quantiles (0.6-0.95). Finally, Figure 5, Panel D shows the effect of EPU on Islamic stock index of Nigeria. In 361 quantiles, the coefficient values range from -0.020 to 0.015. The findings suggest that at middle-higher quantiles, EPU negatively affects the Islamic stock index returns at lower, middle and middle-higher quantiles (0.05-0.70). Furthermore, we find that at middle quantiles (0.5-0.65), EPU positively affects the stock returns at middle-higher and higher quantiles (0.7-0.95).

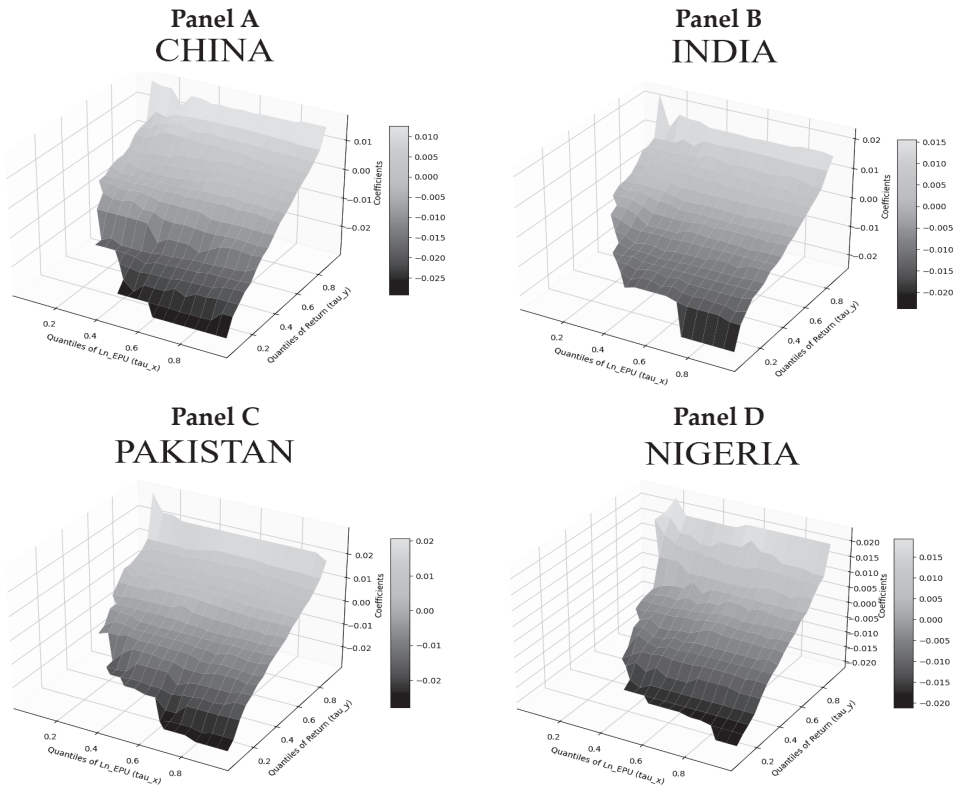


**Figure 3.**  
Quantile-on-Quantile Plots for Developed Markets



Note: This figure shows the QQR estimates of the slope coefficient of developed markets. Where the slope coefficient is displayed on the z-axis of the graph, which measures the effect of EPU on Islamic stocks, namely USA, Europe, Japan, Australia, and Canada.

**Figure 3.**  
**Quantile-on-Quantile Plots for Developed Markets (Continued)**



Note: This figure shows the QQR estimates of the slope coefficient of emerging and frontier markets. Where the slope coefficient is displayed on the z-axis of the graph, which measures the effect of EPU on Islamic stocks, namely China and India (emerging) Pakistan and Nigeria frontiers markets.

**Figure 4.**  
**Quantile-on-Quantile Plots for Emerging and Frontier Markets**

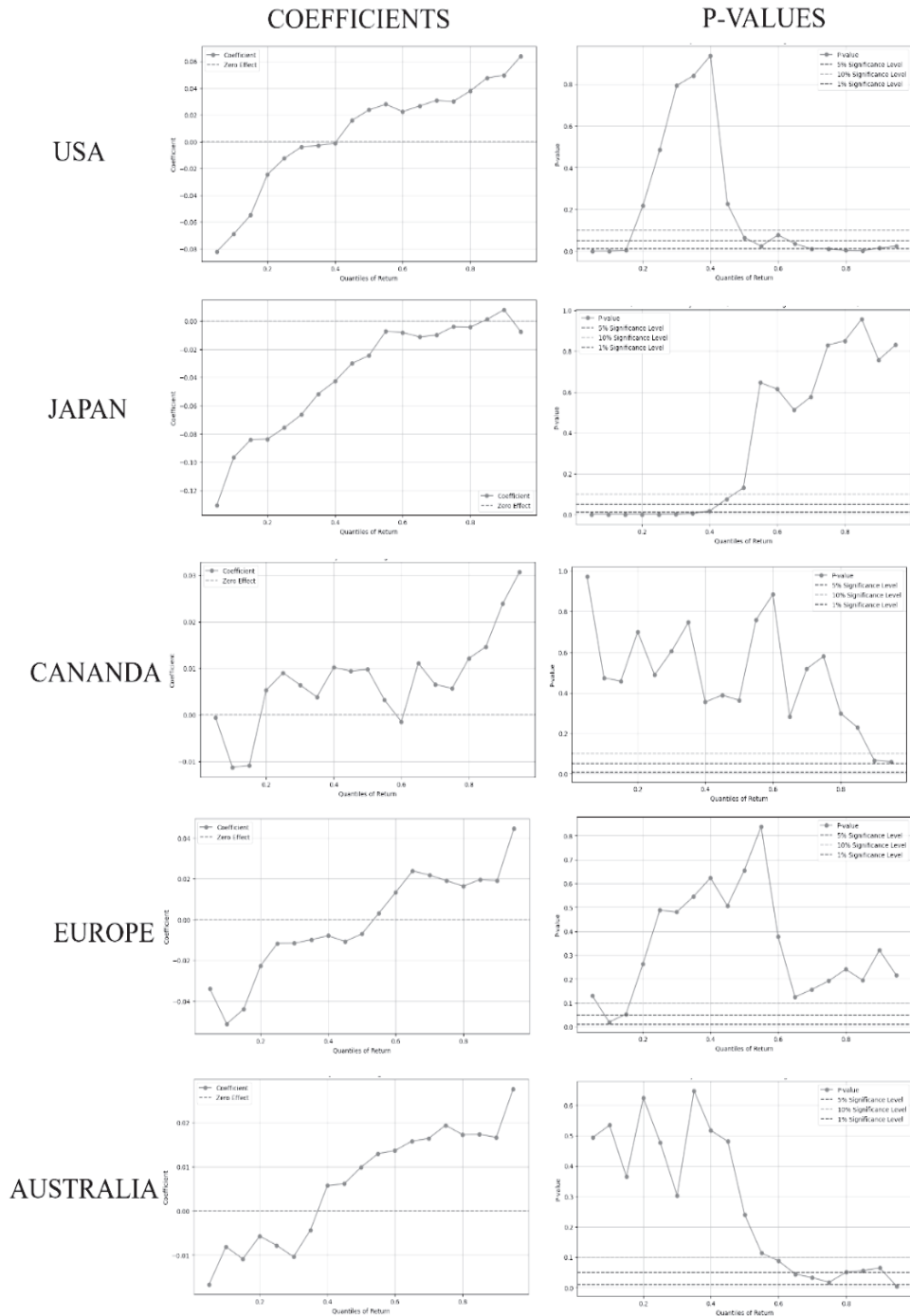
#### **4.4. Robustness Check: Causality in Mean and Variance (CMV) Analysis**

To validate the estimation of preliminary findings, we employ causality in mean and variance (CMV) non-parametric approach for robustness check. The results are presented in Figure 5 to Figure 8. In these figures, the x-axis shows quantiles and y-axis shows coefficients (first graph) and their respective significance values (p-values) (second graph) for the markets under study. In Figure 5, CMV between EPU and Islamic index of the USA graph shows higher variation at lower and upper quantiles. Moreover, at lower quantile EPU negatively and significantly affects the returns at lower extreme and upper quantiles. Further, the figure shows that EPU is positively associated with the stock returns at higher quantiles. Our findings provide evidence that the USA Islamic stock index is significantly impacted by EPU of the USA.

Furthermore, we observe that CMV between EPU and Japanese Islamic stock index graphs show negative and significant impact at lower quantiles (extreme to moderate), while at upper quantiles the graph shows a higher variation. These findings agree with the study of Yu et al. (2021), who document that financial sectors are mainly affected during heightened policy uncertainties (economic and monetary). Moreover, they also find that at the lower extreme stage of EPU, economic stability and thriving conditions are present, which is beneficial for country trade and investment activities.

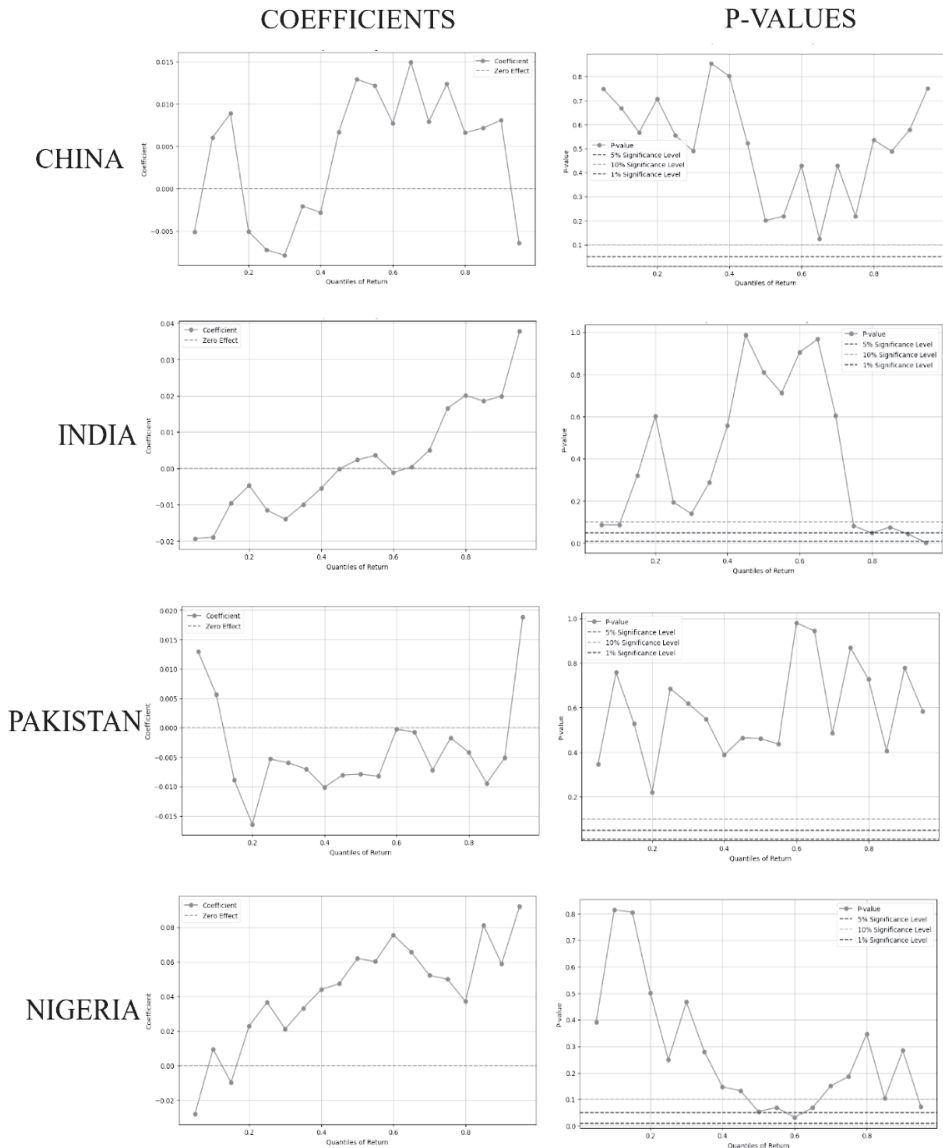
Looking at the causality in mean, we note that the relation between EPU and Canadian Islamic index shows small variations at lower quantiles (extreme) and higher variance at higher (extreme) quantiles. Conversely, considering causality in variance, we observe that the effect is small at lower and middle quantile, moderate and higher at middle-higher quantiles, and lower at higher quantiles. Moreover, for the case of the Chinese Islamic stock market, the graph shows a higher variation at lower (extreme) quantiles and moderate variation at middle (normal) quantiles. Additionally, we report a higher variation in middle-higher quantiles and low variation at upper higher quantiles. Furthermore, for CMV between EPU and Islamic index of Pakistan, the graph shows a higher variation at lower quantiles, moderate variation at middle (normal) quantiles, and higher variation at upper quantiles.

The variations reported in the graphs of Figure 5 to Figure 8 show strong linkage among the Islamic indexes and EPU at bearish, normal and bullish market conditions. To summarize, the findings of causality in mean and variance are time-varying across developed, emerging, and frontier markets, thereby confirming the consistency with baseline findings of QQR (reported in the earlier subsection).



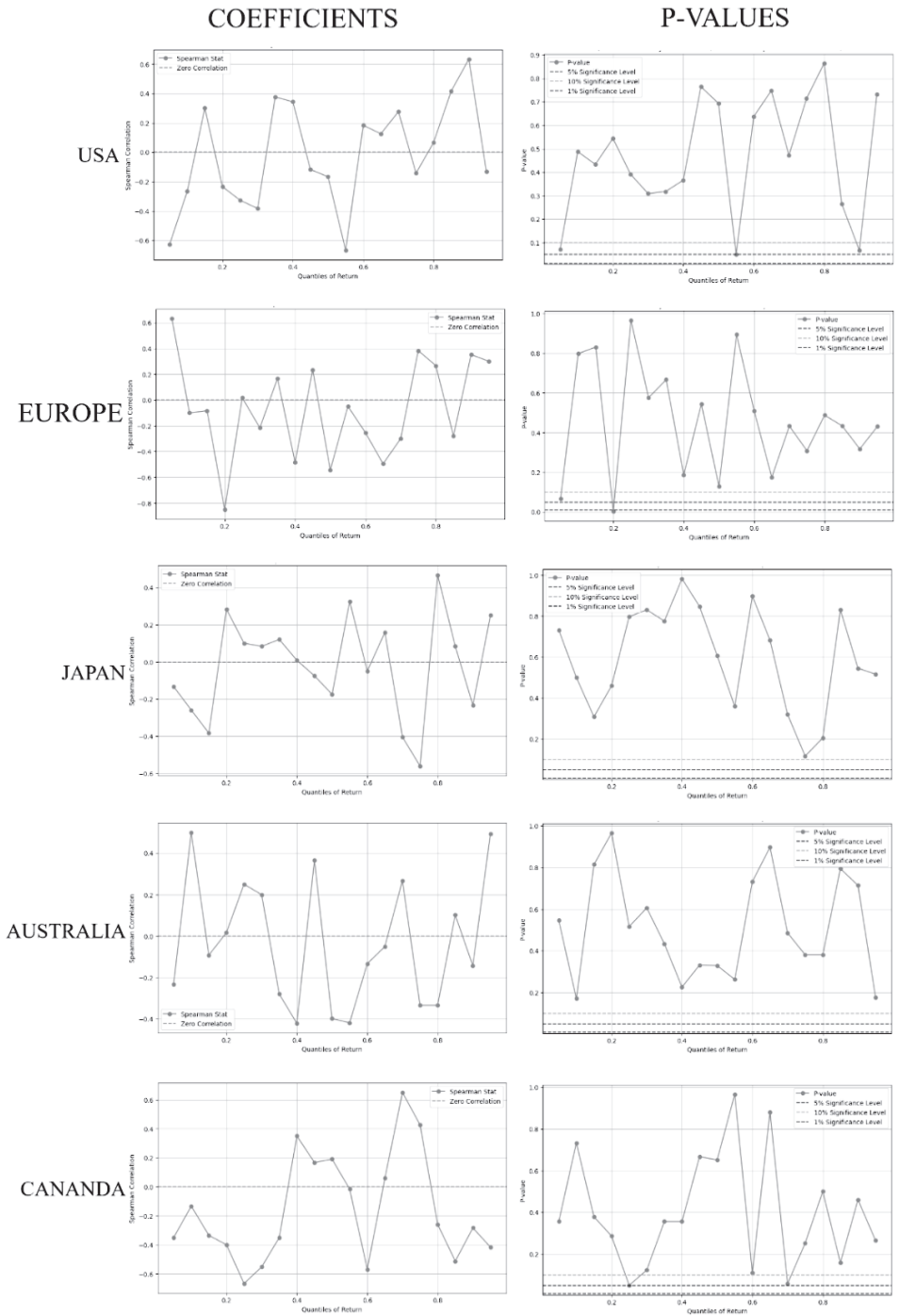
Note: This figure shows the Quantile causality-in-Mean (non-parametric causality test) for EPU and Islamic stock of developed markets, where in the graph the y-axis shows the statistics and x-axis shows the quantiles.

**Figure 5.**  
**Causality in Mean – Developed Markets**



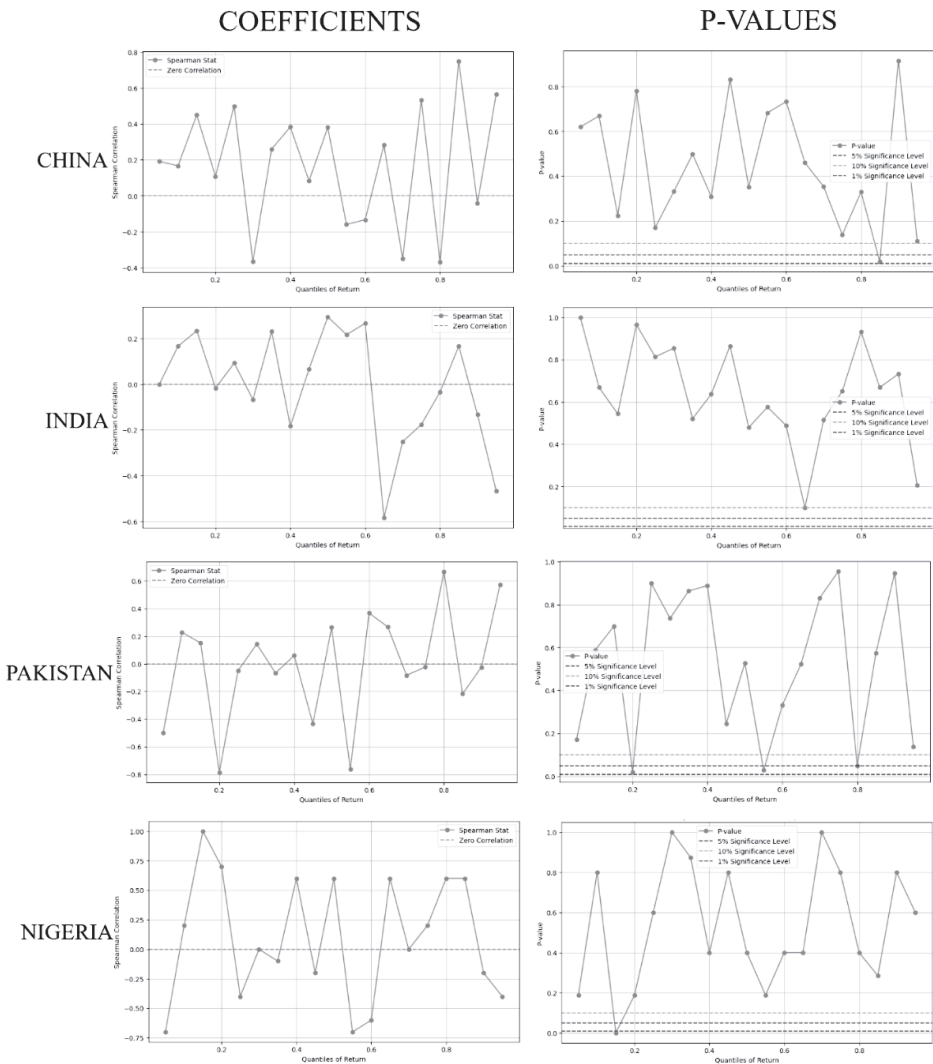
Note: This figure shows the Quantile causality-in-Mean (non-parametric causality test) for EPU and Islamic stock of emerging and frontier markets, where in the graph the y-axis shows the statistics and x-axis shows the quantiles.

**Figure 6.**  
**Causality in Mean – Emerging and Frontier Markets**



Note: This figure shows the Quantile causality-in-Variance (non-parametric causality test) for EPU and Islamic stock of developed markets, where in the graph the y-axis shows the statistics and x-axis shows the quantiles.

**Figure 7.**  
**Causality in Variance – Developed Markets**



Note: This figure shows the Quantile causality-in-Variance (non-parametric causality test) for EPU and Islamic stock of emerging and frontier markets, where in the graph the y-axis shows the statistics and x-axis shows the quantiles.

**Figure 8.**  
**Causality in Variance – Emerging and Frontier Markets**

### V. DISCUSSIONS

The empirical evidence presented provides further support to earlier studies. Specifically, on Islamic stocks, several studies document that EPU and Islamic stock returns show time-varying, causal, and asymmetrical relationship in the short run (Ftiti & Hadhri, 2019; Shaikh et al., 2020). More specifically, our findings are line with the findings of Saeed Meo et al. (2023) who document a negative association between global uncertainty and Islamic stock returns.

However, while Kazak et al. (2025) and Rehman et al. (2024) argue that although Islamic stock returns are negatively impacted by the global economic uncertainty, the adverse impact of these uncertainties is less severe on Islamic stock returns as compared to conventional stock returns. However, our findings do not concur. We show that all the classes of Islamic markets (developed, emerging, and frontier) examined in the current study show, more or less, similar association with EPU. These findings agree with the theoretical notions of Fama (1965, 1970), that prices of securities reflect risks associated with the investments. However, the postulates set forth through application of Islamic economic theory are not supported (Mas'ud, 1975; Siddiqui et al., 2022b, 2022a; Usmani, 2005).

We argue that market integration and global exposure are key reasons for this contradiction, as highlighted by Abuzayed et al. (2021) and Gopinath et al. (2025). Islamic stock markets are increasingly integrated with the global financial markets. Our findings suggest that this increased integration is reducing the distinction between Islamic and conventional markets. Even though these markets are fundamentally different, increased integration between these markets is causing them to behave in a similar manner. Therefore, the expected buffering effects associated with *Shariah* principles (risk sharing, asset-backing, and prohibition of speculative practices) are appearing less profound in practice, as reported by Azmat et al. (2021). Additionally, another reason for the contradicting findings of the current study with Islamic economic theory can be misconception and 'flawed' realization of *Maqasid-al-Shairah*. Al-Nahari et al. (2022) report that currently, the financial institutions and regulatory bodies demonstrate fundamental misconceptions regarding *Maqasid-al-Shairah* that hinders application of an effective Islamic economic system in practice. Such conceptual flaws create a disconnect between Islamic economic theory and exiting practices.

Additionally, our findings also contradict the notions set forth by Fan et al. (2011) and Siddiqui et al. (2024), who argue for a higher level of transparency for developed markets as compared to other markets. Our findings show that, at least in case of EPU, all the three market classes (developed, emerging, and frontier) reflect the effects of respective policy uncertainties in a similar manner. We again link this contradiction with market integration, which may reduce the distinctions between different classes. We argue that increased market integration overshadows benefits expected from higher transparency of developed markets. This integration is also associated with homogenization of investor behavior, as reported by Masmoudi & Namouri (2021), indicating that investors tend to show uniform responses across different market classes amid increased integration.

## VI. CONCLUSION AND RECOMMENDATION

This study examines the impact of EPU on Islamic stock indexes across three market classes (developed, emerging, and frontier) using QQR approach. We integrate conventional finance and economics theories with Islamic economic principles to uncover non-linear and quantile-specific behavior of Islamic stock market under economic policy uncertainty. The findings reveal that in developed markets EPU has an asymmetric effect on the USA and European Islamic stock index, where we report that at higher quantiles of policy uncertainty, Islamic stock shows negative

returns. Furthermore, we show that EPU has favorable impact on the Islamic stock indexes of European market at medium-higher quantiles, where at lower quantiles of EPU, the Islamic stock index reports positive returns. Similarly, for Australian market, we observe that EPU negatively affects the returns of Islamic stocks at higher quantiles. Further, we observe that at higher quantiles, EPU negatively affects the stock returns at lower and middle quantiles.

For the emerging markets, we observe that at middle-higher quantiles, EPU negatively affects the returns of Chinese Islamic stocks at lower and middle quantiles. These findings indicate EPU has time varying effect on Chinese Islamic stocks from lower-higher quantiles. For India, we observe that at higher quantiles, EPU negatively affects the stock returns at higher quantiles. For Pakistan, we observe that at middle-higher quantiles, EPU negatively affects the Islamic index returns at lower, middle and middle-higher quantiles. In Nigeria, the findings indicate that at middle-higher quantiles, EPU negatively affects the index returns at lower and middle-higher quantiles. Moreover, for Nigeria, we observe that at middle quantiles, EPU positively affects the stock returns at middle-higher quantiles. For robustness check, we apply causality-in mean and variance approach, where these findings suggest that the effect of EPU on Islamic stock indexes is time-varying across developed, emerging, and frontier markets, confirming our baseline findings from QQR approach.

From a theoretical perspective, our study links conventional and Islamic economic theories, explaining how these economies or markets respond differently to uncertainties. The uniqueness in Islamic markets, for example, their emphasis on real economic activities, should (theoretically) offer stabilizing effects to the economy in the periods of increased uncertainty. However, our findings do not support this notion, which may be due to the increased level of integration and higher dependency of Islamic markets on conventional financial markets. On a separate note, with the application of QQR, we expand existing literature on Islamic stock markets, demonstrating a non-linear and quantile-specific relationship between EPU and Islamic stock indexes. However, our findings favor the assumption of uniform market behavior, at least under economic uncertainty, and advocate against the need for tailored financial and economic models for EPU. Our findings also show that market classification and institutional factors are slowly becoming uniform in terms of their impact on asset prices due to increased level of integration in the global markets. Our findings provide actionable insights on market stability. Additionally, they are also useful for investors seeking investments in Islamic markets (or more precisely, *Shariah* complaint stocks).

Our study focuses on the Islamic stock indexes of selected markets classified as developed, emerging, and frontier. While we offer a comparative analysis, our study excludes numerous markets that may be added in future studies to provide deeper understanding into the unique dynamics of these markets. Similarly, a sectoral breakup of the overall Islamic stock market may also provide valuable insights into the resilience of different sectors to the EPU shocks. Additionally, our study only examines the impact of EPU. We acknowledge that numerous other macroeconomic variables and geopolitical uncertainties (for example, oil prices, exchange rates, inflation, etc.) impact Islamic stock markets. Assessing the associations of between these uncertainties and Islamic stock indexes may also

provide interesting insights. Finally, future studies may also examine the influence of behavioral factors, like investor sentiments, on EPU and performance of Islamic stock markets.

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