

A Study of Islamic Portfolio Diversification Opportunities for Investors of Pakistan in various stock holding periods

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This study attempts to find out the possible opportunities for the investors of Pakistan Islamic market to maximize the benefits of divergence. Dow Jones Islamic market returns (DJIMR) of four different regions named as Dow Jones Islamic Americas, Dow Jones Islamic European, Dow Jones Islamic Asian Pacific and Dow Jones Islamic Middle East and North Africa Regions across the Pakistan Karachi Meezan Index-30 have been used to capture the approach of diversification benefits. According to objectives, Multivariate GARCH—Dynamic Conditional Correlation (DCC) model is applied and it is suggested that local investors of Pakistan should prefer to invest in Asian pacific region, then to Americas region and further Middle East and North Africa region and least preference should be given to European region to maximize benefits from diversification. In order to capture the change in diversification benefits during various stock holding horizons, Continuous wavelet transformation-CWT is applied and results have indicated insignificant relationship/correlation between two markets (local and international markets of all regions) for short period of holdings rather medium and long term holdings period. Indeed, this study has focused on advance concept of incorporating the role of stock holding horizons while determining the benefits of diversification which has greater implications in the field of portfolio diversification .

Keywords: Dow Jones, diversification, multivariate, dynamic conditional correlation, continuous wavelet transformation, Karachi Meezan Index-30.

This study aims to explore the opportunities of investment for pkaistani invesotrs of Shari’ha compliance returns in multiple dimensions by highlighting the benefits of diversification in various international markets of Islamic returns. In order to capture the approach of diversification in broader prospect, Islamic return markets of different regions of world are taken into consideration across the local Islamic return market of Pakistan. Application of concept of stock holding periods, for which invetors can hold the investment with them, has also been explored in relation to benfits of diversification.

Islamic financial market is reflecting 15-20 % growth rate annually from 2000-2010 which is a basic reason of preferring it in global financial sector by investors (International *Islamic Financial Market*, 2010). Many financial institutions have attracted towards Islamic financial products due to this high growth rate. Major countries which are considered as pioneers of this industry are Egypt, Saudi Arabia, Sudan, Malaysia, and Pakistan. Divine Principles for investment, asset backed financing modes and profit-loss investment tools are considered as strength for the industry (Hakim & Rashidian, 2002). However, still

performance of Islamic stock is doubtful as compare to conventional (Ghazali, Lean, & Bahari, 2013; Mensi, Hammoudeh, Reboredo, & Nguyen, 2015), (Ho, Rahman, Yusuf, & Zamzamin, 2014), (Shamsuddin, 2014), (Alkhazali & Zoubi, 2020; Al-Khazali & Mirzaei, 2017), (Rejeb & Arfaoui, 2019).

Principles of the Islamic Financial Market

Like all other human activities, Islamic Financial activities are governed by shari’ah. Quran and Sunnah (religious text) work as basic regulations for the performance of financial activities within an Islamic framework. Along with preventing specific goods and services, Islam also elaborates/ teaches its followers not to exploit the rights of others while making economic transactions concerning the production, distribution, and exchange of goods and services and their consumption (Alam, Akber, Shahriar, & Elahi, 2017) and (Kassim, Ramlee, & Kassim, 2017). An Islamic theory of Economics and Finance is concerned not with religious success but with personal gains” as (Tatiana, Igor, & Liliya, 2015).

The significant difference between these two markets is that; conventional economic market agents focus on material gains only, while Islamic financial activity agents simultaneously work for endless and material benefits (Mumtaz, Usman, & Nasir, 2014). Therefore, Islamic investor portfolios pay attention to various Shariah-compliant securities to diversify their holdings

Pakistan Islamic Financial Stock Market

According to the American International rating agency, Atlantic Media Company (AMC) ranked Pakistan as one of the stronger economies in South Asia and declared an Emerging economy (Farwa, 2006). Pakistan is chosen as the base country within the framework of the Islamic financial system (Shoaib, 2015).

The Islamic index of Pakistan, known as the Karachi Meezan Index (KMI-30), consists of 30 companies from 12 industries registered on the KMI-30 index in Pakistan. All thirty 30 companies fulfill the criterion of Hilal business and according to Shari’ah Compliance, up to 33% of non-Shari’ah compliant investment is permissible; one company Nishat Mills has above 33% of non-Shariah Compliance investment, as shown in the figure below (Z, U, & M, 2012).

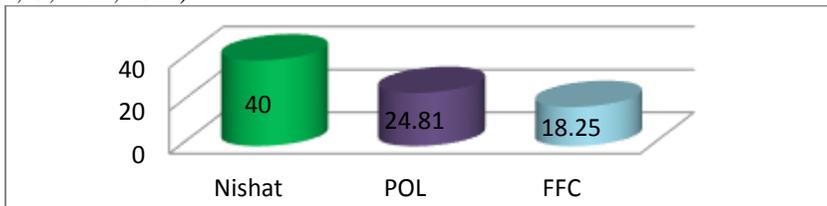


Figure 1 : Non-Shariah Compliance investment in Pakistan

Problem Statement

Recently, the growth of the Islamic financial market has expanded widely in Islamic countries, supporting the argument of options for investors in conventional and Islamic stocks. For four decades, the theory of international portfolio diversification has been widely recognized after seminal work of Grubel (1968) and, most notably, the work of Levy and Sarnat (1970).

The interaction among international stock markets is critical to fund managers and international investors deeply concerned with identifying and creating a well-diversified minimum-risk portfolio mix and lower correlations is essence of international diversification (Dajcman, Festic, & Kavkler, 2012).

However, empirical estimation generates mixed results concerning portfolio diversification, with some literature supporting the argument (Chatti, Kablan, & Yousfi, 2013; Rana & Akhter, 2015) and another side of literature reporting strong correlations (Kamil, Bacha, & Masih, 2012), strong correlation reported by Anwer and Raza (2016). In spite of expanding its financial market in Islamic domains still, investment in local Islamic stocks seems to be little risky which make them to think they look for the zone comparatively safe which ensure them to have lesser risks and secure environment of high returns adopting the choice of “don’t put all eggs in one basket”.

The empirical and theoretical background of the literature reviewed until now has generated mixed and contradictory reviews within the framework of international portfolio diversifications. Simultaneously, the significance/worth of current “investment holding periods” (like short, medium, and long periods), a new emerging dimension in literature, helps understand the strength of instabilities and relationships for stock market returns. This aspect is relatively new as less empirical work has been found (to our knowledge), and being the 6th Islamic state of the world, Pakistan is chosen as a base country (Hasan, Latif, & Al-Za’tari, 2017).

This study empirically and Theoretically explores the impacts of various investment horizons on opportunities for international portfolio diversification in Islamic equities using Pakistan as a base country within context of Markowitz's theory,

Research Objectives

The research aims the following:

1. To study whether Pakistani Islamic stock investors should avail the opportunity to invest in European region markets or Americas, Middle East and North Africa (MENA), or Asia-Pacific regions.
2. To evaluate the importance and connection of different stock-holding periods with international diversification gains for all returns in relation to Investors of Islamic shari’ah Pakistan.

Literature Review

Some studies are conducted in similar context of importance of Islamic capital market and Dow Jones, Portfolio Diversification opportunities for Islamic Investors in various markets and stock holding periods’ contribution in diversification gains which are highleted in this study.

Unique value of Islamic capital market

The Fundamentals of Islamic Finance, better known as the rules of Sharia, are based on five basic principles: Riba, extreme uncertainty, hypothesis, risk and profit sharing and to invest in "unethical" entities (Hayat & Kraeussl, 2011). Islamic stocks have a lower leverage ratio than conventional stocks (Hoque, Kabir, Abdelbari, & Manahov, 2016) and have distinctive features of Islamic Finance (Hassan & Mollah, 2018). Shari’ah supports leasing, profit-sharing, and enterprise, whereas it strictly prohibits the fixed interest rate and profit (Mumtaz, Usman, & Nasir, 2014). key factor is determined for the development of any

financial market (Rizvi & Arshad, 2018). Investments in Islamic stocks are in high demand since the company's financial position is more reliable in the face of uncertain global economic conditions (Budiandru, 2021). Various studies conducted on the performance of Islamic equity markets, (Hussein, 2007) (Kok, Giorgioni, & Laws, 2009) (Rana & Akhter, 2015), (Amyulianthy & Ritonga, 2016), (Deep, 2021) and (Aarif, Rafiq, & Wahid, 2020).

Islamic Portfolio Diversification and Dow Jones

Abbes and Trichilli (2015) discovered that Islamic stock indexes have the possible feature of diversification benefits for less period of time in crisis situations. The benefits of Islamic equities for diversification in Islamic developing and emerging countries, have recently been investigated in a few studies looked into the significance of the stock market in Islamic investing and diversification (Alkhazali & Zoubi, 2020), (Arfaoui & Rejeb, 2020). Raza et al., (2016) capture the diversification of Dow Jones Islamic returns as well. Due to lesser risk feature of Islamic returns, academics believed that high level of potential exist as a means of portfolio diversification (Shamsuddin, 2014) In addition, Saiti et al., (2014) argued the same as (Al Rahahleh, Akguc, & Abalala, 2021). Maghyereh et al., (2019) worked on Dow Jones Citigroup Sukuk index and demonstrated the short-term diversification benefits of portfolios that include both conventional and Islamic shares. Recently, researchers in Islamic stocks have also looked into the significance of the stock market in Islamic investing (Alkhazali & Zoubi, 2020). Al Shugaa and Masi (2014) and Mansourfar, Didar, and Jodatnia (2017) also studied financial integration at industry level and found benefits from international diversification, however somehow there was evidence of increased interdependence across markets in turbulent period (Majdoub & Mansour, 2014).

Many studies have analyzed the importance and features of Dow Jones Islamic returns to find out diversification and due to the reason, in the instant study, researcher has also used Dow Jones Islamic returns (DJIR) of different regions across Pakistan. Researchers have also found that the risk is associated with the Dow Jones Islamic Index (DJII) but significantly lower than the Dow Jones World Index (DJWI) which has made Islamic Dow Jones more attractive for investors (Al-Zoubi, A., & Maghyereh, 2007; Al-Khazali and Mirzaei, 2017).

Time changing and Scale-Dependent Relationships

Above mentioned studies, nevertheless particularly talks about this association of markets from the constancy point of view, yet numerous new studies have established the fact that across nation, these correlations are changing with time and may not be unvarying (Longin & Solnik, 1995). Multivariate GARCH-DCC for capturing time varying correlations, (CWT) the continuous wavelet transform (a new study in literature) and the maximal overlap discrete wavelet transform based on DWT for stock-holding periods are applied to incorporate holding periods role in diversification gains (Ali & Masih, 2016; Buriev & Masih, 2015). Correlation in financial markets and its time scaled dependency of returns were initially supported by Dajcman (2012) and Ilhan and Masih (2014). In addition, a joint examination of investor recognition and institutional holding reveals a significant role of investor recognition in explaining long-term returns was conducted (Amédée-Manesme, Baroni, Barthélémy, & Mokrane, 2015; Poretti & Das, 2020).

Theoretical Framework

Theoretical foundations are derived from Modern theory, developed by Markowitz (1952) Nobel Prize winning a theory of how investors avoid risk by constructing a portfolio which is expected to yield maximum or optimum return within given level of market risk.

Markowitz (1952) Tobin (1958) agreed on the statement that investors are risk averse, so risk and expected returns of portfolio depend mainly on correlation among stock returns. It means no correlation among stocks give benefit of diversification and reduces the risk factor. No doubt stock market has much risk but it can be reduced or minimized to certain extent. Instead of investing in single stock, unsystematic associated risk can be avoided by diversifying portfolios. Moreover, Investors prefer to have diversified portfolios to avoid risk attached to individual home security as suggested by (Grubel, 1968; Grauer & Hakansson, 1987). Markowitz diversification can capture reduction in unsystematic risk. Portfolio diversification can be helpful in building investors' confidence and achieving goal to be as developed country in 2020 (Lee, Fan-Fah, & Cheng, 2016). Hence, application of MPT for Islamic investment in various regions and countries provide theoretical implication through this study.

Method

The methodology of this study has helped to explain the overall research framework developed based on underpinned theories and supporting literature. The Philosophy of Positivism has been used with quantitative approach by utilizing secondary data sources.

Data Summary Statistics

For all research objectives, KMI-30 Shari'ah index (Karachi Meezan Index-30) is used for finding diversification opportunities for Islamic investors of Pakistan. To capture regional market Islamic returns, Dow Jones Islamic for Europe, Americas, Asia-Pacific and indexes for Middle East and North Africa region are used in study (Islamic Finance,2013). For this study, a sample of adopted indices could be evident from Table 1.

Table 1
Sample Indexes

Sr No.	Symbols	Indexes
1	KMI-30	Karachi Meezan Index-30
2	DJIA	Dow Jones Islamic America
3	DJIEU	Dow Jones Islamic Europe
4	DJIAP	Dow Jones Islamic Asia-Pacific
5	DJIMENA	Dow Jones Islamic Middle East and North Africa

Descriptive Analysis and Diagnostic tests

All the series of closing prices of data have been computed as a logarithmic difference of closing prices of stock indexes. First of all descriptive analysis of the series would be done and then basic diagnostic tests for the justification of GARCH parameterization for conditional variance development.

Multivariate GARCH (MGARCH)

The Autoregressive conditional heteroscedasticity process demonstrated by (Engle, 1982), known as ARCH and Generalized ARCH formulation (GARCH), was developed by (Bollerslev, 1986). These are highly known volatility models having conditional volatilities which vary over time. Multivariate GARCH, commonly known as (MGARCH-type models, construct a framework that shows the probability of interactions within conditional mean value and time-varying conditional variance of two or more observed series (Ahmed & Farooq, 2017).

Multivariate GARCH (MGARCH)—Dynamic Conditional Correlation (DCC) model

Multivariate GARCH-DCC Model has been used to capture the behavior of correlations and volatilities and between returns of assets over a period along with size (weaker or more substantial) and directions (positive or negative) both for local and international stockholders for diversifying their portfolios against unseen risks. Hence, Dynamic Conditional Correlation DCC's well-known framework under M-GARCH have enabled to determine whether shocks to return volatilities are complementary or substitutes in facing risk factors. It helped find out both the changes (when and how they occur) in the interdependence between financial market variables as suggested by (Buriev & Masih, 2015). The reason for using DCC over CCC (constant correlations model) is that correlations and co-movements are not considered constant, and returns are time-varying, as suggested by (Dajcman, Festic, & Kavkler, 2012).

$$\begin{aligned}
 r_t &= B_0 + \sum_{i=1}^k \beta_i r_{t-i} + u_t = \mu + u_t \\
 \mu_t &= E[r_t | \Omega_t - 1] \\
 \mu_t | \Omega_{t-1} &\sim N(0, H_t) \\
 G_t &= \text{diag} \left\{ \sqrt{h_{ii,t}} \right\} \\
 H_t &= G_t R_t G_t
 \end{aligned}$$

In the above formulation, $h_{ii,t}$ exhibits estimated conditional variance which is derived from the univariate (GARCH) Model, and G_t stands for the diagonal matrix of conditional standard deviations

Continuous Wavelet Transformation (CWT)

The Continuous Wavelet Transform (CWT) has recently become popular among financial and economic scholars. like (Ferrer, Bolós, & Benítez, 2016;; Madaleno & Pinho, 2012; Saiti, 2016; Saiti, Bacha, & Masih, 2014) and many others as well. Continuous wavelet plots the single variable time series data into the function of two variables known as frequency and time. Hence, this transformation sketches the two-dimensional diagram of correlation series that helps in the interpretation of hidden information and patterns of series. This type of correlation analysis between the two series is called Wavelet coherence. Applying the CWT technique in this study for the desired objective diversification change benefits stock holding time would indicate the degree of correlation among series considering both scale and time changing.

The continuous wavelet transform (CWT) $W_x(u, s)$ is calculated using the below eq.

$$W_x(u, s) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{s}\psi} \left(\frac{t-u}{s} \right) dt.$$

u and s stand for an explanation of the location of wavelet in specific time and frequency domains, respectively. Hence, bivariate framework are identified as wavelet coherence. Here, wavelet coherence is stated as follows:

$$R_n^2(S) = \frac{|S(s^{-1}W_n^{xy}(s))|^2}{S(s^{-1}|W_n^x(s)|^2) \cdot S(s^{-1}|W_n^y(s)|^2)}$$

Above S is the smoothing operator of the series; $W_n^x(s)$ denotes (CWT) continuous wavelet transformation of X time series; s represents wavelet scale; $W_n^y(s)$ stands for continuous series at Y time series; $W_n^{xy}(s)$ indicates cross wavelet transformed series of Y and X (Madaleno & Pinho, 2012).

Results

From 13th June 2013 to 10th September 2021, time series data sets have been obtained using the Thomson-Reuters Data Stream database. The returns from the stock index have been estimated as logarithm differences in indexes' day-to-day closing prices, $\{\ln(pt) - \ln(pt-1)\}$, here p denotes an index value. A few outputs of descriptive statistics can be evident in Table 2.

The diagnostic tests for the justification of GARCH parameterization for conditional variance development are applied. On the basis of results, we may argue that at the 1% level of significance, the hypothesis of normal distribution, observed time series could be rejected. In addition, the author has also tested for Ljung Box Q statistics with ten lags and a serial correlation concerning the squared returns series. Based on the obtained results, we may argue that the null hypothesis could be rejected, resulting from the absence of autocorrelation at the 1% level of significance. The author has also indulged with heteroscedasticity measures through Engle's ARCH effects and lag five. Based on the obtained results, we may argue that the null hypothesis resulting from an absence of ARCH (Autoregressive Conditional Heteroscedastic) effects could not be accepted at 1% significance level of for all. Hence, GARCH could be sufficient for the processes of conditional variance (see Table 2).

Table 2

Descriptive statistics

Indices	KMI30	DJIA	DJIEU	DJIAP	DJIMENA
Mean	0.000148	0.000131	0.000127	0.00015	0.0000527
Maximum	0.038503	0.038357	0.030605	0.019845	0.0379944
Minimum	-0.05602	-0.05006	-0.05116	-0.0252	-0.0645318
Std. Dev.	0.005792	0.004463	0.004224	0.003712	0.0036538
Skewness	-0.606**	-0.983**	-1.119**	-0.482**	-3.248**
Kurtosis	12.094**	23.771**	16.793**	6.943**	64.196**
Coeff. of Var.	39.2037	34.17317	33.40087	24.69578	69.36042
Jarque-Bera	195.71**	173.09**	212.61**	138.16**	22062**
Modified L-B (10)	8.05001	7.86336	7.82714	15.4999	18.5025
Modified L-B (20)	20.6297	13.2466	12.2842	23.2883	29.1882
ARCH Effects (5)	37.687**	304.583**	43.23**	185.785**	133.547**
Observations	2152	2152	2152	2152	2152

Do the investors of KMI-30 invested in international markets and can they enjoy the benefits of diversification?

The author has also adopted a test, namely, the M-GARCH-DCC test on the various global returns, including the KMI-30 index (see table 2). It has been confirmed in Figures 2 and 3, the time-varying attributes of correlations and volatilities. Figure 2, indicate the movement of daily closing prices of selected indexes while figure 3 indicate the volatility in daily returns of selective indexes for the period 13th June 2013 to 10th September 2021. Nevertheless, the KMI-30 returns demonstrated greater instability from June 2015 to 2016 followed by the second quarter of 2018 for a shorter period before submerging afterward in 2020 due to Covid-19. However, the instabilities of the entire indexes in the era of the post-Covid are more or less identical or move together.

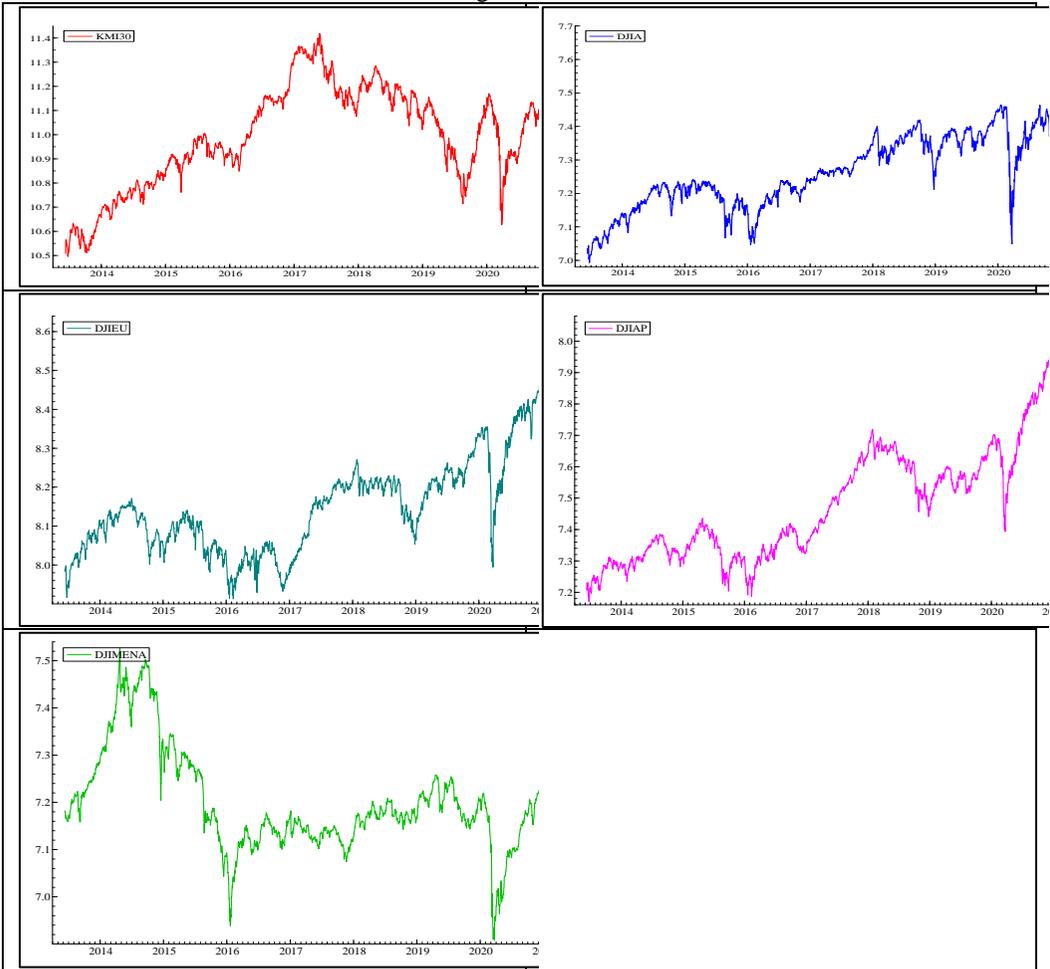


Figure 2 Daily closing prices of all five series

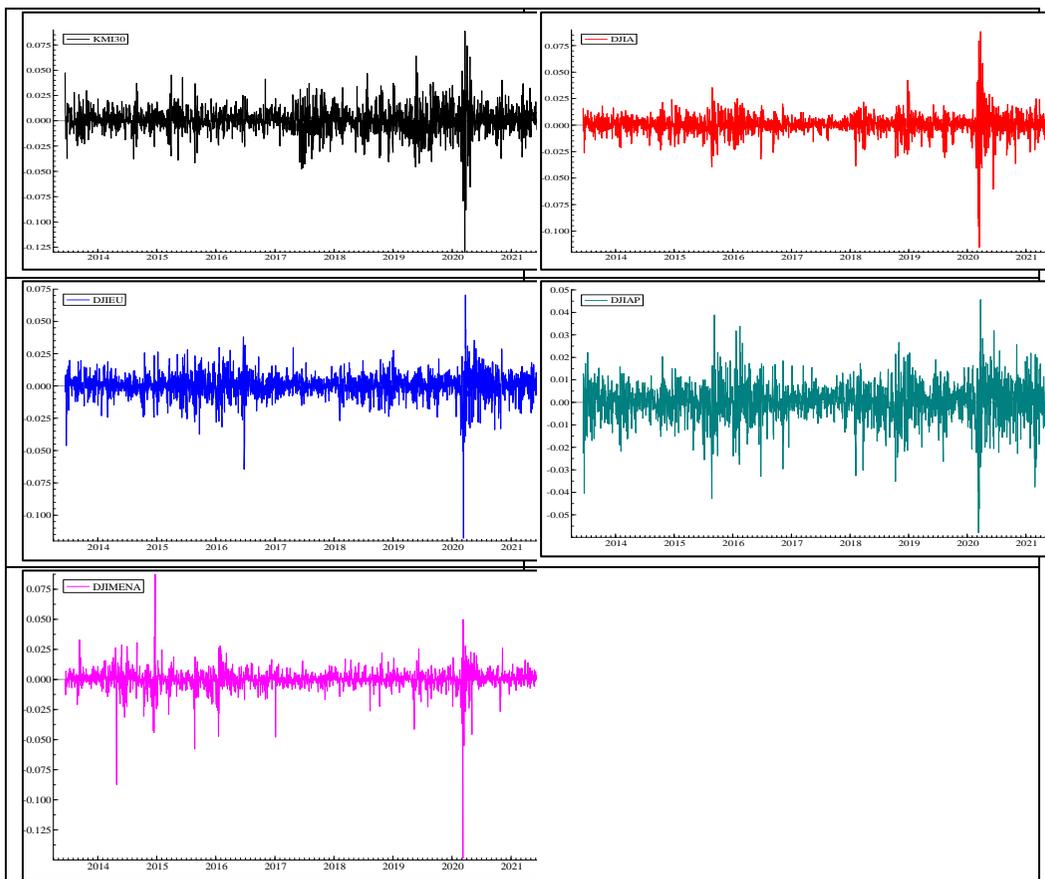


Figure 3: An overview of Daily log-return series of all concerned indexes

Table 3 indicate the estimation association among the Islamic Dow Jones Islamic indexes of developed and developing economies. The findings indicate that returns of KMI-30 are significantly and positively associated with the returns of DJIA ($\beta = 0.245$, $t=10.71$, $p=0.000$), between returns KMI-30 (PSX) and DJIEU (Dow Jones Islamic European Union) ($\beta = 0.433$, $t = 22.50$, $p=0.000$), and DJIAP (Dow Jones Islamic Asia Pacific) ($\beta = 0.055$, $t = 2.494$, $p=0.012$). Moreover, the KMI-30 indicates a significant and positive association with DJIMENA (Dow Jones Islamic Asia Pacific) ($\beta = 0.263$, $t = 11.180$, $p=0.000$). The findings of the present study reveal that KMI-30 (PSX) indicates a significant and positive association with the DJIA, DJIEU, DJIAP, and DJIMENA. However, Pakistani investors should diversify their stocks in different markets rather to one and should prefer Asian Pacific region, then americas markets, next to MENA market and least preference to the European market on the basis on t- value below table. It can be further identified that investors of other regions can diversify their stocks from their local market to international markets like investors in Asian Pacific have the opportunity to invest in European and MENA. Islamic indexes to gain the benefits of portfolio diversification while the Asian Islamic index indicates a negative and insignificant association with the DJIA and European region. Abbas and Trichilli (2015) investigated that similar economic groups present the long run relationship among Islamic stock returns while partial difference has been found in regions belonging to different group through VECM and captured short term integration between various segments of Latin

American vs MENA, European vs Asian emerging and Latin American vs European Islamic return markets, however, investors of Islamic shariah can achieve by diversification in different economic groups like in emerging and developed countries. Similarly, investors from the DJIEU can get the benefit of diversification as previously by Kassim, Ramlee and Kassim (2017), Kafou and Chakir (2017) worked on shariah indices and diversification.

Table 3

Parameter estimation of the DCC-MGARCH Model for KMI30, DJIA, DJIEU, DJIAP, and DJIMENA

Parameter	Coefficient	Std. Error	t-value	t-prob
$Y_{KMI30-DJIA}$	0.245038***	0.022881	10.71	0.000
$Y_{KMI30-DJIEU}$	0.433451***	0.019264	22.50	0.000
$Y_{KMI30-DJIAP}$	0.055787***	0.022365	2.494	0.012
$Y_{KMI30-DJIMENA}$	0.263330***	0.023552	11.18	0.000
$\Phi_{DJIA-DJIEU}$	0.499802***	0.017585	28.42	0.000
$\Phi_{DJIA-DJIAP}$	-0.012739	0.023503	-0.542	0.587
$\Phi_{DJIA-DJIMENA}$	0.113720***	0.024205	4.698	0.000
$\beta_{DJIEU-DJIAP}$	-0.020417	0.022117	-0.923	0.356
$\beta_{DJIEU-DJIMENA}$	0.216331***	0.022774	9.499	0.000
$\epsilon_{DJIAP-DJIMENA}$	0.042951**	0.024083	1.783	0.074
DCC _{alpha}	0.012895**	0.0061651	2.092	0.036
DCC _{beta}	0.869038***	0.10428	8.34	0.000
V	6.496409***	0.34874	18.63	0.000
Log-likelihood	46436.436			
AIC	-43.111			
SBC	-42.985			
Shibata	-43.112			
Hannan-Quinn	-43.065			
Hosking(5)	500.454***			
Hosking(10)	657.970***			
Hosking(20)	840.489***			
Hosking(50)	1647.19***			
Li-McLeod(5)	500.068***			
Li-McLeod(10)	657.424***			
Li-McLeod(20)	840.454***			

How would international portfolio diversification benefits change with various stock- holding time periods like, short, medium, and long period?

As discussed earlier, the researcher has applied the M-GARCH-DCC test to quantify how investors across Pakistan could obtain advantages from their diversified portfolio in the markets of the Americas, European, Asian, MENA regions as previously, DCC approach of

M-GARCH has been applied in study to investigate the corridors for investment in Islamic returns by US based investors and it is found better diversification opportunities can be availed by investing in Islamic return markets (Saiti, Bacha, & Masih, 2014). In the subsequent part, the researcher has indulged with contemporary wavelet transformations to measure the repercussions on the benefits of the diversified portfolio as a result of various horizons of investment as Dajcman et al., (2012), also supported scale dependence for returns in stock market in their latest research regarding co-movement dynamics among Austria, Germany, France and Britain developed stock markets of Europe against developing markets by incorporating Hungary, the Czech Republic and Slovenia (CEE markets) through application of Rolling approach of wavelet and MODWT and it has been found that short term investors get different benefits from long term investors as short term investors are more concerned to higher frequency in comovements among returns due to time scale interdependence.

Figure 5 presents the estimated wavelet coherence and phase difference of Karachi Meezan index-30 (KMI-30) returns with four Dow Jones Islamic regional series. The predicted phase difference and wavelet coherence across Islamic returns in Pakistan markets with the market returns in regions is based on CWT (Continuous Wavelet Transformations). The horizontal axis shows the time i.e years which covers study periods alternatively, from 6/12/2013 to 9/10/2021. The vertical axis shows frequency bands, based on daily units which range from 4- to 2152-day scales. The scales are further categorized into three holding periods as 4-day to 256-day scale (high frequency) relates to the short term dynamics, 256-day to 512-day scale relates to medium-term dynamics and 512-day to 2152-day scale (high frequency) relates to the long dynamics.

Drawing from the results mentioned above, we may argue that time is evident on the horizontal axis concerning the number of working (business days) throughout the FY 2013-2021 (sample years), the vertical axis, on the other hand, refers to the horizon of investment concerning the stockholding periods such as 4-8 days, 8-16 days, 16-32 days, 32-64 days, 64-128 days, 128-256 days, 256-512 days, 512-1024 days, and 1024-2152 days. A 5% level of significance from below mentioned curved line has been evident, which is predicted based on Monte Carlo simulations at the 95% level of significance. Color codes have been followed by figures as demonstrated on the right with ranges of power of correlation with different colors.

It can be seen undoubtedly that each market has practiced both short-term, medium-term, and long-term volatility. These existences are connected with the interaction of the overlapping effects of financial shocks. Similarly, to ease the interpretation, arrows indicate the phase differences between the considered series. In all the images of CWT, \rightarrow and \leftarrow represent phase in and phase out for both stock returns and housing prices respectively. Moreover, \nearrow and \swarrow capture the leading trend and while \searrow and \nwarrow denote lagging trend between housing prices and returns.

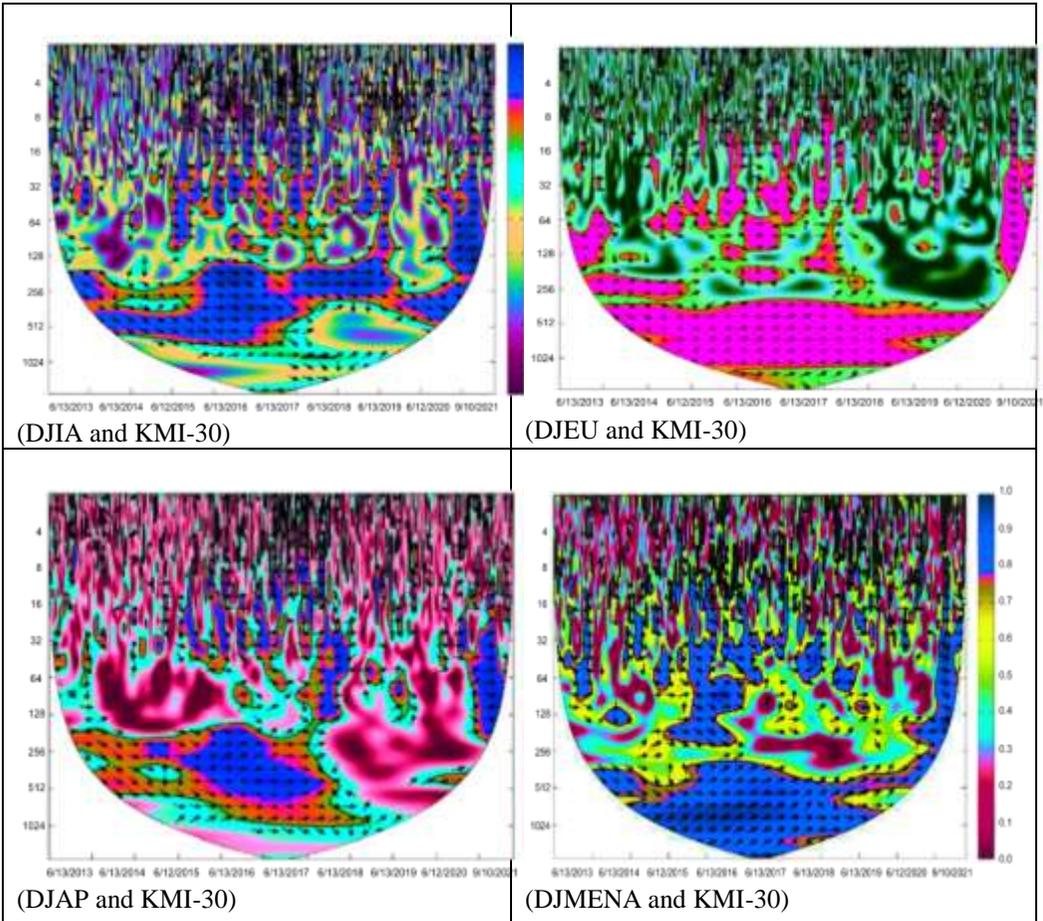


Figure 5: Continuous wavelet transform between four regions and KMI-30

Figure 5, as far as the short investment periods are concerned, these periods comprise 16-32 days, 32-64 days, and 64-128 days of holding periods. Hence, it has been again evident that the correlations are relatively said to be insignificant across the all -region based markets and KMI-30, which demonstrate relatively greater levels of returns in terms of interdependence. Hence, businesspersons have global-level horizons in portfolio diversification across the markets. However when we move forward to medium term stock holding periods, investors a different scenario is reflected from all above, which shows slightly more correlations of all four regional series with KMI-30 return series, hence reducing benefits of diversification to some extent for investors of Pakistan like Abbes and Trichilli (2015) found that the Islamic stock index has possible diversified returns in the short-term crisis period. Last but not least, as far as long-run holding periods are concerned, these comprise of 512 to onward holding periods, are highly significantly related to returns across entire markets, consequently mitigating any potential global portfolio diversification in all of these four regional markets DJIAM, DJIEU, DJIAP and DJIMENA. Overall, local investors can diversify their stock in following regions in order of preference as on priority basis in Asian Pacific region, then in MENA region and third preference for diversification could be European markets and finally last preference would be Americas region keeping in view “don’t put all eggs in one basket” to get the benefits of diversification keeping in view stock holding periods results derived

from Continuous wavelet transformation series (CWT) above more specifically. Comovements and relationship among Islamic returns of US and other partner countries named as: Mexico, Germany, Japan, China and Canada. For capturing diversification opportunities, three techniques of volatility and correlation, first one- GARCH- DCC, then for time scale interdependence used wavelet transmissions as CWT along with MODWT. Application of DCC has shown greater independence among US and its partner countries especially after 2018 till 2020. Further wavelets transmission results have enabled to identify that benefits can be availed by investing in Mexico and China but in specific horizons only and Mexico can provide for long run and China can give benefit of diversification in short run only (Jin, 2020).

Conclusions

The above study investigates the possible opportunities for the investors of Pakistan Islamic market in multiple dimensions and in various markets to maximize the benefits of divergence considering international regional markets and investment holding periods.

On the basis of diagnostic test, GARCH-DCC model has applied to capture the correlations which are time varying and moving continuously. Finding of study revealed that KMI-30 (PSX) indicates a significant and positive association with the DJIA, DJIEU, DJIAP, and DJIMENA due to correlation between two series for all regions. In a study, US Islamic returns have been studied by applying three models (GARCH CCC, DCC and BEKK) against five Islamic markets named as: Qatar, Indonesia, Turkey, Malaysia and Pakistan in order to find out the relationship in terms of conditional correlations and results have shown weak correlation of US Islamic returns with the emerging markets of the five **countries** (Majdoub & Mansour, 2014). The present study concludes that Pakistani investors should diversify their stocks in different markets rather to one and should prefer Asian Pacific region, then Americas markets, next to MENA market and least preference to the European market on the basis of results derived from GARCH-DCC application. This study also opens new doors for investors of other regions to for diversification from their local market to international markets.

The results are surprisingly consistent with previous evaluations of continuous wavelet transforms (Najeeb, Bacha, & Masih, 2015). Based on the discussion about might Islamic diversification argue that DM exhibits more dynamic horizons in republic-held portfolio shortened diversification, for short period? However, for long-term investment opportunities, it has been observed that the relationship between international markets returns and Pakistan market is so significant that it reduces any potential prospects for Pakistani investors with respect to portfolio diversification. Overall, Asian Pacific and MENA region present more dynamic opportunities for Pakistani entrepreneurs across the time series. Americas markets, on the other hand, offer opportunities for portfolio diversification may be least preference while taking into account holding periods. Very similar results were obtained from DCC-MGARCH Model and CWT analyses except for the Americas region which was not least preference in GARCH-DDC model. Furthermore, it is obvious that in the mid-term period after the outbreak of COVID-19, compared with the index return behavior after the collapse of Lehman Brothers in the global financial crisis of COVID-19, higher returns and lower volatility (Zaimovic & Dedovic, 2021).

Implications and limitations of the Study

This study has focused not only investment opportunities for local but international investors, regulators and fund managers with minimum risk profile because with passage of time both and Islamic and even non-Islamic countries also considering the development of

Islamic Financial Products in order to reduce risk factor and to attract investment from Islamic perspective as well. Hence, this study finds that causal connection between the different Sharia indices of different countries motivates portfolio managers to foresee Sharia-compliant funds in their portfolios and thus activates them to diversify their funds and provides an understanding of the Islamic International portfolio of diversification benefits change with various stock-holding time periods like short, medium, and long periods. Although the study attempted to find out the effect of the financial meltdown on the market of Sharia indices and others in COVID-19 of economies of the world. But there may be another reason which can influence the market integrations, like investor behavior, macro-economic variables, investment channels, and technology usage, etc. are not included in the present study.

References

- International Islamic Financial Market. (2010). *World Islamic Capital Markets, The State of the Islamic Capital Market and Future Prospects* (pp. 1-20). Bahrain: IIFM.
- Islamic Finance*. (2013, August 17). Retrieved 15 Sunday, 2017, from www.DowJones.com: file:///C:/Users/Sohail/Desktop/library%20thesis/dj...list%20of%20regionsDOW%20JONES%20ISLAMIC%20MARKET%20INDICES-%20SHARIAH%20SCREENING%20METHODOLOGY.html
- Regime-dependent relation between Islamic and conventional financial markets. (2018). *Borsa Istanbul Review*, 18(2), 114-121.
- Aarif, M. B., Rafiq, M. R., & Wahid, A. N. (2020). Do 'Shariah' indices surpass conventional indices? A study on Dhaka Stock Exchange. *International Journal of Islamic and Middle Eastern Finance and Management* .
- Abbes, M. B., & Trichilli, Y. (2015). Islamic stock markets and potential diversification benefits. *Borsa Istanbul Review*, 15(2), 93-105.
- Ahmed, N., & Farooq, O. (2017). Does the Degree of Shari'ah Compliance Affect the Volatility?: Evidence from the MENA Region. *Research in International Business and Finance*, 1-21.
- Ahmed, W. M. (2019). Islamic and conventional equity markets: Two sides of the same coin, or not? *The Quarterly Review of Economics and Finance*, 72, 191-205.
- Al Rahahleh, N., Akguc, S., & Abalala, T. (2021). Dow Jones Islamic Index firms: how profitable are they? *International Journal of Islamic and Middle Eastern Finance and Management*.
- Al Shugaa, A., & Masih, M. (2014). Uncertainty and Volatility in MENA Stock Markets During the Arab Spring.
- Alam, M. M., Akber, C. S., Shahriar, S. M., & Elahi, M. M. (2017, March 14). The Islamic Shariah principles for investment in stock market. *Qualitative Research in Financial Markets*, 9(2), 132-146.
- Ali, H., & Masih, M. (2016). Evidence of cross-country portfolio diversification benefits: The case of Saudi Arabia. 1-22.
- Alkhazali, O. M., & Zoubi, T. A. (2020). Gold and portfolio diversification: A stochastic dominance analysis of the Dow Jones Islamic indices. *Pacific-Basin Finance Journal*, 60, 1-15.
- Al-Khazali, O., & Mirzaei, A. (2017). Stock market anomalies, market efficiency and the adaptive market hypothesis: Evidence from Islamic stock indices. *Journal of International Financial Markets, Institutions and Money*, 51, 190-208.
- Al-Zoubi, A., H., & Maghyereh, A. I. (2007). THE RELATIVE RISK PERFORMANCE OF ISLAMIC FINANCE: A NEW GUIDE TO LESS RISKY INVESTMENTS. *International Journal of Theoretical and Applied Finance*, 10(2), 235-249.

- Amédée-Manesme, C.-O., Baroni, M., Barthélémy, F., & Mokrane, M. (2015). The impact of lease structures on the optimal holding period for a commercial real estate portfolio. *Journal of Property Investment & Finance*, 33(2), 121-139.
- Amyulianthy, R., & Ritonga, E. K. (2016). The Effect Of Economic Value Added And Earning Per Share To Stocks Return (Panel Data Approachment. *International Journal of Business and Management Invention*, 5(2), 08-15.
- Anwer, T., & Raza, M. Y. (2016). Economic integration of stock markets: An evidence from Pakistan, China and Malaysia stock exchanges. *Management and Organizational Studies*, 3(3), 2330-5495.
- Arfaoui, M., & Rejeb, A. B. (2020). Modeling the volatility of DJIM equity indices: a fundamental analysis using quantile regression. *International Journal of Islamic and Middle Eastern Finance and Management*.
- Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of econometrics*, 31(3), 307-327.
- Budiandru, B. (2021). ARCH and GARCH Models on the Indonesian Sharia Stock Index. *JURNAL AKUNTANSI DAN KEUANGAN ISLAM*, 9(1), 27-38.
- Buriev, A. A., & Masih, M. (2015). Impact of Arab uprising on Portfolio diversification benefits at different investment horizons for the Turkish investors in relation to the regional stock markets Multivariate GARCH-DCC and Wavelet coherence approaches.
- Chatti, M., Kablan, S., & Yousfi, O. (2013). Are Islamic Banks Sufficiently Diversified? An Empirical Analysis of Eight Islamic Banks in Malaysia. *Islamic Economic Studies*, 21(2), 23-54.
- Dajcman, S. (2012). The dynamics of return comovement and spillovers between the Czech and European stock markets in the period 1997-2010. *Finance a Uver*, 62(4).
- Dajcman, S., Festic, M., & Kavkler, A. (2012). European stock market comovement dynamics during some major financial market turmoils in the period 1997 to 2010—a comparative DCC-GARCH and wavelet *Applied Economics Letters*, 19(3), 1249-1256.
- Kamil, N., Bacha, O., & Masih, M. (2012). Do ‘sin stocks’ deprive Islamic stock portfolios of diversification? Some insights from the use of MGARCH-DCC. *Capital Markets Review*, 20(1), 1-20.
- Deep, F. I., (2021). *Conventional and Islamic Indices in Bangladesh: A Comparison on Performance and Volatility*. School of Business & Economics.
- EL Alaoui, A. O., Dewandaru, G., Rosly, S., & Masih, M. (2015). Linkages and co-movement between international stock market returns: Case of Dow Jones Islamic Dubai Financial Market index. *Journal of International Financial Markets, Institutions and Money*, 36, 53-70.
- Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the econometric society*, 987-1007.
- Farwa, U. (2006). *Pakistan as Asia’s Emerging Economy: Prospects, Limitations and Policy Options*. Islamabad: Institute Of Strategic Studies.
- Ferrer, R., Bolós, V. J., & Benítez, R. (2016). Interest rate changes and stock returns: A European multi-country study with wavelets. *International Review of Economics & Finance*, 1-12.
- Ghazali, M. F., Lean, H.-H., & Bahari, Z. (2013). Is gold a hedge or a safe haven? An empirical evidence of gold and stocks in Malaysia. *International Journal of Business and Society*, 14(3), 428 - 443.

- Grauer, R. R., & Hakansson, N. H. (1987). Gains from international diversification: 1968–85 returns on portfolios of stocks and bonds. *The Journal of Finance*, 42(3), 721-739.
- Grubel, H. G. (1968). Internationally diversified portfolios: welfare gains and capital flows. *The American Economic Review*, 1299-1314.
- Hakim, S., & Rashidian, M. (2002). Risk & Return of Islamic Stock Market Indexes. *9th Economic Research Forum Annual Conference in Sharjah*, (pp. 1-13). UAE.
- Hasan, S., Latif, H., & Al-Za'tari, U. (2017). *State of the Global Islamic Economy Report*. Dubai: Thomson Reuters.
- Hassan, A., & Mollah, S. (2018). Islamic Finance: A Global Alternative. In *Islamic Finance*. *Islamic Finance*, 19-30.
- Hayat, P., & Roman, K. (2011). Risk and Return characteristics of Islamic Equity Funds. *Emerging Markets Review*, 189-203.
- Hayat, R., & Kraeusl, R. (2011). Risk and return characteristics of Islamic equity funds. *Emerging Markets Review*, 12(2), 189-203.
- Ho, C. S., Rahman, N. A., MuhamadYusuf, N. H., & Zamzamin, Z. (2014). Performance of global Islamic versus conventional share indices. *International evidence. Pacific-Basin Finance Journal*, 28, 110-121.
- Hoque, H., Kabir, S. H., Abdelbari, E. K., & Manahov, V. (2016). Islamic and Conventional Equity Market Movements During and After the Financial Crisis: Evidence from the Newly Launched MSCI Indices. *Financial Markets, Institutions & Instruments*, 25(4), 217-252.
- Hussein, K. A. (2007). Islamic investment: evidence from Dow Jones and FTSE indices. *Islamic Economics and Finance*.
- Ilhan, B., & Masih, M. (2014). Do Portfolio Diversification Opportunities exist across the Euro Zone Islamic Equity Markets? MGARCH-DCC and Wavelet Correlation Analysis.
- Jin, L. S. (2020, october 1). Portfolio diversification opportunities for U.S. Islamic investors with its trading partners when the world catches a cold: A Multivariate GARCH and wavelet approach. *Munich Personal RePEc Archive*, pp. 1-29.
- Kafou, A., & CHAKIR, A. (2017). From Screening to Compliance Strategies: The Case of Islamic Stock Indices with Application on "MASI". *Islamic Economic Studies*, 25, 55-84.
- Kasi, U., & Muhammad, D. J. (2016). Strict and Uniform Shariah Screening Methodologies in Selected Asian Countries in Comparison with the United States. *Asian Journal of Finance & Accounting*, 8(1), 38-70.
- Kassim, N., Ramlee, R., & Kassim, S. (2017). Impact of Inclusion into and Exclusion from the Shariah Index on a Stock Price and Trading Volume: An Event Study Approach. *International Journal of Economics and Financial Issues*, 7(2), 40-51.
- Kok, S., Giorgioni, G., & Laws, J. (2009). Performance of Shariah-compliant indices in London and NY stock markets and their potential for diversification. *International Journal of Monetary Economics and Finance*, 2(3-4), 398-408.
- Lee, H.-S., Cheng, F.-F., & Chong, S.-C. (2016). Markowitz Portfolio Theory and Capital Asset Pricing Model forKuala Lumpur Stock Exchange: A Case Revisited. *International Journal of Economics and Financial*, 6(3), 59-65.
- Levy, H., & Sarnat, M. (1970). International Diversification of Investment Portfolios. *The American Economic Review*, 60(4), 668-675.
- Longin, F., & Solnik, B. (1995). Is the correlation in international equity returns constant: 1960–1990? *Journal of International Money and Finance*, 14(1), 3-26.
- Madaleno, M., & Pinho, C. (2012). International stock market indices comovements: a new look. *International Journal of Finance & Economics*, 17(1), 89-102.

- Maghyreh, A. I., Abdoh, H., & Awartani, B. (2019). Connectedness and hedging between gold and Islamic securities: A new evidence from time-frequency domain approaches. *Pacific-Basin Finance Journal*, 54, 13-28.
- Majdoub, J., & Mansour, W. (2014). Islamic equity market integration and volatility spillover between emerging and US stock markets. *The North American Journal of Economics and Finance*, 29, 452-470.
- Mansourfar, G., Didar, H., & Jodatnia, S. (2017). International Portfolio Diversification at Industry Level within South-East Asian Stock Markets. *Iranian Journal of Management Studies*, 10(1), 61-80.
- Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77-91.
- Mensi, W., Hammoudeh, S., Reboredo, J. C., & Nguyen, D. K. (2015). Are Sharia stocks, gold and U.S. Treasury hedges and/or safe havens for the oil-based GCC markets. *Emerging Markets Review*, 24, 101-121.
- Mumtaz, R., Usman, M., & Nasir, S. B. (2014). An Empirical Study of Risk-Return Profile of Islamic Mutual Funds: A Case from Pakistan. *European Journal of Business and Management*, 6(20), 156-167.
- Najeeb, S. F., Bacha, O., & Masih, M. (2015). Does heterogeneity in investment horizons affect portfolio diversification? Some insights using M-GARCH-DCC and wavelet correlation analysis. *Emerging Markets Finance and Trade*, 51(1), 188-208.
- Poretti, C., & Das, P. (2020). What explains differing holding periods across hotel investments? A hazard rate framework. *International journal of hospitality management*, 89.
- Rana, M. E., & Akhter, W. (2015). Performance of Islamic and conventional stock indices: empirical evidence from an emerging economy. *Financial Innovation*, 1(1), 1-17.
- Rejeb, A. B., & Arfaoui, M. (2019). Do Islamic stock indexes outperform conventional stock indexes? A state spacemodeling approach. *European Journal of Management and Business Economics*.
- Rizvi, S. A., & Arshad, S. (2018). Understanding time-varying systematic risks in Islamic and conventional sectoral indices. *Economic Modelling*, 70, 561-570.
- Saiti, B., Bacha, O. I., & Masih, M. (2014). The diversification benefits from Islamic investment during the financial turmoil: The case for the US-based equity investors. *Borsa Istanbul Review*, 14(4), 196-211.
- Shamsuddin, A. (2014). Are Dow Jones Islamic equity indices exposed to interest rate risk? *Economic Modelling*, 39, 273-281.
- Shoaib, M. (2015). *Awareness om islamic investment and capital markets*. Karachi: Al Meezan Investment Management Ltd.
- Tatiana, N., Igor, K., & Liliya, S. (2015). Principles and instruments of Islamic financial institutions. *Procedia Economics and Finance*, 24(1), 479-484.
- Tobin, J. (1958, February 1). Liquidity Preference as Behavior Towards Risk. *Review of Economic Studies*, 25(2), 65-86.
- Wälti, S. (2011). Stock market synchronization and monetary integration. *Journal of International Money and Finance*, 30(1), 96-110.
- Z, H. S., U, A. R., & M, R. (2012, September). Analysis of KMI-30 Islamic Market Index of Pakistan: Enter or Exit Decisions of Shariah Advisory Board. *International Poster Journal of Science and technology*, 2(2), 51-60.
- Zaimovic, A., & Dedovic, L. (2021). World Economy and Islamic Finance: Comparison of Government Policies during the Global Financial Crisis and the COVID-19 Crisis. *JKAU: Islamic Econ*, 34(1), 79-92 .