# Do Asymmetric Return's Volatility and Changes in Macroeconomic Variables Matter? A Case of Conventional Stocks and Islamic Stocks

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## Abstract

*This study explores the asymmetric return's volatility effects and macroeconomic variables (MV) changes for conventional and Islamic stocks. The GARCH (1,1) in mean and variance equations are acquired to predict these effects, which covered the period from January 4, 2005, to December 30, 2015. The markets, SSE (China), BSE (India), PSE (Pakistan), DJIM (Malaysia), JKII- (Indonesia), and DJWII- (Dow -Jones World Islamic Index) are considered in the study. The asymmetric effects and volatility of returns for the markets were found to be persistent. Changes in macroeconomic variables showed that the asymmetric return's volatility of SSE and BSE is influenced by the inflation and PSE by interest rate from the conventional side. However, interest rates from the Islamic side negatively affect DJIM by industrial production and DJWI. The investors of other countries can employ these strategies to interpret the asymmetric market conditions, current and past effects, business environment, the actions of the equity market's returns and macroeconomic factors. Moreover, investors, policymakers and portfolio managers can benefit from their diversification strategies.*

**Keywords:** Asymmetric Volatility, Macroeconomics Variables, Pakistan Stock Exchange, Auto-Regressive Conditional Heteroscedasticity.

## Introduction

The debate on Stock return's asymmetric volatility is a significant facet of the equity market that creates attention in the literature. The ups and downs in stock returns and positive and negative behaviour can be observed as asymmetric volatility. The volatility is perceived during stock market crashes that decrease stock prices but increase the market's volatility (Wu, 2001). The leverage effect is explored in different theories that exposed the volatile behaviour of the stock market's return to Islamic modes of financing (Black, 1976 & Christie, 1982). The establishment of Islamic finance has a significant innovative impact in contemporary regions (Masih et al., 2018). The acquisition of Islamic backing (funds) and oil markets created a new feature in the financial crisis during 1992-2006 (Imam & Kodar, 2013). The oil prices were found to be a major factor and have a significant impact. The reflection of any state regarding the economy is being considered as the equity markets of the country for the factors that affect the economic conditions of the country like inflation rate- (IR), industrial production -(IP), and interest rate -(IR) as well.

On the other side, the countries in Asia mostly also rely on exports, comparative to another world where the exports of Asia are exported to European countries as the turnover is more significant than one-fourth regarding GDP, which is more for the countries developed, i.e., China, India and

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Pakistan. This phenomenon perceived that the exports of Asia were falling due to the global financial crisis and crashed. The working capital tends to decline, which is the base of sufficient cash flows (Khan et al., 2011). The values of real property and transfers in India crashed during the global financial crisis -(GFC) for 2007-2009 (Wade, 2009), where the exports declined by 24.3 per cent to 2.25 per cent, a clear picture of bust as visible in India. Any firm's value can determine the business's performance (Hussain et al., 2011). However, the performance of financial institutions also showed asymmetric effects due to risk (Khan et al., 2023). Comparatively, in the Asian world, China and India have larger populations, and regarding demographical look enclosed well on account of the global financial crisis (GFC) and the countries in the region also may have an impact of it, i.e., on Pakistan, Indonesia and Malaysia as the sample of this study. Asia tackled most internal issues in terms of volatility, which was perceived to a greater extent than Western nations' stock markets over the five to seven years after the crisis. Different causes lead to asymmetric stock return trends and expose the signalling effect (Akash et al., 2019). A financial crisis occurs due to Strategic complementarities in financial markets (Goldstein, 2005), Leverage (Maroney et al., 2005), and assets and liabilities mismatched (Ryan, 2013).

The developing markets have different features, as Wu and Bekaert (2000) identified. Information asymmetry and transaction costs lead to market inefficiency, which can be improved by perfect information and risk transfer (Stephen, E., 2017). Investment criteria and boom trading time based on risk adjustment selection could be made upon portfolio diversification and hedging (Halari et al., 2015; Oloko, 2017; Hasan et al., 2017). Comparatively, equity assets dependent on Islamic patterns moderately have less risk and show higher liquidity than conventional equity assets (Al et al., 2017). Islamic system may be considered a comparatively conventional system regarding investment and adoption of diversification tools to strengthen the financial look (Balcilar et al., 2015). The same study was conducted to explore the effects of interest rate exposure and stock volatility (Khan et al., 2020).

Sustainability is another domain that can strengthen the business environment (Khan et al., 2021). Moreover, the trend regarding positive and negative equity market assets is more pronounced (Hammoudeh et al., 2014; Ajmi et al., 2014) for developing and developed assets (equity) stocks (Dewandaru et al., 2014; Bahloul et al., 2017 and Ben Rejeb, 2017), in term of stocks and bonds on Islamic pattern (Aloui et al., 2015) and Islamic markets at regional level (Aloui et al. l., 2015, and Saiti & Masih, 2016). However, this effort is aimed to seal the gap in terms of investigating the volatility effects for conventional and Islamic stocks, which would facilitate the investors to forecast the path, which gives a chance to investors to hold more stocks to earn profit and portfolio management to achieve diversification. Moreover, the best policies may lead the investors to better investment, cash flows and economic growth (Amir et al., 2023; Ali et al., 2019).

**History and Background**

GFC triggered the sub-prime mortgage crisis (USA) in 2008 when the USA's banks failed to invest. It primarily occurred due to loans and credit defaults/swaps established for loans ensured and GFC originated. Fannie Mae and Freddie Mac, enterprises in the US Government with a size of $5 trillion in 2008, the Federal Housing Finance Agency of the US was running at that period. The financial institutions of the US failed due to Lehman Brothers and others as well. Many businesses, such as JP-Morgan Stanly, are asking the Bank of Federal Reserve to demand benefits as the Government of the US poured funds from bailout money. The crisis suddenly became a crisis globally, and markets turned down when the Institute of National Association Realtors (NAR) explored that it was a massive burst of the world and the prices suddenly declined, which led towards inordinate depression (The New York Times (NYT), 2008). The slump of 2007-2009 is perceived as speculation regarding its impact on the Asian world. The arguments are disclosed that the major countries like China and India having economic growth decoupled and set an alternative

pole for growth globally. The markets of China and India adopted reforms and competed the challenges relatively perceived as efficient markets that are stable in such types of challenges (Wolf, 2008). The global world was affected, but Asia proved a significant player facing the GFC in terms of trade internationally, and China sustained its growth and showed high dependency in terms of growth.

However, this is much more important, and an effort to seal the gap to investigate the asymmetric volatility effects for conventional and Islamic stocks subject to effects of slump and macroeconomics variables. The inflation rate (IR) inclined the stock market's returns regarding conventional and Islamic equity market returns of indexes. Volatility was observed in macro conditions such as in inflation rate (IR), oil prices (OP), and interest rate (IR) were more volatile during the global financial crisis (Khan et al., 2020). The relative changes during the crisis period affect the global economy, and such variables, industrial production, inflation, interest rate, trade structure, and regional effects behaviour of investors to become risk averse regarding transnational slump (Homapour et al., 2022; Zhang et al., 2022). The shocks in Malaysia, India, Indonesia and Taiwan markets are noted (Padhi & Lagesh, 2012). The itemized approach provides a better way to expose returns between the stated markets (Engle, 2002).

Furthermore, it will further enhance robust evidence for determining volatility between conventional and Islamic market returns (Basher & Sadorsky, 2016., & Robiyanto et al., 2021). Given that the GARCH technique is an attempt to identify the possibility of advantages for diversification, reactions to financial time series during the crisis period, and structural changes amongst financial strength of assets (Righi & Ceretta, 2011; Aas & Berg, 2009 & Kilic et al., 2022). This study focuses on GARCH modelling by fulfilling the criteria of dynamic volatility to extend the association between the conventional and Islamic equities market's returns.

Moreover, the current focus dominates the modelling to explore the asymmetric volatility effects and macroeconomic variables such as inflation rate (IR), oil prices (OP), industrial production (IP) and interest rate (IR). For this purpose, general autoregressive conditional heteroscedasticity (ARCH and GARCH) modelling is employed. The markets of Asia and the Middle East are crude oil dependent and traded frequently. Crude oil is the primary source of energy. It is the most traded commodity and an essential contributor to the world's economy that challenges the other macroeconomic variables and prices of the equity markets (Sahu et al., 2008). The equity returns' economic upturn and asymmetric behaviour depend on crude oil and other macroeconomic variables in the markets. This behaviour explores its volatility and exposes the macroeconomic variables' fluctuation and instability in other factors of the economy (Wakeford, 2008). It is argued that the fluctuation of crude oil prices exposes the increase in interest rate, inflation, industrial production and equity market prices. So, this study investigates the asymmetric return's volatility and macroeconomic variables for conventional and Islamic equity markets. Based on the above discussion, the following objectives are highlighted to expose the effects below.

1- The conventional and Islamic stock markets follow asymmetrical variance and mean patterns.

2- The asymmetries in equity markets and reactions in terms of negative increases are more volatile than positive in conventional and Islamic markets.

3- The returns of conventional equity market and Islamic equity market returns follow asymmetric volatility.

4- The information asymmetries impact returns, volatility, and macroeconomic variables.

In light of the above, it is explored that the problems became part of falling valuations and expected profits and were reduced, affecting the equity market's returns (Akash et al., 2023). Numerous studies have been elucidated on asymmetric return volatility and macroeconomic variables regarding exposing conventional and Islamic stocks. The fluctuation in prices is a critical concern in equity markets and macroeconomies. Islamic stock indices exposed less in terms of interest rate,

and less volatility was observed in stock returns than in conventional stocks during the crisis period (Khan et al., 2020). The sustainable impact of asymmetric stock market settings regarding returns of equity markets and volatility, considering conventional and Islamic equity market returns while in monetarist turmoil (Khan et al., 2021). In this way, the volatility in the stock market's returns upon its degree may facilitate the investors to forecast the path, giving investors a chance to hold more stocks to earn profit and portfolio management to achieve diversification. Investors should also hold better corporate values and rational decisions while investing in Islamic equities (Ahmad et al., 2022). The following literature review is discussed to explore the matter further.

## Literature Review

This study explored the review of articles to describe the empirics of conducted studies. Linear and nonlinear GARCH-type modelling and its comparison were documented to expose the shocks in oil prices and volatility in exchange rates on economic upturn (Jin, 2008). The related study explored that the economic upturn followed the oil price increase in China, and a positive impact also resulted in the Russian economic upturn. The GDP of Russia, China, and Japan have a negative relation. The volatility features have been elucidated regarding crude oil markets, i.e., West Texas Intermediaries (WTI) and Brent (Wei et al., 2010). The daily prices were considered to expose the linear and nonlinear GARCH modelling from January 1992 to December 2009. The results revealed that the GARCH model captured the asymmetric volatility better than linear models. The asymmetric volatility in the South African exchange rate was exposed using the symmetric GARCH and Asymmetric exponential generalized autoregressive conditional heteroscedasticity- EGARCH (Kutu & Ngalawa, 2017). The performance of asymmetric EGARCH is comparatively better than that of symmetric GARCH, as explored by South African policymakers. The global shocks were showing prominent results regarding the exchange rate of South Africa.

Conversely, Wang (2013) observed the drive of the stock market's returns in East Asia from 2007-2009 at pre and during crises. Cointegration and causality tests were applied. Overall results suggested that the gradation of addition was high when market shocks followed a pattern. (Faff and Howard, 1999) investigated interest rate (IR) exposure for financial firms in Australia. The demand for goods and services declined internationally; exports proliferated, GDP, Unemployment, FDI, and foreign flow declined in the short term due to the declining effect of exports in the Asian world. Chhibber et al., 2009 explored rapid change in employment and showed multiplier effects on exports found negative. The capital flow disturbed the liquidity, which offered volatility in the stock market's returns and became the reason for the deficit, and fiscal debt severely declined (Akash et al., 2023). The liquidity depends on brand character and firm value (Khan et al., 2023). The difficulties for domestic industries established and working capital turned down for these industries increase the loan at high cost and the sales and profit margin (Akash et al., 2011).

Akhtar, Pappas and Khan (2017) investigated comparing the Islamic insurance industry and its conventional counterpart during and post-financial crises ranging from 2005 to 2014. Fourteen countries, Bangladesh, Sri Lanka, Pakistan (South Asia), Indonesia, Thailand, Malaysia (ASEAN), Bahrain, Qatar, Kuwait, United Arab Emirates- (UAE), Lebanon, Iran, Jordan, and Saudi Arabia (Middle East), were considered. GDP per capita, CPI and deposit rate offered by commercial banks were taken as explanatory variables—data from the World Bank website. A panel regression model was applied. Results depicted that the demand for insurance regarding conventional and Islamic was affected negatively and linked to GDP per capita during the Crises period. The overall result suggested that Islamic insurance demand was negatively and positively related to higher average income in the Middle East and risk associated with capital structure (Akash et al., 2020). (Aloui et al., 2016) determined the investor's sentimentality and the time-variant link between the

Dow Jones Islamic Index (DJWI) and the conventional matching part of the US, ranging from 1990 to 2010. Monthly returns were collected from DataStream. Wavelet methodology and asymmetric causality test were applied. Results depicted time-varying comovement regarding the returns of Islamic and conventional counterparts in the US equity market. Overall results suggested that Sharia rules were unrelated and far from the relationship between sentiments and Islamic returns. Moreover, the variables regarding information like trade volume, macroeconomics, market liberalization and the business cycle could be observed in predicting the volatility and modelling, but gaps in modelling of conditional volatility, asymmetries, value at risk, downsizing risk and asset pricing modelling in terms to observe the interest rate exposure regarding the relation of conventional and Islamic stocks phenomenon is still pending (Akash et al., 2023).

**Theoretical Background**
This study explores an economic theory regarding insight into the impact of asymmetric information and conditions of market asymmetries on the equity market's returns and volatility (Verhoeven & McAleer, 2004; Cheong et al., 2007; Zhang & Li, 2008; Liau and Yang, 2008., Ibrahim, 2010 and Akash et al., 2023). The larger the returns, either in terms of the negative or positive signs, are shown/pursue an expected level of more significant returns or vice versa (Mandelbrot, 1963). Moreover, numerous revisions were presented regarding the stability of the stock market's assets during financial uncertainty, considering the conventional stock market's view (Khan et al., 2020). The selected macroeconomic variables in this study will be occupied with the ability to affect the stock returns theoretically and expectedly. It motivates the examiners to observe the ability to capture the volatility in stock prices due to changes in macroeconomic variables. The linkages among the variables (stock returns and macroeconomic variables) have been illustrated through a theory, namely the efficient market hypothesis (Alshogeathri, 2011).

**The Efficient Market Hypothesis**
The theory was explored by Fama, 1965, 1970 which stated that the available market information is fully reflected by stock returns, which are not predictable and abnormal profit is irrelevant to the investors. It can be observed under

$\Omega_t{}^* = \Omega_t$ ……………………….. (1)

Where it also explores how the business is expected to perform regarding the macroeconomic variables and publically available information regarding GDP, interest rate, industrial production and oil prices. The macroeconomic variables have been included in the study in a sequence that as the previous studies to develop the theoretical relation to equity stocks.

It will motivate to highlight the volatility effect of equity returns and changes in macroeconomic variables. The variables include inflation, industrial production, interest rate, oil prices and international equity markets (Conventional and Islamic). According to economic theory, a negative relation exists between interest rate and equity returns (Hasan & Zaman, 2017); shocks will indirectly affect the discount rate through stock market risk (Alshogeathri, 2011). Based on the above literature and theory, the following methodology is explored.

## Data and Methodology
The data regarding daily stock market indexes for Pakistan, China, and India from Asia, Indonesia, and Malaysia were reserved for attention in this research. Dow Jones World Islamic Market Index (DJis) is a Scale reserved attention to epitomising the overall equity market's indexes founded on Islamic patterns. The monthly data regarding macro indicators are interest rate (IR), inflation rate (IR), (Consumer price index) (CPI), industrial production (IP), and oil price (OP). The data was collected from the World Bank bank site and equity markets indexes, and the inclusion of monthly

values for Jan- 4, 2005, to Dec- 30, 2015, was taken and targeted to Yahoo Finance. To test the data, Eviews-9 and Stata software are used for data analysis in this study.
The returns are intended as follows.

$$S_{rt} = \ell n \left( \frac{p_t}{p_{t-1}} \right) \qquad \dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

The foremost phase in which GARCH approach proceed residuals calculation, and followed towards sign bias test as elucidated under below exposed regression regarding squared residuals.

$$\hat{\varepsilon}_t^2 = \lambda_0 + \lambda_1 \, Signz_{t-1}^- + \mu_t \qquad \dots\dots\dots\dots\dots\dots \, (2)$$

Where, $Signz_{t-1}^- = 1$ if $\hat{\varepsilon}_{t-1} < 0$ and $Signz_{t-1}^- = 0$ or otherwise.
The character $\lambda_1$ is considered as coefficient, comprises t-test regarding size bias technique. The coefficient $\lambda_1$
Would be significant statistically while it would be varied outcome on volatility regarding to shocks either positive or otherwise. For capturing shocks based on past trends, sign, and size bias technique for volatility, and resulting regression equation as under.

$$\hat{\varepsilon}_t^2 = \lambda_0 + \lambda_1 \, Signz_{t-1}^- + \lambda_2 \, Signz_{t-1}^- \, \hat{\varepsilon}_{t-1} + \lambda_3 \, Signz_{t-1}^+ \, \hat{\varepsilon}_{t-1} + \mu_t \qquad \dots\dots\dots\dots (3)$$

$$Signz_{t-1}^+ = 1 - Signz_{t-1}^-$$

Null hypothesis regarding sign, and size bias test in case of zero correspondence will be reported as re $H_0: \lambda_1 = \lambda_2 = \lambda_3 = 0$. Considering part of technique is to be followed by Lagrange -Multiplier (LM) technique.
The fixed part of model is residuals for its retrieval concerning variance equation.
ARCH model regarding first order auto regression is followed as under.

$$r_t = \alpha \, r_{t-1} + \hat{\varepsilon}_t \qquad \dots\dots\dots\dots\dots\dots\dots\dots\dots.. (4)$$

Furthermore, it also enhances historical shocks when modeled in lagged values. The ARCH (q) model is explored as where q exposed as lag length regarding the autoregressive element and is a linear function regarding the past q squared as

$$\delta_t^2 = \Psi + \sum_{i=1}^{p} \alpha_i \, \hat{\varepsilon}_{t-i}^2 \dots\dots\dots\dots\dots\dots\dots.. (5)$$

Whereas,
$\Psi$ and $\alpha_I$ are explored as non negative parameters regarding to increase the validity of conditional variance which is positive and
$\hat{\varepsilon}_{t-i}^2$ is square error calculated from mean equation (Alshogeathri, 2011). The extended form to understand the theory is explored by Engle (1982) that is examined as below. The consideration of lags is exposed as below.

$$\delta_t^2 = \acute{\alpha}0 + \acute{\alpha}_1 r_{t-12} + \hat{\varepsilon}_t \qquad \dots\dots\dots\dots\dots\dots\dots\dots \qquad (6)$$

So, $\hat{\varepsilon}_t \sim iid \, (0,1)$, Engle (1982) announced a technique to parameterize like $\boldsymbol{\delta_t 2}$ in relation to explore the conduct regarding heteroskedasticity.
ARCH model considers the maximum lag length, but GARCH does not. It is the quality of GARCH. So, the extended form of ARCH is observed for GARCH further. Bollerslev (1986) announced the GARCH technique, an extension of the ARCH technique (Engle, 1982). The GARCH technique is a superior fit to ARCH because non-negative constraint permits a better way of conditional variance.

In this way, the first procedure regarding the equity market's returns for the GARCH model is described as follows. The ARMA (p, q) model regarding the conditional mean equation is explored below.

$$r_t = \Psi_0 + \sum_{i=1}^{p} \psi_i \, r_{t-1} + \sum_{i=1}^{q} \lambda_1 \, \hat{\varepsilon}_{t-1} + \hat{\varepsilon}_t \qquad \dots\dots\dots\dots \, (7)$$

Where is persistent, and are the restrictions, is represented for return at time t, and is symbolized as white noise regarding time t. The equation captures the sightsees that shocks relating to returns need and are following the past trends. Conditional mean captured in residual functions for

historical trends explores conditional variance. The equation will be improved regarding prediction based on past information in the variance equation and should be captivated. Engle, 1982 examined the approach below.

The GARCH ($\rho$, q) technique is explained as an equation below.

$$\ddot{\varepsilon}_t I \, \Omega_{t-1} \sim N\left(0, \delta_t^{\,2}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (8)}$$

$$\delta_t^{\,2} = \Psi O + \sum \Psi i q i = 1 \ddot{\varepsilon}_t - i2 + \sum ¥j p j = 1 \boldsymbol{\delta}_\mathfrak{t}2 \text{-} \mathrm{J} \text{ ---------------------------- (9)}$$

$$\Psi > 0, \; \dot{\alpha}_i, \; \beta_j \geq 0 \rightarrow \delta_t^{\,2} \geq 0, \; i=1,\dots\dots, q \text{ and } j=1,\dots\dots, p$$

Whereas, $\Omega_{t-1}$ is set of information available in the market, $\Psi$ is the mean of yetsreday forcasts, epitomized part of GARCH, and ARCH will be inducted as $\rho$, q order. Conditional variance at time $\mathfrak{t}$ symbolized as $\delta_t^{\,2}$, $\Psi O$ symbolized as constant, restrictions are symbolized as $\Psi i$ and $¥j$ and $\ddot{\varepsilon}_t - i2$ is the former square shocks gauge. $\delta_{t-j}^{\,2}$ clarified regarding variance at preceding identifier.

The volatility is modeled in term of macroeconomic variables as under.

$$X\_\mathfrak{t} = \dot{\alpha}\_O + \gamma \delta\_t^{\wedge}2 + \pi\_(1)(\text{Inflation Rate})\_\mathfrak{t} + \pi_2(\llbracket \text{Interest Rate Change})\rrbracket\_\mathfrak{t} + \pi\_3(\text{Oil Prices})\_\mathfrak{t}$$
$$+\pi\_4(\text{Industrial production})\_\mathfrak{t} + \varepsilon\_t \qquad \dots\dots\dots\dots\dots\dots\dots\dots.. \text{ (10)}$$

Where $x_t$ is denoted for returns at time t. $\alpha_0$ for constant and slopes, and coefficients are denoted as $\beta, \gamma, \pi$ and $\varepsilon_t$ as error term.

$$v_t = \gamma_0 + \sum_{i=1}^{p} v_{t-1} + \sum_{j=1}^{q} \gamma_j \, \mu_{t-j}^2 + \sum_{k=1}^{m} \mu_k \, L_k \dots\dots\dots\dots\dots \text{ (11)}$$

Where $v_t$ indicates as variance, $L_k$ for macroeconomic variables that might enhance to define variance.

## Results and Arguments

**Table-1 Descriptive Statistics Regarding Daily Equity Market's Returns**

|  | CONVENTIONAL MARKETS | | | ISLAMIC MARKETS | | |
|---|---|---|---|---|---|---|
|  | **SSE** | BSE | PSE | DJIM | JKII | DJWI |
| Mean | 0.000351 | 0.000547 | 0.000789 | 0.000393 | 0.000540 | 0.000260 |
| Median | 0.000341 | 0.000870 | 0.010521 | 0.000000 | 0.000762 | 0.000289 |
| Maximum | 0.087243 | 7.897678 | 0.088465 | 0.052689 | 0.336851 | 0.0934052 |
| Minimum | -0.089416 | -7.946798 | -0.066524 | -0.218994 | -0.275864 | -0.076522 |
| Std. Dev. | 0.025468 | 0.195236 | 0.124563 | 0.145698 | 0.118541 | 0.056489 |
| Skewness | -0.495682 | -0.258962 | -0.510568 | -2.242568 | 1.245862 | -0.489652 |
| Kurtosis | 6.012125 | 1398.44600 | 7.207589 | 23.220551 | 70.566472 | 13.938650 |
| Jarque-Bera | 2388.0840 | 276000000.00 | 1521.3561 | 49560.278 | 639632.70 | 12127.080 |
| Probability | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Results revealed in above table-1, descriptive statistics regarding daily equity market returns of PSE -Pakistan, SSE -China, BSE-India, DJIM-Malaysia, JKII-Indonesia, and DJWI- Dow -Jones World Islamic Index as Standard were focused. The average return of PSE-Pakistan explored higher comparatively SSE-China, BSE-India remained hazardous. SSE-China, BSE-India, PSE-Pakistan, DJIM-Malaysia, and DJWI-Dow Jones World Islamic Index showed negative skewness, but JKII-Indonesia skewness persisted positively. Jarque Bera's technique explored normality adversely regarding the equity market's returns, as shown in the graph.

**Figure 1 Normality of equity markets return**
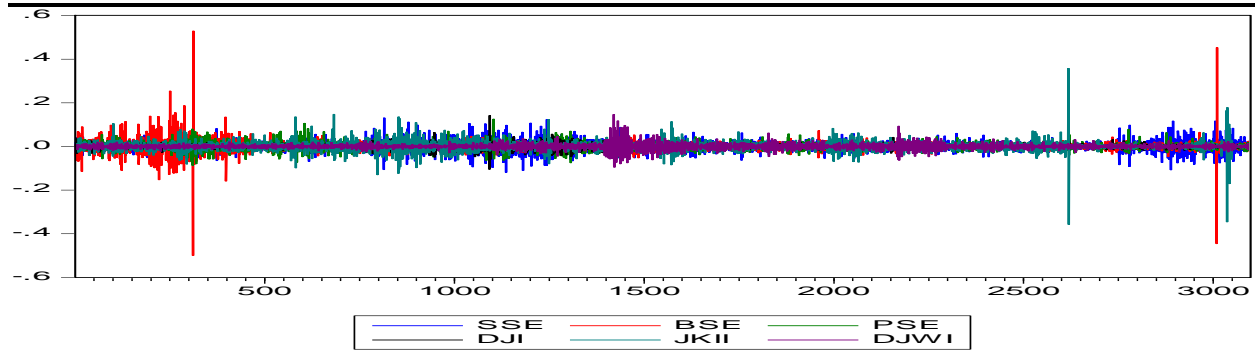


Results revealed in Table -1.1 regarding descriptive statistics of monthly returns regarding interbank offer rate (IBOR) representation of interest rate (IR) regarding countries like (China, Malaysia, India, Indonesia, and Pakistan). Average returns regarding Indonesia, China, and India were positive, except for Malaysia and Pakistan. The skewness test explored that the equity market's returns for Malaysia and China remained skewed but negatively, and Indonesia, India, and Pakistan skewed positively. Jarque Bera's test explored normality adversely regarding interbank offer rate (IBOR) in selected countries, as shown in the graph below.

**Table-1.1 Descriptive Statistics Regarding Monthly Returns of Interbank Offer Rates (IBOR) (China, Pakistan, Malaysia, India, and Indonesia)**

|  | China (IBOR) | India (IBOR) | Pakistan (IBOR) | Malaysia (IBOR) | Indonesia (IBOR) |
|---|---|---|---|---|---|
| Mean | 0.010353 | 0.001954 | -0.001629 | -0.000191 | 0.001988 |
| Median | 0.010526 | 0.000000 | 0.000000 | 0.000000 | 0.000152 |
| Maximum | 0.602529 | 0.255933 | 0.217920 | 0.074569 | 0.133531 |
| Minimum | -0.746731 | -0.078988 | -0.140878 | -0.111571 | -0.126486 |
| Std. Dev. | 0.174105 | 0.033928 | 0.050504 | 0.020958 | 0.044537 |
| Skewness | -0.394457 | 5.121064 | 0.322150 | -1.540686 | 0.300524 |
| Kurtosis | 7.442150 | 35.970940 | 6.867924 | 14.369910 | 3.907054 |
| Jarque-Bera | 111.104800 | 7756.248000 | 93.927100 | 857.451900 | 7.462692 |
| Probability | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.029504 |

**Figure 2 Normality regarding interbank offer rate (IBOR)**
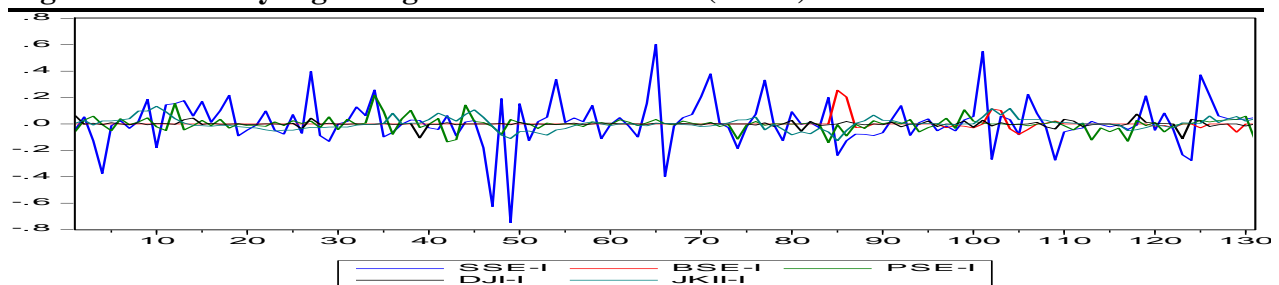


Table-02 explores the estimation regarding results in term of sign bias test. It is further categorized as (1) positive size bias (PSB), and (2) negative size bias (NSB) technique. Significant results regarding all equity markets are determined for NSB and PSB which suggested that asymmetries exist and may be observed in returns series. Asymmetry is the indication that the market is

violating the efficient market hypothesis. There is something wrong upon which the means returns are fluctuating.

**Table-02 Results of Sign and Size Bias Test**

| Results/Index | Conventional Markets | | | Islamic Markets | | |
| --- | --- | --- | --- | --- | --- | --- |
| | SSE-China | BSE-India | PSE-Pakistan | DJIM-Malaysia | JKII-Indonesia | DJWI-Dow Jones World Islamic Index |
| SB-T | 0.00002 | -0.00008 | -0.00003 | 0.00008 | -0.00055 | 0.00008 |
| p-value | 0.88980 | 0.10750 | 0.68000 | 0.45183 | <0.0001 | 0.1788 |
| NSB-T | -0.00920 | -0.03347 | -0.01981 | -0.00223 | -0.07625 | -0.018591 |
| p-value | <0.0001 | <0.0001 | <0.0001 | 0.82942 | <0.0001 | <0.0001 |
| PSB-T | 0.00807 | 0.00904 | 0.00946 | 0.01549 | 0.001916 | 0.00588 |
| p-value | <0.0001 | <0.00040 | <0.0001 | <0.00491 | 0.7060 | <0.05191 |

Note: 5% is significance level.

The results predicted that the sign regarding asymmetry perspective explored strong evidence. It was elucidated that distribution is at extreme changes. The corroborated result of sign asymmetry supported the postulated fear in the markets. The negative size bias test (NSB-T) is predicted as valuable in terms of significant estimation, which was generated for PSE, BSE, DJIM, SSE and JKII that observed negative asymmetry in these markets. However, the hypothesis is rejected for the equity market of DJWI in case of negative asymmetry. The returns series predict asymmetric patterns because sign and size bias tests are observed and expected as non-linear patterns. (LM) The Langrage Multiplier test is performed to predict the effects of ARCH in this regard.

**Table-03 LM-Test/ Langrage Multiplier Test Regarding ARCH Effects For GARCH.**

| Index | Conventional Markets | | | Islamic Markets | | |
| --- | --- | --- | --- | --- | --- | --- |
| | SSE-China | BSE-India | PSE-Pakistan | DJIM-Malaysia | JKII-Indonesia | DJWI-Dow Jones World Islamic Index |
| F-STATISTICS | 0.593181 | 0.95507 | 0.184628 | 0.151050 | 0.039168 | 0.255165 |
| P-Value | 0.7888 | 0.5393 | 0.9348 | 0.9845 | 0.9848 | 0.948 |
| $R^2$ | 0.578256 | 0.814655 | 0.625363 | 0.533799 | 0.09763 | 0.564188 |
| P-value | 0.7883 | 0.5389 | 0.9345 | 0.9844 | 0.9854 | 0.9579 |
| (P-value)/ARCH (Lag values) | | | | | | |
| 1 | 0.5729 | 0.4592 | 0.7598 | 0.6253 | 0.9893 | 0.9148 |
| 2 | 0.4837 | 0.7550 | 0.7395 | 0.9839 | 0.8646 | 0.6044 |
| 3 | 0.7833 | 0.195 | 0.7565 | 0.8795 | 0.8873 | 0.9878 |

Table 03 estimates the Langrage Multiplier (LM) test for the GARCH model, which shows p-values at lag lengths 1, 2 and 3 for the return series. The results regarding table-04 show no non-linear effect, which can be noticed directly, and ARCH asymmetric effect through the LM-test for the GARCH model. LM test exposed the asymmetric trends and direction, which allowed to proceed for GARCH models. The variation in variables exposed the asymmetric volatility and trends upon which the decision-makers enhance their skills to invest in either conventional or Islamic markets.

**Table-04 Estimation Regarding GARCH (1,1) model**

| Statistics | Parameters | Conventional Markets | | | Islamic Markets | | |
| | | SSE-China | BSE-India | PSE-Pakistan | DJIM-Malaysia | JKII-Indonesia | DJWI-Dow Jones World Islamic Index |
|---|---|---|---|---|---|---|---|
| **MEAN EQUATION** | A | 0.000513 | 0.001375 | 0.01447 | 0.000353 | 0.001583 | 0.001487 |
| | (P-Value) | [0.1576] | <0.0001 | <0.0001 | [0.4244] | <0.0001 | <0.0001 |
| | β | 0.042783 | 0.094659 | 0.08253 | 0.187282 | 0.111439 | 0.113052 |
| | (P-Value) | [0.2123] | [0.0003] | [0.0009] | <0.0001 | <0.0001 | <0.0001 |
| **VARIANCE EQUATION** | $\Psi_0$ | 0.0002 | 0.0001 | 0.0003 | 0.00005 | 0.00000082 | 0.00003 |
| | (P-Value) | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | $\Psi_1$ | 0.07051 | 0.14579 | 0.178543 | 0.19348 | 0.67719 | 0.149842 |
| | (P-Value) | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | $\phi_0$ | 0.93504 | 0.96520 | 0.87498 | 0.63986 | 0.78754 | 0.91293 |
| | (P-Value) | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **DIAGNOSTIC TEST** | AIC (Statistics) | -5.49058 | -5.52988 | -5.49048 | -6.38487 | -5.92674 | -5.66108 |
| | SI (Statistics) | -5.47943 | -5.5179 | -5.66956 | -6.37171 | -5.92872 | -5.63942 |
| | Log Likelihood | 7406.198 | 6553.964 | 7643.171 | 8476.982 | 7937.949 | 7598.954 |

Table 04 shows the results regarding GARCH to capture the conditional equation of mean, p-value < 0.00001, significant, and excluding SSE-China equity market's returns. The current volatile behaviour of the market's returns followed past price trends. GARCH explored the persistency regarding volatility and significant at a 95% confidence interval. The equity market's returns coefficient was significant, and p<0.005. It means that current volatility significantly has an impact on the lagged volatility. The coefficients like and are forecasted as that the ρ<0.00001, specified that hypothesis regarding constant variance resulting rejected. The persistency in the variables supports the evaluation of the asymmetric pattern in the conventional and Islamic markets.

**Table-05 Estimates GARCH (1,1) model regarding coefficient of conditional mean**

| Statistics | Parameters | Conventional Markets | | | Islamic Markets | | |
|---|---|---|---|---|---|---|---|
| | | SSE-China | BSE-India | PSE-Pakistan | DJIM-Malaysia | JKII-Indonesia | DJWI-Dow Jones World Islamic Index |
| Mean Equation | A | 0.000513 | 0.001375 | 0.01447 | 0.000353 | 0.001583 | 0.001487 |
| | p-value | [0.1576] | <0.0001 | <0.0001 | [0.4244] | <0.0001 | <0.0001 |
| | B | 0.042783 | 0.094659 | 0.08253 | 0.187282 | 0.111439 | 0.113052 |
| | p-value | [0.2123] | [0.0003] | [0.0009] | <0.0001 | <0.0001 | <0.0001 |
| Variance Equation | $\Psi_0$ | 0.0002 | 0.0001 | 0.0003 | 0.00005 | 0.00000082 | 0.00003 |
| | p-value | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | $\Psi_1$ | 0.07051 | 0.14579 | 0.178543 | 0.19348 | 0.67719 | 0.149842 |
| | p-value | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | $\phi_0$ | 0.93504 | 0.96520 | 0.87498 | 0.63986 | 0.78754 | 0.91293 |
| | p-value | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Diagnostic Testing | AIC (Statistics) | -6.49058 | -6.52988 | -6.51469 | -7.48562 | -6.89564 | -6.78546 |
| | SIC (Statistics) | -5.47943 | -5.5179 | -5.66956 | -6.37171 | -5.92872 | -5.63942 |
| | Log Likelihood | 7406.198 | 6553.964 | 7643.171 | 8476.982 | 7937.949 | 7598.954 |

Table 05 shows the results regarding GARCH to capture the conditional equation of mean, p-value < 0.00001, significant, and excluding SSE-China. The coefficients are symbolized as and. The significance level equalized as p<0.00001, which explored that constant variance, showing the hypothesis as rejected. The selection of criteria regarding the model is explored as AIC, Schwarz, and Log Likelihood. The variables in the model explored the selection for the actual model and interpretation further. The justification is that if there is an indication of rejection of the hypothesis, then there will be the validity of results for actual variables in the model.

**Table- 06 Results of GARCH in Mean (1,1) Regarding Equity Market's Returns, Volatility and Macroeconomic (SSE-China, BSE-India, PSE-Pakistan, DJIM-Malaysia, JKII-Indonesia and DJWI-Dow Jones World Islamic Index to Fix the Impact of Macroeconomic Factors on Equity Market's Returns.**

| Statistics | Parameters | Conventional Markets | | | Islamic Markets | | |
| | | SSE-China | BSE-India | PSE-Pakistan | DJIM-Malaysia | JKII-Indonesia | DJWI-Dow Jones World Islamic Index |
|---|---|---|---|---|---|---|---|
| Mean Equation | $\alpha_0$ | -0.28555 | 0.055 | -0.03422 | -1.087542 | 0.063843 | 0.337083 |
| | p-value | <0.00001 | 0.9361 | 0.6669 | 0.0754 | 0.3466 | 0.8653 |
| | $\beta$ | -0.07158 | 0.034891 | 0.365824 | 0.067895 | 0.058962 | 0.67856 |
| | p-value | <0.00001 | 0.3848 | 0.3458 | 0.0254 | 0.7658 | 0.05897 |
| | $\gamma$ | 3.577295 | -78.7838 | 6.710543 | 0.086872 | -0.782053 | -53.3886 |
| | p-value | <0.00001 | 0.5494 | 0.5885 | 0.5353 | 0.5836 | 0.9743 |
| | $\pi_1$ | 0.084942 | -0.02007 | -0.36845 | -1.50639 | 0.400508 | -0.085269 |
| | p-value | <0.00001 | 0.9282 | 0.8977 | 0.4366 | 0.8798 | 0.9438 |
| | $\pi_2$ | -0.58652 | 0.002364 | -0.30269 | -0.074 | -0.65527 | 0.223928 |
| | p-value | 0.3595 | 0.9827 | 0.0739 | 0.3558 | 0.0008 | 0.8949 |
| | $\pi_3$ | 0.004632 | 0.002364 | 0.038964 | 0.0536302 | 0.008208 | 0.040827 |
| | p-value | 0.2274 | 0.9856 | 0.988 | 0.7065 | 0.9807 | 0.9089 |
| | $\pi_4$ | -0.06258 | 0.092464 | 0.061548 | 0.077654 | -0.02227 | -0.033325 |
| | p-value | 0.0389 | 0.3358 | 0.8745 | <0.00001 | 0.8856 | 0.8845 |
| Variance Equation | $\gamma_0$ | -0.00048 | 0.000214 | 0.006189 | 0.0000254 | 0.003841 | 0.005789 |
| | p-value | <0.00001 | 0.6790 | 0.6358 | 0.5872 | 0.3365 | 0.0968 |
| | $\Delta$ | 0.0365891 | 0.896542 | 0.71568 | 0.896584 | 0.526482 | 0.088659 |
| | p-value | <0.00001 | <0.00001 | 0.653 | <0.00001 | 0.3626 | 0.8808 |
| Diagnostic Testing | AIC (Statistics) | 0.830924 | -0.005492 | -0.058851 | 0.896856 | 0.524853 | 0.053542 |
| | SIC (Statistics) | <0.00001 | 0.4998 | 0.7944 | <0.00001 | 0.0056 | 0.8804 |
| | Log Likelihood | 40.41289 | -3.75854 | -1.93804 | -6.41929 | -2.285137 | -2.57045 |

Table 06 explores the results of SSE-China, BSE-India, PSE-Pakistan, DJIM-Malaysia, JKII-Indonesia, and DJW-Dow Jones World Islamic Index regarding GARCH in mean (1,1), which added prolonged with the inclusion of descriptive variables, i.e., the equation of macroeconomic variables was found significant regarding conditional mean, and $p<0.10$. The short-term liquidity effect can be observed that the inflation is significantly related to the return for SSE. The equity market's returns and returns of oil prices (OP) relation were explored as unfavourable because the more the oil price adversely affected equity market returns of SSE-China—the results of BSE-India, negative relation in between inflation and equity market's returns of BSE-India. For PSE-Pakistan, identical results were found regarding interest rate (IR) and equity market returns of PSE-Pakistan. The results of DJIM predicted a positive relation between oil prices (OP) and return

among macroeconomic variables, as growth in oil prices (OP) also increased the returns of equity markets. The results of JKII were found to be significant and harm interbank offer rate (IBOR) (representation of interest rate) on returns. That means if there is an increase in interest rate, then the returns of the equity market of JKII. As far as macroeconomic variables are considered insignificant, results were found and did not affect the returns of DJWI.

## Conclusion

The study discovers the volatile behaviour of the equity market's returns, asymmetric pattern, conditional variance, and macroeconomic factors relationship internationally. The robustness of the model for volatility forecast was also studied and out-sampled. The period regarding this study is from 4 January 2005 to 30 December 2015. The outcomes regarding tests of different explorations, i.e., sign bias (SB) technique, positive size bias (PSB) technique and negative size bias (NSB) technique, are performed for SSE, BSE, PSE, DJIM, JKII and DJWI where positive as well as negative sign bias regarding all equity markets found except JKIM. These models are non-linear and show support for these elements. The significant estimation regarding the positive sign bias test results was predicted for PSE, BSE, SSE, DJIM and DJWI, which showed positive asymmetry. DJIM equity market rejected the hypothesis in terms of positive asymmetry. The negative sign bias test results were found to be significant for PSE, BSE, DJIM, SSE and DJWI, which showed negative behaviour in terms of asymmetry for all these markets. The volatility in the stock returns was higher in the crisis period than the average period as the visibility of the size effect was evident, as observed by the value, which was found to be significant.

The results concluded that there was an increase in conditional volatility regarding all equity markets with a higher proportion of sudden after innovations in terms of negative. In the second section, it is concluded that the results regarding the model, when extended in terms of inclusion of macroeconomic variables, were found interesting for SSE-China, BSE-India, PSE-Pakistan, DJIM-Malaysia, JKII-Indonesia and DJWI-Dow Jones World Islamic Index. The volatility for the market of BSE was also observed regarding the impact of macroeconomic variables, which disclosed that inflation and volatility were positively and significantly related. A higher period of inflation leads to volatility, and results regarding volatility and interest rates are significant and negative. The variance equation regarding GARCH in the mean model for PSE was extended in terms of macroeconomic variables where the conditional mean was significant. The interest rate impacts returns, but it is negative and significant. It explored that with the rise in returns, the returns of interest rate decline. The volatility for the PSE market was also identified regarding the impact of macroeconomic variables. The relation between inflation and volatility was found to be positive and significant. Higher periods of inflation found higher levels of volatility (Akash & Abbas, 2015). Overall results proposed no effect regarding interest rate (IR) exposure on the equity market's returns of DJIM-Malaysia. The final concluding remarks are that volatility, asymmetric conditions, and macro exposure are exposed through the modelling in terms of conventional stocks but a little bit in Islamic stocks, which means that the stock markets are more conventional than Islamic in terms of macroeconomic variables globally. The volatility was higher regarding conventional and Islamic equity market returns. The Islamic markets were less affected in terms of macroeconomic variables.

### Implications, Limitations and Future Directions of the Study

The results implicated that the investors can employ the factors to consider the strategies and interpretation of this study for macroeconomic conditions, current and past effects, the environment of business, and the actions of equity market's return globally and internationally to generate the gain from these markets. This strategy of understanding portfolio management and success to get market benefits depends on energetic behaviours (Sharma & Seth, 2012). The

booming investment will be awarded support from the effects of volatility and macroeconomic variables globally/ internationally regarding implementing diversification tools and organising proper portfolios.

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