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PRIMARY RESEARCH

Portfolio Diversification Across Islamic Vs. Conventional Banks: The Role of Macroeconomic Fundamentals in Stock Volatility

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Abstract.
Purpose: This study aims to investigate the effect of macroeconomic factors on the stock return volatility and volatility dynamics on comparative bases for Islamic vs. Conventional Banks.
Methodology: The stock returns volatility of all the Pakistani listed banks from Islamic and Conventional sectors is considered for the period from Jan 1, 2010, to Dec 31, 2021. A time-series model GARCH(1,1) is applied for the relationship between stock returns volatility along with its various dynamics and economic fundamentals.
Findings: All the macroeconomic factors prove their significance in finding the stock return volatility in both Islamic and Conventional banking systems. The market return shows a negative association with stock return volatility in both Islamic and Conventional Banks. For most of the Conventional and Islamic banks, the risk-free rate shows positive and negative effects, respectively. Finally, the exchange rate and oil prices show a negative impact on both Islamic and Conventional banks. The volatility shocks are quite persistent. Both the ARCH and GARCH effects play their role in generating conditional future stock return volatility. Moreover, the overall volatility process is mean-reverting; nonetheless, the speed of mean reversion varies across both sectors.
Significance: To the best of the authors' knowledge, this is the first study of its kind that compares the Conventional and Islamic banks' stock volatility with regard to the economic fundamentals in Pakistan.
Practical Implication: The results designate that there are significant dissimilarities (even carrying opposing or negative correlation) in both sectors; hence, the investors may diversify their investment and form their liquidity positions in both sectors to attain the maximum advantages from the market and bank's specific factors.

KAUJIE Classification: L11, L33
JEL Classification: I22, L31

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INTRODUCTION

The financial system is an integral component of a modern economy and ensures economic growth and development (Sholpanbaeva et al., 2021). Further, the financial system is mainly based on the stock market, which contributes a significant role in soothing the financial sector and boosting the macroeconomic growth of a country (Jan et al., 2018; F. Khan et al., 2021; Singh, 2010). A plethora of research studies existing in the context of both developed and emerging markets (particularly after the stock market crash in 1987) (Hammoudeh et al., 2010; Jan et al., 2018; Joseph, 2002; Karmakar, 2007) have addressed the connectivity of both i.e. stock markets and the economic fundamentals (Chinzara, 2011; F. Khan et al., 2014; Jan et al., 2018). Moreover, these markets offer numerous opportunities for gain as well as to generate risk for the investors. For this purpose, several other studies have researched the contribution of economic variables in identifying businesses' overall systematic risk and cash flows (ultimately contributing to the stock returns of these firms).

A critical issue in stock markets that also need special attention is volatility, in the presence of which the efficient allocation of funds and subsequently economic development might be hampered (Sapian et al., 2018; San Marino et al., 2021). In general, volatility can be defined as a radical variation in the price of a financial instrument (such as a stock) in a relatively small interval (Ejem & Ogbonna, 2020; Okpara, 2011). In a similar vein, Jan et al. (2018) highlighted that volatility is the risk or uncertainty in stock returns, which can be calculated by using the "annualized standard deviations" of daily fluctuations in the stock or bond price (F. Khan et al., 2014). The issue ascends when this variation becomes severe and impacts the stock markets' efficiency, usually resulting in stock market crashes (Batra & Taneja, 2020; Bhowmik, 2013; Hasan & Zaman, 2017).

Researchers and investors always strive to find good investment diversification opportunities across stocks in several ways to avoid market and idiosyncratic risks (Compernolle et al., 2022; Jan et al., 2018; Leković, 2018). Effective diversification could be achieved by diversifying the investment across uncorrelated stocks (Elyasiani et al., 2011), diversified sectors (S. A. Khan et al., 2017), or even across advanced and developing stock markets (Ayub, 2019; Jan et al., 2018). However, after the introduction of Islamic indices and Islamic banks in the '90s, researchers have also produced empirical studies that have compared both conventional and Islamic markets for diversification purposes (Shahzad & Naifar, 2022). This research is also conducted on comparative bases between Islamic and conventional banking systems and makes an addition to the existing body of knowledge in this area. Based on the significance established from the literature and accessibility of data, the macroeconomic factors included for analysis in this study are exchange rate (ER), oil prices (OIL), risk-free rates (RFR), and the market returns (based on the index returns from both conventional and Islamic banks) are considered; since they can have a considerable association with the equity returns volatility.

Background and Motivation of Investment Diversification Across Islamic and Conventional Banking Systems

During the global financial crisis (GFC) of 2007-08, academic researchers and industry practitioners alike realized that the Islamic capital markets (ICMs), are fundamentally different from

the conventional capital markets (Jawadi, Jawadi, & Cheffou, 2020; Sahabuddin et al., 2022). Studies have highlighted many attributes of ICMs for their uniqueness from conventional markets which include the prohibition of *ribā*, *gharar*, and *maysir* (referring to interest, uncertainty, and gambling respectively). Apart from these fundamental differences, the Islamic capital markets, particularly Islamic banks, also have distinct structural mechanisms in their corporate governance (shariah committees and Islamic corporate governance system), ethical standards, and the attainment of trust of its customers as compared to the conventional banks (Mollah & Zaman, 2015; Nguyen, 2021). In addition, the Islamic banking system is based on such a financial framework that comprises an "ethically-oriented trade system" which ensures the existence of social as well as responsible investment and sustainable financial and banking structure (Sahabuddin et al., 2022). The researchers believe that these unique features have helped the Islamic Financing System to escape the negative effects of GFC; in fact, these Islamic institutions exhibited positive momentums during these crises (Abbes & Trichilli, 2015; Arshad & Rizvi, 2013; Lahsasna et al., 2018). Due to this trend among the Islamic capital markets and institutions, even the non-muslims have been attracted to invest in Islamic banking stocks (Delle Foglie & Panetta, 2020). Based on this discussion, it is inferred that both Islamic and conventional banking sectors have reacted differently (in fact, in opposite directions) to the major crises and events, and hence, there is a likely potential available to diversify the investment across both Islamic and conventional banking systems.

Currently, in Pakistan, there are two different systems of modern banking where the Islamic banking system operates along with the conventional banking system. Though the share of Islamic banks is comparatively low and around 15% to 20% but it is increasing at a rapid and steady rate. The increasing trend is not merely driven by Islamic sentiments rather it is also attributed to the quality of services and return on investment by the deposits in Islamic banks (Bashir & Azeez, 2022). Though the fundamental function of both the banking systems in Pakistan is the mobilization of funds, both have different fundamental and secondary differences concerning structure and operations (Bashir & Azeez, 2022). Similarly, as risk management is also different across both types of banks, the investors believe that they might react differently to both micro- and macro-level events in the country as well as at international levels.

The aforementioned discussion probes every reason for the authors to conduct a study on a comparative basis between the Islamic banking system versus the conventional banking system on the impacts of macro economic fundamentals on their stock returns volatility in Pakistan.

Objectives of the Research

This study aims to explore:

- The effect of economic fundamentals at the firm's level stock return volatility in Pakistani listed Islamic and Conventional banks.

- The various dynamics of volatility (such as their "persistence", "mean-reversion", and

their "speed-of-mean-reversion") at a firm's level stock return in Islamic and Conventional banks of Pakistan.

The rest of the paper documents the previous work in the present study's context and also about the motivation for conducting the study by taking the macroeconomic factors and various volatility dynamics of stock volatility of both banking systems in section two. It also documents the theoretical and empirical studies in the context of macroeconomic factors and stock returns volatility (and derives the study's hypotheses). The subsequent chapter (section three) explains the study's methodology, data, variables, and model. Chapter four presents the results and analysis from the GARCH(1,1) model. The final chapter concludes the study by reporting the major findings.

LITERATURE REVIEW

Motivations for Macroeconomic Exposure and Stock Market Development

Realizing the significance of macroeconomic indicators in determining a firm's general systematic risk and cash flows, the relationship between economic variables and the capital market is instinctively fascinating (A. Khan et al., 2021; Mandimika & Chinzara, 2012). Furthermore, comprehending the roots of stock return fluctuations is of the utmost importance to both policymakers and practitioners. Particularly, for the policymakers, knowledge about the determinants of the stock market is important which helps them if they have the intention to formulate a policy ensuring macroeconomic and financial stability. From the practitioners' (e.g. investment managers') perspective, this knowledge would greatly help them to make important hedging strategies for their investments.

The whole body of empirical work on economic fundamentals and the stock market can be grouped into two main parts. One group of research studies only focused on aggregate market-level data in this regard (Ahmed, 2008; Ibrahim & Aziz, 2003; Siddique et al., 2016). Irrespective of the context (developed or developing markets) in which these studies are conducted, most of them have presented mixed results (either in the positive or negative direction) as far as macroeconomic fundamentals' impact on stock returns is concerned. In these studies, the various factors that showed a significant relationship with stock markets included the "exchange rate", oil prices, "interest rate", "inflation", "money supply", market returns, etc.

The other stream of studies extended the previous literature by examining the sectoral response of economic variables while ignoring the individual firm level (McSweeney & Worthington, 2008; West & Worthington, 2006) studied the Australian market; Chinzara (2011) explored South African markets; Elyasiani et al. (2011) Kilian & Park (2009) focused on US markets, and Degiannakis et al. (2013) 2013 examined European market). However, Rahman et al. (2009) criticized the aggregate and sectoral-level analyses by arguing that firms are heterogeneous. A study of research literature shows that a firm-level analysis in this area is very rare, particularly in the settings of developing economies, e.g. Pakistan F. Khan et al. (2014). The only work that is relevant, but still limited to some specific sectors (e.g. bank, cement, and textile sectors) in Pakistan's context is done by Butt et al. (2010); F. Khan et

al. (2014) and Muneer et al. (2011). Hence, this research aims to address this deficiency by conducting research at the firm level (across all sectors of both NYSE and PSX) stock returns. Moreover, benefiting by focusing on the firm level, the current study also examines all these aspects in the context of various firm features.

Motivations for Stock Return Volatility and Volatility Dynamics

Volatility in stock markets can destabilize the economic and financial environment of a country (Jan et al., 2018; Mandimika & Chinzara, 2012), and hence it is imperative to investigate volatility tendencies over a particular period. More specifically, an extreme level of stock market volatility can even disrupt the smooth flow functions of other financial institutions in the economy and ultimately have an inverse impact on investments, savings, the performance of the real economy, and economic growth in two different ways, i.e., either positive or negative (Mandimika & Chinzara, 2012). An important aspect of volatility is the "persistence of volatility", which means for how long the volatility shock persists in the capital market. It is an important factor in detecting the relationship between volatility (risk) and return as variations in volatility persistence also cause adjustments in the risk premia (Elyasiani et al., 2011). As Dueker (1997) argued, forecasting volatility is fundamental to establishing options pricing and efficient hedging strategies. This view was also reinforced by Karmakar (2007). From the financial literature, the clusters of high and low changes in pricing where one of the fundamental apprehensions in the volatility process(Engle & Patton, 2004). This is further elaborated by Verma et al. (2019), according to whom large changes in the prices of assets are chased by another large change and small changes followed by another small change. This behavior of volatility was also reported by many other researchers (Ewing et al., 2005). As a result of this volatility clustering, the volatility shock of today has a considerable impact on the expected volatility for several future time horizons.

Now referring to the "mean reversion" property of stock return volatility which entails that in general, volatility shocks mean reverting in stock markets (Carrol & Connor, 2011; Qarni et al., 2019). It appears from a theoretical perspective that the patterns of return to means for stock volatility are the result of volatility clustering, based on the idea that volatility fluctuates. Therefore, it admits that the periods of low volatility will eventually offer a route to high volatility and similarly, the high volatility must be followed by normal volatility (Engle & Patton, 2004; Carrol & Connor, 2011). This means that the mean-reversion of volatility for any single financial instrument simply states the presence of a mean level of volatility for the instrument, which in turn would ultimately return to its standard level of volatility. Moreover, even for very long-term volatility, it will eventually return to its mean level of volatility, no matter when this is accomplished (Engle & Patton, 2004; Carrol & Connor, 2011).

The inspiration for investigating the differences between all the above-mentioned volatility dynamics on the firm level came from the following literature (the arguments are pertinent, albeit derived through somewhat different approaches as compared to this thesis). Concentrating on the volatility of sales growth, Comin & Mulani (2006), explored that sales growth volatility at the micro (firm) level has increased significantly in comparison to the aggregate sales growth volatility. In a similar vein, Sharma et al. (2014) also concluded that firm-level

volatility in NYSE increased more than the aggregate market-level volatility. This school of thought appears to be very engaging, as the firms are distinctive, and hence there is every reason for them to display diverse behavior as compared to aggregate market trends. On the contrary, Bernales et al. (2020) believe that a firm's level of volatility is expected to decrease following an option listing exercise. This view finds support in other studies as well (Loderer & Waelchli, 2010; Shumway, 2001). According to these studies, listing increases media exposure and significantly accelerates growth opportunities; hence it can be expected from these firms to show more stability. However, Harris (1989) denies the validity of these views by arguing that firm and market-level volatilities are not different as they both are directly or indirectly exposed to the same environment. Given the inconclusive results presented above, this phenomenon has become debatable and needs an empirical investigation, particularly from the perspective of a developing economy. Now addressing its importance for the capital market players, firstly, the aggregate level volatility can be deceptive for investors, as the firm-specific response can be rather unique. Therefore, it develops their understanding to diversify themselves and earn higher returns. Secondly, this also helps the policymakers to make more informed decisions about the economy and financial stability of the country. Finally, to the best of the authors' awareness, this is one of the first such research which has compared the context of Islamic and conventional banks in Pakistan.

Moreover, there are four other stylized facts (based on some features) that motivate the firm-level analysis of volatility. The first view was presented by Shleifer & Vishny (1997) who argued that for some stocks the higher individual volatility can be mispriced and therefore, results in lower anticipated returns. Similarly, the second view came from Campbell et al. (1997) who postulated that abnormal returns are dependent on a firm's level of volatility rather than aggregate market or sector-level volatility. Moreover, they also admitted that the majority of investors hold individual stocks and for them, the variation in firm-level volatility is as important as the aggregate market-level volatility.

Thirdly, as volatility is the proxy for risk, therefore, according to the view of "incomplete market models" as discussed by Haddad & Muir (2021), investors don't achieve perfect diversification of their risk, and hence the importance of firm-level volatility further increases in asset pricing. In another similar study, Merton (1987) concluded that as investors have imperfectly diversified portfolios, they need higher average returns to be compensated for higher firm volatility. Investors with poorly diversified portfolios do demand higher idiosyncratic risk premiums which must be greater than liquidity and market risk premiums. The fourth point in this list is added from the study of Sharma et al. (2014) who argued that recent years have witnessed a higher rate of increase in a firm's level of volatility as compared to market volatility. Therefore, it motivates us to investigate the volatility dynamics at the individual firm level.

Theoretical Framework and Hypotheses Development

Exchange Rate (ER)

The existing research thus far has documented a considerable impact of the "exchange rate" on local stock markets. Fang & Miller (2002) concluded that the devaluation in the

local currency market relative to foreign variations the return on the international currency and consequently, the investors divert their investments from local assets such as stocks to international currency as it offers higher returns. All of this results in an inverse effect of the exchange rates on the stock market returns. In addition, the exchange rate can affect the stock return of a firm using two potential mediums, which are transaction exposure and economic exposure. Transaction exposure refers to the firm's transactions made in foreign currency and the short-term duration. It is essentially the difference in outcome between the date when the firm enters into the transaction and when it finally settles it. On the other hand, economic exposure refers to the exchange rate's exposure to the macroeconomic situations of an economy and is of long-term duration. The fluctuations in the exchange rate brought by economic exposure in turn considerably affect the stock returns of a firm even if the firm manages to escape the transaction exposure (Caglayan & Lajeri-Chaherli, 2009; Flota, 2009). Domestic firms benefit from the currency depreciation relative to their importing counterparts (since the prices they face increase), and the demand for the products of the domestic firm increases; hence a positive impact on their stock returns is observed (Flota, 2009; Caglayan & Lajeri-Chaherli, 2009; Jan, Khan, & Khan, 2018).

The current research articles Ibrahim & Aziz (2003); Maysami & Koh (2000) have shown considerable evidence of the negative effect of exchange rates on stock market returns. Moreover, from the above discussion, it is quite obvious that this association between exchange rate and stock returns might behave differently depending upon the firm's sectoral location. For instance, some of the firms belong to exporting sectors, some non-exporting sectors, and some are purely local industries, each of which may exhibit different responses.

Hypothesis 1: There is an effect of exchange rate fluctuations on stock returns volatility at the firm level for both Islamic and Conventional banking systems.

Risk-Free Rate of Return (RFR)

The financial and economic literature has exhibited a significant impact of risk-free rates on stock market returns (Oertmann et al., 2000). An indirect impact of interest rates on stock returns through discount rates is explained by Mukherjee & Naka (1995). According to them, an increase in the short-term interest rates of Treasury bills leads to an increase in discount rates via the risk-free rate of return, which decreases the expected future cash flows and consequently leads to falling stock returns. Moreover, according to Bartram (2002), this positive or negative impact of interest rate on stock returns might be occurring either indirectly via variations in their competitive position, or directly through variations in cash flow and value of financial assets. Subsequently, with the increase in interest rates, higher returns on investment, an increase in cash flows, and hence an increase in the stock returns are forecasted Nissim & Penman (2001). However, some of the existing financial studies are also of the opposite opinion and have declared an inverse impact of interest rates on the stock return of the firms (Butt et al., 2007; Joseph, 2002) [1].

Hypothesis 2: The risk-free rate has an impact on the stock return volatility at the firm level

[1]They have mainly attributed this negative impact to the other investment opportunities such as depositing their investment into the banks or investing in the real estate etc.

of both Islamic and Conventional banking systems.

Oil Prices (OIL)

For the net importers of oil, any price hike leads to an increase in the cost of business which in turn affects the expected cash flows and eventually adversely influences the stock returns. Similarly, the reverse impact of oil prices on the stock return can also be due to demand-driven shocks (Degiannakis et al., 2013). As discussed by Backus & Crucini (2000), the increase in oil prices due to the expectations of increasing production costs and, subsequently, higher output prices results in lowering demands by consumers and negatively affecting income levels Abel & Bernanke (2001). Moreover, this decrease in demand will also lead to a decline in output levels and consequently cause a lowering of future expected cash flows. Analyzing all these possible results together, a final result would be in the form of bearish trends in the stock markets Sadorsky (1999).

Some recent studies have also shown the considerable effect of oil returns on the stock returns of various firms (Elyasiani & Mansur, 1998; McSweeney & Worthington, 2008). Despite the importance of oil prices in determining the stock returns as documented above, no significant work has been documented in the context of developing markets targeting firm-level returns in Islamic and conventional banking systems. Though some evidence can be found from developed contexts (such as the US) that showed this relationship at sectoral level data, firm-level analysis is still very limited (Elyasiani et al., 2011; Ewing et al., 2005; Jan et al., 2018; **?**). Moreover, it is very logical to believe that oil prices can influence the stock returns volatility of the firms differently, subject to the various firm features (Elyasiani et al., 2011). Hypothesis 3: The oil prices have an impact on stock return volatility at the firm level for both Islamic and conventional banking systems.

Market Return

A review of relevant literature reveals that market return is considered one of the significant predictors of stock return and volatility. Furthermore, several researchers have also documented that market indexes strongly affect stock returns (Joseph, 2002; Mouna & Anis, 2016). The current study will consider the market return to observe either its exclusive effect on stock return volatility or concerning other economic factors. Hypothesis 4: The market returns have an impact on stock returns volatility at the firm level for both Islamic and conventional banking systems.

DATA AND METHODOLOGY

Data Collection and Justification

The focus of this study is the Islamic and Conventional banking systems of Pakistan. Therefore, the daily share prices of all the available firms from both Islamic and Conventional banks are collected provided that they meet the criteria of the current study. Most importantly, the bank must be listed on an exchange and actively trading for the whole data period, i.e. Jan 1, 2010, to Dec 31, 2021, so that an equal number of observations could be considered for all the factors used in this study.

TABLE 1
Definitions of Independent (Macroeconomic) Variables

Macro-economic Factor	In Pakistani and US Context	
Market Return (MR)	Daily closing prices of KSE-100	Almost 90% of equity market capitalization is represented by this weighted index, which reflects 100 companies (S. A. Khan et al., 2017; Jan et al., 2018).
Risk-Free Rate (RFR)	6-month Treasury bill yield	(Jan et al., 2018; Jawadi et al., 2020; S. A. Khan et al., 2017). Investors define risk-free rates as rates that are not affected by variations around anticipated returns. Any increase in the risk-free rate increases the discount rate and that in turn affects the stock prices (Jan et al., 2018).
Exchange Rate (EXR)	Nominal exchange rate of PKR to US$	(F. Khan et al., 2014; Jan et al., 2018).
Oil Prices (OIL)	Brent oil prices which are known as the most appropriate measure of oil prices in both developed and developing markets	(Filis, 2010; Levin et al., 2003). Brent oil prices constitute more than 60% of the total world oil consumption per day Filis (2010); Jan et al. (2018); Maghyereh (2004); Waheed et al. (2018).

Variables of the Research

The stock returns are calculated from the daily share prices of all the banks only considering the capital gain and ignoring dividends for both conventional and Islamic banks. The economic fundamentals included in this study are Exchange Rate (EXR), Oil Prices (OIL), Risk-Free Rate (RFR), and Market Return (MR). These variables are mainly considered on the bases of their proven theoretical/empirical significance and data accessibility on daily basis. In table 1, the details regarding the proxy and references are given for all the independent variables in both Islamic and conventional banks.

The Analytical Procedure

As a first step, the log returns from the daily closing prices of each bank listed at PSX were calculated following the existing financial literature (Elyasiani & Mansur, 1998; Jan et al., 2018; F. Khan et al., 2014; **?**). Moreover, the logarithmic returns were taken to avoid time-series problems such as "non-stationarity", "heteroskedasticity", "autocorrelation", and "multicollinearity" (Gujarati Damodar, 2004). In the second step, the data was examined for the temporal characteristics (such as Mean, SD, "Skewness", "Kurtosis", "Jarque Bera (JB)", & "Ljung Box Q Statistics (LQ)", etc.) to establish the "normality" of the time-series (stock data), "serial correlation" with "volatility clustering", and "heteroskedasticity". Furthermore, to check and correct the "stationarity" issue of the time series, the most significant and promising tests i.e. "PP" and "ADF" were applied (Jan et al., 2018; Sharma et al., 2014). In the next step, the following multi-factor model is used to represent all the explanatory variables of the study:

$$Vit = \beta_0 + \beta_1 MR_t + \beta_2 EXR_t + \beta_3 RFR_t + \beta_4 OIL_t + \varepsilon_{it} \quad (1)$$

Where, V_{it} denotes the share returns volatility (dependent variable) for bank i, for day t. Moreover, β_i represents the degree to which the dependent variable is sensitive to each explanatory variable. There are four economic factors (i.e. "market returns", "exchange rates", "interest rates", & "oil prices") as independent variables for GARCH (1, 1) multi-factor equation. Next, the equation by GARCH(1,1) model is examined at the firm's level stock returns of the banks individually. While estimating the GARCH model (Jan et al., 2018; S. A. Khan et al., 2017), the log-likelihood function is maximized assuming the "conditional normality" of the firm returns' shocks (ε_t). Further, the "persistence of volatility" shocks is determined by the mean of adding up the coefficients of ARCH+GARCH terms. Now, in case, the sum is closer to 1, the volatility shocks are said to be "quite persistent"; if $it = 1$, volatility shocks are said to be "integrated into variance"; while, if their sum > 1, volatility shocks are "explosive". Thereafter, the half-life of volatility which indicates how much time the volatility takes to cover the "half distance" backwards to its mean volatility after following a deviation from it is computed for each of the firm-level stock return volatility. However, the "half-life" is only calculated for the stock returns holding the mean reversion nature of their volatility. Next, if the sum of $ARCH + GARCH =< 1$, the volatility process is said to be "mean reverting" in its nature. This property of the "mean reversion" pattern of stock returns volatility is also explored at each of the firm-level stock return volatility. Moreover, the "half-life" so calculated for the returns series employs the speed-of-mean reversion at each of the firm's level stock return volatility for both banking systems.

The GARCH(1,1) Model

The traditional econometric models, for instance, OLS, are based on some assumptions such as the "constant variance" and "normal distribution". However, as denoted by Verma et al. (2019), most of the time series, such as stock prices/returns, exhibit "volatility clustering" (where large variations in stock returns incline to be followed by large variations and small variations by small in either direction). As the assumptions of OLS cannot be realistically

met in our case, it cannot be applied to financial time series. With the advancement in the area of financial econometrics, some special and powerful models have been introduced which can address the above issues. Bollerslev (1986) introduced the Generalized ARCH model. It is indeed amazing that the GARCH(1,1) condition can adequately be applied to any financial time series to comprehend volatility dynamics so a significant contribution has been made to the financial literature (Fah et al., 2011; Elyasiani et al., 2011; Engle & Patton, 2004). Based on the existing financial literature (Elyasiani et al., 2011; Engle & Patton, 2004; Minkah, 2007), the current study also applied GARCH(1,1) technique to examine the effect of macroeconomic fundamentals on stock return volatility along with volatility dynamics. Furthermore, this was also evident from "Schwarz Information Criterion (SIC)" that lag one is the most suitable lag. It is, therefore, advisable to use GARCH (1, 1) in this case, as it stands to be the most fitting order in this case. Following is the "general univariate equation" for GARCH(1,1) model (Mandimika & Chinzara, 2012):

$$r_t = u_{i=1} + \sum_{i=1}^{k} \alpha_i r_{t-1} + \varepsilon_t, \frac{\varepsilon_t}{l_{t-1}} \sim N(o, h) \tag{2}$$

$$h_t = \Omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2, + \sum_{j-1}^{q} \beta_j h_{t-j}, \omega > 0, |\alpha_i + \beta_j| < 1 \tag{3}$$

The "half-life" of volatility signifies the period taken by the volatility shock to cover the "half distance" back to its mean volatility after following the deviation from it Engle & Bollerslev (1986). Further, this characteristic of the time series (stock return volatility) of reverting to its mean entails that in general, the volatility shocks hold the characteristics of "mean reversion" in capital markets (Carrol & Connor, 2011).

In the above set of equations, equation no. 2 is the "mean" equation of GARCH(1,1) model which introduces and explains the variation in the dependent variable due to the "previous innovation" or most recent shock. Here, the It – 1 holds a "0" mean, a variance ht, and is serially "uncorrelated". Furthermore, here the lagged and current returns are denoted by $\backslash r_{t-i}$" and $\backslash r_t$" respectively.

Whereas, equation no. 3 is the "variance" equation of GARCH(p,q), here the "conditional variance" is denoted by ht,; the constant is denoted by $Omega$; the "coefficient of lagged square residuals" developed from mean equation ($\varepsilon^2 t - 1$) are denoted by i but j holds the representation of coefficient of lagged conditional variances. For mean reversion to hold, the sum of ARCH(α_i) and GARCH (β_j) terms must be less than one (S. A. Khan et al., 2017; Mandimika & Chinzara, 2012). There is a tendency in the financial data (i.e. stock return volatility) to hold the property of "non-mean reversion" (Elyasiani et al., 2011).

The mean-reverting phenomenon is also closely associated with the persistence of volatility shocks (Engle & Patton, 2004; **?**; Mandimika & Chinzara, 2012). Again, the persistence of volatility will be high, if the sum of ARCH and GARCH parameters is closer to 1. Further, the persistence of volatility shock is also measured with the "half-life" of volatility as introduced by Engle & Bollerslev (1986). The "half-life" concept was later also used by several researchers including Elyasiani et al. (2011); Engle & Patton (2004); S. A. Khan et al.

(2017); West & Worthington (2006).

The equation for calculating the "half-life" (also applied by the above-mentioned researchers) is:

$$Half - Lif(HL) = log(0.5)/log(ARCH + GARCH) \quad (4)$$

RESULTS AND ANALYSIS

TABLE 2
Output of GARCH(1,1) Model – Islamic Banks

Banks	ARCH	GARCH	MR (KSE100)	RFR	EXR	OIL
Meezaan Bank Ltd	0.000138*	0.11171*	0.55359*	0.0160*	-0.00038*	-0.0088*
Soneri' Mustaqeem Islamic Bank	0.000122*	0.29738*	0.44264*	-0.0033*	0.001373*	-0.0093*
Dubai Islamic Bank	0.000454*	0.07336*	0.5791*	-0.00027*	-0.00054**	-0.0337*
Al-Baraka Bank	0.06106*	0.13325*	0.83393*	-0.0008*	-0.05205*	0.00199*
Bank Alfalah Islami	0.000674*	0.12569*	0.53707*	-0.00565	-0.00101*	-0.048*
BankIslami Pak. Ltd.	0.08805*	0.22722*	0.69059*	-0.0015*	-0.00018*	0.00341*
MCB Islamic Banking	0.000277*	0.15418*	0.52697*	0.00631*	-0.00082*	-0.0137*
UBL Islamic Banking	0.001057*	0.15781*	0.59837*	-0.0350*	-0.00515*	0.014167
HBL Islamic Banking	0.00022*	0.1704*	0.54687*	0.00432*	-0.00082*	-0.0140*
Bank Al-Habib Islamic Banking	0.000178*	0.14844*	0.53350*	-0.0012*	-0.00056*	-0.0114*
Bank of Punjab Islamic Banking	0.09505*	0.19182*	0.65886*	-0.001**	0.000178*	-0.0034*

Source: Author's self-compilation from GARCH (1, 1) results for Islamic Banks

TABLE 3
Output of GARCH(1,1) Model – Conventional Banks

Banks	ARCH	GARCH	MR (KSE100)	RFR	EXR	OIL
Askari Bank Ltd	0.0106*	0.054562*	0.933817*	-0.00087*	0.0108***	-0.00048*
Allied Bank Ltd	0.0690*	0.062249*	0.911379*	-0.00088*	0.9708	0.000314
Bank Alfalah	0.0180*	0.045888*	0.940243*	-0.00095*	0.1608	-0.00029***
Bank Al Habib	0.0110*	0.03351*	0.95721*	-0.00126*	0.0807**	-0.00052**
Faysal Bank	0.0180*	0.028643*	0.962696*	-0.00129*	0.9208*	-0.00023***
Habib Bank Ltd	0.0380*	0.054659*	0.930853*	-0.00142*	-0.2707*	-0.00108*
JS Bank	0.0680*	0.041513*	0.947532*	-0.00153*	0.8308	-0.00052**
Standard Chartered Bank	0.0806*	0.039505*	0.947068*	-0.00089*	0.0207*	-0.0003**
Soneri Bank	0.0100*	0.03878*	0.94898*	-0.00081*	0.3507**	-0.00015
United Bank Ltd	0.0370*	0.041333*	0.943153*	-0.00087*	0.2007**	-0.00044*
MCB Bank	0.0706*	0.051221*	0.944237*	-0.00116*	-0.8609	-0.00054*

Source: Author's self-compilation from GARCH (1, 1) results for Conventional Banks

From GARCH (1, 1) results, it is evident that market return has shown a statistically significant positive relationship with stock return volatility for all of the banks found in the conventional sector as well as in the Islamic banking sector. The RFR has shown an inverse effect on stock volatility in the context of Islamic banks. However, in the conventional banking sector, a few banks have shown positive relationships between RFR and stock volatility as

well. Is Nonetheless, the majority of banks showed an inverse impact of RFR on stock volatility. EXR has shown an inverse impact on stock returns volatility for the majority of the banks in the Islamic sector; however, there is a mixed result for the conventional banks in the context of this variable. For the case of Islamic banks, OIL exhibited an inverse significant impact on stock returns volatility for all of the banks; whereas, for conventional banks, few banks show a positive impact for the same variables.

TABLE 4
Volatility Dynamics for Conventional Banks

Volatility Dynamics	Volatility Persistence	Mean-Reversion	Speed-of-Mean-Reversion
Conventional Banks	(ARCH+GARCH)	(ARCH+GARCH)<1	HL
Askari Bank	0.065162	(ARCH+GARCH)<1	0.253818
Allied Bank Limited	0.131249	(ARCH+GARCH)<1	0.341341
Bank Alfalah	0.063888	(ARCH+GARCH)<1	0.251996
Bank Al Habib	0.04451	(ARCH+GARCH)<1	0.222731
Faysal Bank	0.046643	(ARCH+GARCH)<1	0.226132
JS Bank	0.092659	(ARCH+GARCH)<1	0.291382
Standard Chartered Pakistan	0.109513	(ARCH+GARCH)<1	0.313398
Soneri Bank	0.120105	(ARCH+GARCH)¡1	0.32705
United Bank Limited	0.04878	(ARCH+GARCH)<1	0.229486
MCB Bank Limited	0.078333	(ARCH+GARCH)<1	0.272165

Author's self-compilation from GARCH (1, 1) results for Conventional Banks

TABLE 5
Dynamics for Islamic Banks

Volatility Dynamics	Volatility Persistence	Mean-Reversion	Speed-of-Mean-Reversion
Islamic Banks	(ARCH+GARCH)	(ARCH+GARCH)<1	HL
Meezan Bank Limited	0.111848	(ARCH+GARCH)<1	0.316417
Soneri Mustaqeem Islamic	0.297502	(ARCH+GARCH)<	0.571746
Dubai Islamic Bank	0.073814	(ARCH+GARCH)<1	0.26596
Al Baraka Bank	0.19431	(ARCH+GARCH)<1	0.423089
Bank Alfalah Islamic	0.126364	(ARCH+GARCH)<1	0.335082
BankIslami Pakistan Ltd.	0.31527	(ARCH+GARCH)<1	0.600478
MCB Islamic Banking	0.154457	(ARCH+GARCH)<1	0.371096
UBL Islamic Banking	0.158867	(ARCH+GARCH)<1	0.376774
HBL Islamic Banking	0.17062	(ARCH+GARCH)<1	0.391981
Bank Al Habib Islamic	0.148618	(ARCH+GARCH)<1	0.363594
Bank of Punjab Islamic	0.28687	(ARCH+GARCH)<1	0.555083

Source: Author's self-compilation from GARCH (1, 1) results for Islamic Banks

In the above tables, the level of positive/negative significance for ARCH and GARCH parameters along with "persistence", "mean-reversion", and "speed-of-mean-reversion" of volatility are provided for both conventional banks and Islamic banks.

Comparison of the Results Regarding volatility Dynamics for Conventional and Islamic

Banks

Some of the earliest studies (Ewing et al., 2005; F. Khan et al., 2014; Mandimika & Chinzara, 2012; Su & Bilson, 2011; West & Worthington, 2006) determined the role of ARCH (the last period's shock) and GARCH (previous period's shocks) in increasing stock returns volatility; however, they focused mainly on the market or sectoral levels. Particularly, the studies of Carrol & Connor (2011); Elyasiani et al. (2011); Engle & Patton (2004) targeted the developed market of NYSE and concluded a significant effect on both ARCH and GARCH parameters in increasing the futures stock returns volatility. This study uncovered these effects from the perspective of both conventional and Islamic banks. For instance, all banks, both conventional and Islamic, irrespective of their features, have shown significant coefficients for both ARCH and GARCH parameters. Similarly, for the majority of the banks in both sectors, close to 100% of firms have the characteristics of mean reversion i.e. (ARCH+GARCH) <1. Similarly, for the property of "stationarity" to hold, it is also necessary that the sum of ARCH and GARCH parameters must be < 1 (Elyasiani et al., 2011; S. A. Khan et al., 2017). The current study has found it very close to 1, which implies that the returns-generating process is characterized by a high degree of persistence (long memory in conditional variance). Hence, any shock in volatility in the present period would persist for several future periods (Panda & Nanda, 2018). The "half-life of volatility" is yet another indicator of volatility persistence, defined by Engle & Bollerslev (1986). It is the time volatility takes to revert halfway back to its mean value. The results of the current study suggest that all firms in both conventional and Islamic banks do revert to their mean value but this happens with wide variations. More specifically, following Elyasiani et al. (2011) for all the conventional banks, the majority of banks don't fulfill the pre-set criteria for speed of mean reversion (i.e. HL<15) and they revert to their mean value after more than 15 days. According to Elyasiani et al. (2011), the same results have been reported by many conventional banks, most of which have HLs longer than 30 days. In the volatility persistence context, HL¡30 in the conventional banks the highest percentage of banks. On other hand, for the second group of Islamic banks (2<HL<6) the highest percentage comes from the majority of the banks.

Conclusion

The study explains how (some selective) macroeconomic variables affect the volatility of bank stock returns as well as volatility dynamics in the context of conventional or Islamic banking systems. Findings from GARCH(1,1) model presented that market returns in both conventional and Islamic banks were the most significant of all economic factors. Irrespective of the firm's features market return proved an inverse significant effect on the stock returns volatility in both types of banks. Particularly, for all the conventional banking sector and most of the Islamic banking sector, the majority of the banks have exhibited a negative association between economic fundamentals and stock return volatility. This shows that as the market return improves the stock returns volatility of particularly those firms composing the KSE 100 indexes decreases. The risk-free rate showed a positive effect on stock returns volatility in conventional banks; whereas, a negative effect in Islamic banks. The exchange rate showed a significant negative effect on the stock return volatility of the majority of conventional banks.

On the other hand, the exchange rate also showed a negative significant effect on the stock return volatility for most banks in the Islamic banking sector. A negative correlation was found between oil returns, and stock returns volatility of the majority of conventional banks. Similarly, for the Islamic banking sector, the oil returns presented an inverse significant effect on the stock returns volatility of the majority of the banks. As for the volatility dynamics, the shocks are quite persistent but vary across various bank features. Further, the volatility process in both sectors is, by and large, mean-reverting; however, it also varies over the various bank features.

In light of the findings of this research, the authors are convinced that if the investors diversify their investment across the Islamic and conventional banks of Pakistan, they can minimize their investment risk. However, they still have to keep a close eye on the fluctuations of economic fundamentals and policies of the state. This will help them to decide on the proportion of investment in these two different stocks.

This study sets two prospective avenues for future research studies. First, the current study, while investing the conventional and Islamic banking sectors for the possible effect of macroeconomic factors, didn't consider the economic cycles, i.e. boom or recession (particularly, the 2007-08 financial crisis). Hence, it would be advisable for future researchers to consider this and build an event study for this purpose, as the dynamics of the relationship between economic factors and stock returns volatility have remarkably changed after these crises (Abbas et al., 2018). Second, due to the limitation of the current study (as it considered daily returns), some of the important macroeconomic factors were dropped which would surely affect the relationship. Thus, future research studies are suggested to incorporate them as well.

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