Resources Policy 66 (2020) 101638

Contents lists available at ScienceDirect

Resources Policy

journal homepage: http://www.elsevier.com/locate/resourpol

How oil prices, gold prices, uncertainty and risk impact Islamic and conventional stocks? Empirical evidence from QARDL technique

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ARTICLE INFO

Keywords:
Oil price
Global policy uncertainty
Geopolitical risk
Islamic stock market
QARDL

ABSTRACT

There are shreds of evidence of Islamic securities to behave differently from conventional ones, especially under the influence of certain factors such as oil, gold, economic policy uncertainty, and geopolitical risk. This paper has empirically evaluated such pieces of evidence through Quantile Autoregressive Distributed Lags Error Correction Model. Analysis has been performed on monthly returns from Dow Jones Islamic Market and Dow Jones Conventional Market Indexes for the sample period from January 1997 to July 2019. Results suggest that the Islamic stocks do behave differently from conventional stocks only for the long term in case of oil price influence under bullish market conditions; whereas, under bearish market conditions, economic policy uncertainty causes Islamic securities to behave differently. Hence, investment in Islamic stocks can be used for diversification of conventional securities' portfolio under specific conditions. For instance, under oil price changes Islamic and conventional securities can diversify risk in bullish market trends; such diversification can also be achieved in case of the bearish market trend under economic policy uncertainty shock. The results of this study are significant for policymakers and investors as this will provide a clear picture to the investors regarding their investment with respect to Islamic or conventional markets. A further new basis will be provided to both speculators and portfolio managers of Islamic and conventional markets.

1. Introduction

Diversification is the fundamental concept of portfolio management, and it is the key element in investment decision making. It is primarily a risk management tool, which induces investors to look for un-correlated securities or asset classes. Effective diversification of portfolio requires an understanding of long-term associations among the financial assets to mitigate the investment risk. Diversification can be performed at various levels from securities, companies, asset classes to geographical diversification at market or economy level. The advent of Islamic Finance has added a new dimension to the diversification. Investors and portfolio managers are very keen on adding Islamic products in their portfolio. Analysts and researchers are now focusing their studies on this whole new array of asset classes.

Islamic securities are important from the viewpoint of their behavior because it is usually reported that their sensitivity differs from conventional instruments (see Narayan and Phan, 2017; Rahim and Masih, 2016). Islamic Finance got significance as a separate asset class during the Subprime crisis or Global Financial Meltdown (see Chapra, 2011; Hasan and Dridi, 2010; Beck et al., 2010). Islamic financial market has achieved remarkable growth over the last decade, and it has been providing investors with an extensive range of investment opportunities. According to Rizvi et al. (2015), Islamic markets, which also include portfolios of markets have been resilient to the 2007 global financial meltdown. In fact, the 2007 crises compelled investors to search for newer investment opportunities; at that time, the Islamic financial system has become one of the substitutes for the drowned-in-losses conventional financial system. According to an estimation by IFSI,

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https://doi.org/10.1016/j.resourpol.2020.101638
Received 3 November 2019; Received in revised form 12 January 2020; Accepted 19 February 2020
Available online 2 April 2020

Table-1
Effects of changes in oil prices on stock returns.

Negative Effects	Positive Effects	No effect
Sadorsky (1999)	Zhu et al. (2011)	Apergis &Miller (2009)
Ciner (2001)	Li et al. (2012)	Hussin et al. (2012)
Ghouri (2006)		Narayan et al. (2019)
Miller and Ratti (2009)		

investment in Islamic securities amounts to USD 2.05 trillion in 2017. Additionally, multiple studies have suggested a 15%–20% growth rate of Islamic markets. Pew Research Center has forecasted that the global Muslim population will touch 1.9 billion in 2020, which represents around 24% of the total world population. Mentioning the facts of Muslim population doesn't mean that the market of Islamic finance is limited to the world only.

There are several rationales of the success of Islamic finance. Sharia-compliance element is one of them, which marks basic differentiation between Islamic and conventional securities. The two major prohibitions under Sharia-compliance are riba (interest) and gharar (speculation), which allow Islamic financial products to be less sensitive to interest rate and other market risks. One can say that Islamic finance is asset-driven, whereas Conventional finance is generally debt-oriented. Asset-driven financing obligates the creditor to share risk and reward, which results in lesser information asymmetry in Islamic financial institutions and markets. Narayan et al. (2019) have stated that, in Islamic markets, the possibility of not recognizing risk profiles of borrowers is quite low. The same approach of detailed screening is also performed in Islamic index composition; gambling-related stocks, alcohol-producing companies, and other non-sharia compliant securities are excluded from the index.

From the above discussion, it can be safely said that Islamic finance is more oriented towards the real economy. Another salient feature of Islamic securities is their origin; most of the Islamic securities are being issued in the Islamic world, which consists of relatively more uncertain zones as far as economy or economic policy and geopolitical dynamics are concerned. These premises motivate us to analysis Islamic securities vis-à-vis to conventional securities on the factors derived from the aforementioned context. Authors have selected oil prices to proximate real economy, gold prices for its significance as a hedging instrument, economic policy uncertainty (EPU), and geopolitical risk (GPR) to contextualize Islamic finance. This study analyzes the impact of these four factors on Islamic and conventional securities so that the possibility of diversification through Islamic financial instruments can be explored.

The motivation behind using the QARDL is to test the long-term association across the quantiles of dependent variables i.e. DJIM and DJCM along with the possible asymmetric relationship with the exogenous factors in consideration. Analysis of asymmetries is the main advantage of QARDL over linear ARDL (Xiao, 2009). Mishra et al. (2019), and Badeeb and Lean (2018) have found a nonlinear association between oil prices and Islamic stocks. The nonlinear association may be the outcome of the asymmetric relationship among the variables, which indicates the changing effects of regressors under different conditions of regressands (see Shahbaz et al., 2018). In this study, quantiles of indexes are clustered into three market trends namely bullish, sideways and bearish; asymmetries in association with oil prices, gold prices, EPU, and GPR, are analyzed with reference to aforementioned market trends. Besides locating asymmetries under different quantiles of Dow Jones Islamic Index and Dow Jones Conventional Index, QARDL is also handling not only the long-run association of oil prices, gold prices, EPU, and GPR, with indexes but also their short-run dynamics under different market trends as indicated by quantiles of indexes.

QARDL technique also addresses across quantile time-varying cointegration coefficient caused by exogenous shocks, which is another advantage of QARDL over nonlinear models; take Nonlinear Autoregressive Distributed Lag (NARDL) model, for example, the threshold is not data-driven rather it is arbitrarily set to zero, which means that the normality is imposed on data exogenously in NARDL (Shin et al., 2014). Considering the significance of Islamic securities as a separate asset class as well as tool for diversification vis-à-vis to the conventional securities, the analysis includes both the indices of Dow Jones; more specifically, Quantile Autoregressive Distributed Lags Error Correction Model (QARDLECM) has been used on Dow Jones Islamic Market (DJIM) and Dow Jones Conventional Market. This study will provide a clear picture to the investors regarding their investment options with respect to DJIM or DJCM. Summing up the arguments, QARDL techniques are more suitable to analyze nonlinear as well as asymmetric association between oil prices, gold prices, EPU, GPR, and stock indexes. To the best of researchers' knowledge, QARDLECM has not been tested simultaneously with respect to both DJIM and DJCM.

The results of this study are significant for policymakers and investors as this will provide a clear picture to the investors regarding their investment with respect to Islamic or conventional markets. A further new basis for diversification will also be provided to the portfolio managers of Islamic and conventional markets. The emergence of new avenues in Islamic finance based on the Sharia compliance framework and its decent performance during the global financial meltdown have attracted investors worldwide, which encouraged authors to include DJIM in analysis. The remaining paper is structured as follows: Summary of literature review is produced in the "Literature Review." The research approach and analysis technique are discussed in "Methodology'. Analysis of data and discussion is shown in "Results and Interpretation," whereas the concluding remarks and policy implications are shown "Conclusion".

2. Literature review

The role of oil is vital in driving the economy irrespective of the country's growth rate. Oil price change affects not only the real economy but the financial sector as well. Huang et al. (1996) have stated that because of the economic significance of oil, significant variations in oil prices have resulted in volatility in stock prices. Sarwat et al. (2019) have shown that the causality in the oil market moves from future prices to spot prices of oil. Arshad (2017) has found the simultaneous volatility in both oil price as well as Islamic stock markets is due to the dependence of Islamic stocks on the real economy. Oil price plays a major role as input cost for several industries; it also affects the cost of production indirectly for most of the companies. Discounted Cash Flow (DCF) method of stock valuation asserts that the stock prices reflect the present value of future cash flow, and the fluctuation in prices is transmitted in stock returns. Future cash flows are very much dependent on Input cost; thus, the oil price is the important determinant of stock returns. Based on this theoretical premise, oil would have a significant impact on both conventional and Islamic securities, but most of the empirical studies have indicated otherwise. Mohanty et al. (2011) have shown that the effect of oil price on stock returns of conventional and Islamic industry (in the same market) are different. Even the response of Islamic securities is not homogeneous on oil price change. Narayan et al. (2019) have found that out of 2178 global Islamic stocks, 68% have no effect due to oil price fluctuations, which means that the influence of oil shocks on Islamic securities is not similar across the market.

Mishra et al. (2019) also indicated the heterogeneity in the effect of global crude oil prices on the Islamic Stock Index. They concluded that oil price variations might have a positive influence on the Islamic stock index in the short run, but on achieving firmness, the oil prices have a negative impact on this index. Mishra et al. (2019), and Badeeb and Lean (2018) have found a nonlinear association between oil prices and Islamic stocks. The reason behind mixed findings of the influence of oil prices on Islamic stocks might be due to the fact that too much evidence on the impact of oil prices on Islamic stock is captured from conventional markets (Kang et al., 2015; Lambertides et al., 2017). The other reason for mixed findings is the presence of moderating factors, which

Table-2
Contingent effect of changes in oil prices on stock returns.

Contingent to:	Positive to Oil Export	Negative to Oil Import
Import or Export of Oil	Nandha and Faff (2008) Kilian and Park (2009) Güntner (2014)	Kilian and Park (2009) Cunado and de Gracia (2014)
Contingent to:	**Positive to Developed Economy**	**Negative to Emerging Economy**
Type of Economy		Basher and Sadorsky (2006) Hammoudeh and Choi (2007)

Note: Studies, cited in Tables 1 and 2, are different in terms of geographical coverage and methodology.

are altering the influences of oil price change on Islamic stocks. Those findings are tabulated below in Tables 1 and 2.

Ftiti and Hadhri (2019) have concluded that the lagged oil price could be utilized for the prediction of Islamic stock returns. There are several studies, which confirm the predicting power of oil prices to forecast returns of conventional stocks. Based on the existing literature and theoretical framework, authors have included crude oil prices for analyzing the returns of both conventional and Islamic securities in order to find out their behavior on oil price change along with the following three variables.

Valuable metals, especially gold has always been considered a safe haven for investors. In the long run, gold along with real estate prices can hedge inflation. Gold has special significance in Islamic finance as well; the Islamic financial system inspires pure gold standard at its ideal stage. Jain and Ghosh (2013) found that in the aftermath of the financial meltdown, precious metal markets, i.e. gold, silver, and palladium, etc. have attracted the attention of traders as a substitute tool, identical to the Islamic stock markets. Hillier et al. (2006) found that gold has a low association with security markets, which makes it far more appealing to the investors. Sensoy (2013) has highlighted the significance of precious metals (i.e. gold, silver, and platinum) as a diversification tool in the scenario of increasing uncertainty in financial markets.

Most of the existing literature comprises empirical methods that attempt to confirm the safe haven hypothesis for gold (Coudert and Raymond, 2011; Ghazali et al., 2013). McCown and Zimmerman (2006) have presented that on average, gold has the same margin as T bills; thus the market risk is nil. Baur and Lucey (2010) found gold as a safe haven for securities in the USA, UK, and Germany. Junttila et al. (2018) also supported safe-haven hypothesis of gold; Śmiech and Papież (2017) have found gold as weak hedge of equity; whereas Bekiros et al. (2017) have shown that diversifying potential of gold tends to decrease in the long-run, and they did not find gold as a safe haven and good hedge for stocks in the BRICS countries.

Baur and McDermott (2010) evaluated the position of gold in the worldwide financial system to examine the safe haven hypothesis. The result of their study suggests that the hypothesis is valid for US and European markets, but invalid for emerging markets. Ziaei (2012) investigated the association among the stock exchange markets in Malaysia, Indonesia, Philippines, Thailand, Singapore, South Korea, China, Japan, and gold prices. Results indicated a significant negative association between gold prices and the aforementioned markets. Arouri et al. (2015) analyzed the return volatility distributions between gold prices and the Chinese stock exchange from 2004 to 2011 and found the existence of volatility cross-effects. Tursoy and Faisal (2018) examined the short-run and long-run interaction between stock prices of Turkish stock markets, gold prices, and crude oil prices. Their study revealed that both short-run and long-run results confirm a negative association of stock prices with the gold prices, whereas a positive association between crude oil and stock prices.

Maghyereh et al. (2019) have studied the correlations of Islamic securities with gold, and their results suggested relatively lower correlations, which means gold is a good tool for diversification for Islamic securities. Tuna (2019) has concluded that gold persists to be an effective diversification tool in both Islamic share markets, as well as in traditional stock markets. Beckmann et al. (2015) adopted a novel approach to conduct their research; they included statistics from 18 countries and 5 regional indices. Their findings confirm that the gold acts as a safe haven and a hedging tool contingent on the precise economic environment under deliberation. Bredin et al. (2015) used a wavelet technique for analysis and discovered that the gold is a good hedge for a variety of global equity and debt markets over multiple time horizons that extend up to one year. Maghyereh et al. (2018) performed similar research on Sukuk and found diversification potential in gold for Islamic markets.

Future cash flows are also dependent on macroeconomic conditions, economic policies, and their implementation; thus, Discounted Cash Flow (DCF) approach has relevance with Economic Policy Uncertainty (EPU) as well. According to Pastor and Veronesi (2012), government policy uncertainty is the variance of policy change. Brogaard and Detzel (2015) have defined EPU as uncertainty in regulatory, fiscal or monetary policy. This uncertainty influences both economic and financial aspects and results in deteriorating macroeconomic indicators. Although the impact of EPU on macroeconomic variables has received considerable attention from researchers, the studies on the association between EPU and stock returns are few and far between. It is important from the viewpoint of investors as well, to study EPU as a predictor variable for returns of Islamic and conventional stock.

Some studies have shown the significance of EPU in forecasting the stock returns and markets' trends, but a large proportion of literature is focused on studying the impact of EPU on macroeconomic indicators. Studies, related to the effect of EPU on financial sector includes, impact of EPU on volatility of stock market (Liu and Zhang, 2015), corporate investment (Wang et al., 2014), commodity markets (Wang et al., 2015), and stock and bond market correlation (Li et al., 2015); whereas studies investigating effects on macroeconomic factors includes, impact of EPU on economic development (Scheffel, 2016), inflation and output (Jones and Olson, 2013), unemployment rate (Caggiano et al., 2017), exchange rate forecasting (Beckmann and Czudaj, 2017), and real housing yields (Christou et al., 2017), etc. However, according to Phan et al. (2018), there is a limited number of researches that emphasize the nexus between stock return and EPU.

Literature that examines the association between financial markets and EPU has shown mixed results as far as the direction of causation is concerned. For instance, Li et al. (2016) have shown that the stock market performance is negatively affected by EPU in the sense that uncertainty in economic policies causes participants to harbor pessimistic considerations about expected future dividends and/or discount rates, which may lead to a drop in share prices. Similarly, Pastor and Veronesi (2012), and Ozoguz (2008) have also revealed a negative association between EPU and stock returns. Whereas Brogaard and Detzel (2015) reported that EPU and return on stock are linked positively; however, the variation in EPU has a negative influence on stock returns. Regional studies on this association have shown mostly the negative relation between EPU and stock returns. Results of regional studies are summarized in Table 3:

In their reviews and analysis, business experts, media person, and financial analysts often mention Geopolitical risk (GPR) as an important

Table-3
Regional studies on the impact of EPU on stock returns.

Research Studies	Region	Direction of Relation
Bekiros et al., (2016)	USA	Negative
Demir and Ersan (2018)	Euro Zone	Negative
Li et al. (2016)	China	Negative
Bhagat et al. (2013)	India	Negative

factor that impacts businesses, but this factor has not received much attention from scholars and researchers. Caldara and Iacoviello (2018) define GPR as "the risk associated with wars, terrorist acts, and tensions between states that affect the normal and peaceful course of international relations." They have also developed an international GPR index by calculating the number of happenings in reports of the major international newspapers. The GPR index is a comprehensive scale and indicates an extensive array of extrinsic uncertainty that exists globally (Balcilar et al., 2018). An increasing level of geopolitical uncertainty usually results in diversion or delay of portfolio investment. In a survey carried out by Gallup in 2017, GPR was classified ahead of both economic and political uncertainty, which can be referred to as evidence of its increasing importance.

Geopolitical risk is a sort of systematic risk, which means non-diversifiable, thus should be compensated (Drakos, 2004). Studies on the effects of political stresses, and law and order situation on stock returns (especially of tourism business) are relatively limited (see, for example, Drakos, 2004; Chen, 2011; Zopiatis et al., 2019), which generally blamed terrorism for the poor performance of tourism stocks. There is a cascade effect of GPR on tourism stocks; uncertain conditions cause individuals to postpone their traveling (Demir and Gözgör, 2018), results in the cancelation of hotel bookings (Chen and Noriega, 2004). Samatas (2007) has argued that GPR gives rise to the cost of doing business for tourism corporations in terms of an increase in security costs and insurance premiums. Besides the direct and obvious impact on tourism stocks, GPR also affects various other industries and their stock returns.

Bahloul et al. (2017) have investigated the impact of regional and global uncertainty on Islamic and conventional securities in the USA and found insignificant relationships. Similarly, Bouras et al. (2019) have analyzed the global and country-specific role of GPR on the risk and return of stocks in 18 emerging economies. They used monthly data of risk and returned from 1998 to 2017 and found that the influence of country-specific GPR on return and volatility of the stock is statistically weak, whereas global GPR has a significant effect on risk and returns of emerging markets' stocks. The dominance of global GPR over domestic GPR was also found by few terrorist index-based studies, like Caladara and Iacoviello (2017), Balcilar et al. (2018), and Bouri et al. (2018). One can contend that the influence of GPR on investment decisions might be specifically critical in the nations where GPR is comparatively stronger and more persevering.

Bouri et at. (2019) have argued that GPR impacts the volatility of Islamic equity markets rather than their returns whereas GPR tends to predict both returns and volatility of the Islamic bonds market. Surprisingly, several organizations of countries in Southeast Asia that have the largest stake of Islamic financial resources have shown more stability during uncertain days of the market (Hasan and Dridi, 2010). Similar findings were also presented by Hkiri et al. (2017), and Abu-Alkheil et al. (2017). Their findings revealed that during the period of financial stress, Islamic indices perform better, and Islamic securities are considered as safe investments in comparison to conventional ones. On the other hand, Bouri et al. (2019) have argued that the Islamic securities are issued by the companies, operating in trouble zones; therefore, Islamic securities shall be affected by GPR.

3. Methodology

Owing to the mixed findings in literature, and nonlinear association between four global variables, i.e. oil prices, gold prices, EPU, and GPR on Dow Jones Conventional Market global as well as on Dow Jones Islamic Market (DJIM), the researchers have utilized QARDL model formulated by Cho et al. (2015). This model enables the testing of the quantile long-term equilibrium effect of oil prices, gold prices, EPU and GPR on stock prices. The QARDL is an advanced form of "ARDL model," through which asymmetries between oil prices, gold prices, EPU, GPR, and stock prices can be tested. The time-varying integration connection is also analyzed through the Wald test to check the steadiness of integrating coefficients throughout the quantiles. This will help in analyzing long and short-run symmetries. The basic form of ARDL is as under:

$$SP_t = \mu + \sum_{i=1}^{P} \partial_i SP_{t-i} + \sum_{i=0}^{q} \theta_i OP_{t-i} + \sum_{i=0}^{r} \kappa GP_{t-i} + \sum_{i=0}^{s} \omega_i EPU_{t-i} + \sum_{i=0}^{U} \psi_i GPR_{t-i} + \varepsilon_t \quad (1)$$

where ε_t represents the error term explained as $SP_t - \mathrm{E}[SP_t/\gamma_{t-1}]$ where γ_{t-1} being the smallest σ-field generated by $\{SP_t, OP_t, GP_t, EPU_t, GPR_t, SP_{t-1}, OP_{t-1}, GP_{t-1}, EPU_{t-1}, GPR_{t-1}\}$ and *p, q, r, s,* and *u* are lag orders according to the Schwarz information criteria (SIC). In equation (1), SP, OP, EPU, GP, and GPR are stock prices, oil prices, economic policy uncertainty, gold price, and global political risk.

The model shown in Equation (1) was extended by Cho et al. (2015) in the form of quantile and suggested the following QARDL(p,q,r,s,u) form:

$$Q_{SP_t} = \mu(\tau) + \sum_{i=1}^{P} \partial_i(\tau) SP_{t-i} + \sum_{i=0}^{q} \theta_i(\tau) OP_{t-i} + \sum_{i=0}^{r} \kappa(\tau) GP_{t-i} + \sum_{i=0}^{s} \omega_i(\tau) EPU_{t-i} + \sum_{i=0}^{U} \psi_i(\tau) GPR_{t-i} + \varepsilon_t(\tau) \quad (2)$$

where, $\varepsilon_t(\tau) = SP_t - Q_{SPt}(\tau/\delta_{t-1})$ (Kim and White, 2003) and $0 > \tau < 1$ is showing quantile. Due to the chances of serial correlation, the QARDL model shown in equation (2) is generalized as given below:

$$\begin{aligned} Q_{\Delta SPt} = {} & \mu + \rho SP_{t-1} + \phi_{OP} OP_{t-1} + \phi_{GP} GP_{t-1} + \phi_{EPU} EPU_{t-1} \\ & + \phi_{GPR} GPR_{t-1} + \sum_{i=1}^{P-1} \partial_i \Delta SP_{t-1} + \sum_{i=0}^{q-1} \theta_i \Delta OP_{t-1} \\ & + \sum_{i=0}^{r-1} \kappa_i \Delta GP_{t-1} + \sum_{i=0}^{s-1} \omega_i \Delta EPU_{t-1} + \sum_{i=0}^{U-1} \psi_i \Delta GPR_{t-1} + \varepsilon_t(\tau) \end{aligned} \quad (3)$$

The generalized reformulated version of equation (3) which shows the QARDL-ECM model is given below:

$$\begin{aligned} Q_{\Delta SPt} = {} & \mu(\tau) + \rho(\tau)(SP_{t-1} - \beta_{OP}(\tau) OP_{t-1} - \beta_{GP}(\tau) GP_{t-1} \\ & - \beta_{EPU}(\tau) EPU_{t-1} - \beta_{GPR}(\tau) GPR_{t-1}) + \sum_{i=1}^{P-1} \partial_i(\tau) \Delta\, SP_{t-1} \\ & + \sum_{i=0}^{q-1} \theta_i(\tau) \Delta OP_{t-1} + \sum_{i=0}^{r-1} \kappa_i(\tau) \Delta GP_{t-1} + \sum_{i=0}^{s-1} \omega_i(\tau) \Delta EPU_{t-1} \\ & + \sum_{i=0}^{U-1} \psi_i(\tau) \Delta GPR_{t-1} + \varepsilon_t(\tau) \end{aligned} \quad (4)$$

By utilizing the delta method, the cumulative short-run impact of previous stock prices on present stock prices is determined by:

$$\partial_* = \sum_{i-1}^{p-1} \partial \partial_j,$$

while the cumulative short term impact of the previous and current levels of OP, GP, EPU, and GPR are determined by:

$$\theta_* = \sum_{i-1}^{q-1} \partial \theta_j,$$

$\kappa_* = \sum_{i-1}^{r-1} \partial \kappa_j$, $\omega_* = \sum_{i-1}^{s-1} \partial \omega_j$ and $\psi_* = \sum_{i-1}^{u-1} \partial \psi_j$ respectively.

The parameter related to long-run for oil prices, gold prices, EPU, and GPR, is calculated as:

$$\beta_{OP*} = -\frac{\beta_{OP}}{\rho}, \quad \beta_{GP*} = -\frac{\beta_{GP}}{\rho}, \quad \beta_{EPU*} = -\frac{\beta_{EPU}}{\rho} \text{ and } \beta_{GPR*} = -\frac{\beta_{GPR}}{\rho}.$$

It shall be noted that the ECM parameter ρ should be significantly negative.

To examine the short and long-run asymmetric effect of oil prices, EPU, gold price and GPR on stock prices, the researchers have performed the Wald test in order to analyze the given below null hypotheses ρ_* parameter.

$$H_0: \ \rho_*(0.05) = \rho_*(0.1) = \rho_*(0.2) = \ \ldots\ldots\ = \rho_*(0.95)$$

contrary to an alternative one

$$H_1: \ \exists\, i \neq j/ \ \rho(i) \neq \rho(j)$$

4. Results and Interpretation

This research contains six variables, i.e. Dow jones Islamic stocks, Dow jones conventional stocks, oil prices, gold prices, GPR, and EPU. The collected data is on a monthly basis from January 1997 to July 2019. The data was extracted from the data stream managed by Thomson Reuters. The descriptive analysis of all variables is shown in Table-4.

Minimum, mean and maximum values of all the variables show positive results, i.e. DJIM (3.023-3.313-3.595), DJCM (2.786-3.080-3.407), OIL (1.053-1.684-2.127), GP (2.408-2.841-3.248), GPR (1.407-1.907-2.736) and EPU (1.707-2.030-2.494). The Jarque-Bera test has been used to validate the normality, and hence it is confirmed that all the null hypotheses for testing normality were rejected, which is a green signal for researchers to proceed towards QARDL analysis (see Shahbaz et al., 2018; Troster et al., 2018; Sharif et al., 2019a,b; Arain et al., 2019; Batool et al. 2019).

The unit root tests, i.e. Zivot and Andrews (1992) (ZA) and Augmented Dickey-Fuller (ADF), are applied, the results are stated in Table 5. The benefit of the ZA test is that it also accounts for structural breaks in the dataset. The outcomes of ZA and ADF confirm that at I (1) all the data is stationary either at a 5% or 10% significance level. The findings confirmed that all variables have a unique order of integration which is I(1).

The outcomes of QARDL for both types of securities are stated in Tables 6 and 7. For both types of securities, the value of ρ is negative, and the same was required. However, in the case of Islamic securities, it is significant at all the quantile levels, while for conventional ones, it is significant at quantile (0.30) along with quantiles at the middle to upper level, i.e. (0.60–0.95). Moreover, as far as long-term association is concerned between oil-Islamic stock prices and gold-Islamic stock prices, both are significantly associated with lower-middle quantile (i.e. 0.60) to higher quantile (i.e. 0.95). Additionally, gold prices are also significant at quantile (0.30). While the negative sign in the case of oil shows that under the bullish trend, as oil prices increase, prices of Islamic stocks decrease, whereas, in case of the gold, a positive sign shows that under both bullish and bearish market conditions, increase in gold prices will result in the increase in stock prices. GPR is significant at higher quantiles (i.e.0.8–0.95) and indicates that under the bullish market, the Islamic stock prices decrease with an increase in global GPR.

The same is the situation for EPU, but, at lower and lower-middle quantiles (i.e. 0.05–0.3), which means that, in bearish market conditions, an increase in policy uncertainty results in a decrease in Islamic stock prices. In the case of conventional stocks, β_{OP} is significant at higher quantiles (i.e. 0.80–0.95); whereas β_{GP} is also significant from the middle to higher quantiles (i.e. 0.50–0.95). A positive sign under both cases shows that under bullish market conditions increase in gold prices or oil prices will result in the increase in conventional stock prices. β_{GPR} is again significant at higher quantiles (i.e.0.8–0.95) as in the case of oil prices, but its negative sign shows that under bullish market, an increase in the GPR will decrease Islamic stock prices. β_{EPU} is significant and positive at lower quantiles (i.e.0.05–0.20), which means that when the market is bearish, increased uncertainty in economic policy will push the prices of conventional stocks upwards.

Shifting the paradigm of analysis towards the short-term scenario, the outcomes indicate that the price variations in Islamic stocks are significant and negatively associated with its own previous level only at lower quantile (0.10) i.e in bearish market conditions, the same behavior is observed in case of conventional stocks at higher quantile (0.95) i.e. in bullish market. Current and lagged changes in oil prices are positively and significantly associated with current changes in stock prices at low quantiles (bearish market) under both types of stocks. In the case of gold, current and lagged changes in gold prices are significant and inversely associated with current changes in Islamic stock prices. This situation exists only at one higher quantile (0.80) i.e. under bullish market trend. Current and lagged variations in GPR are significant but negatively associated with current changes in both types of stocks. In the case of Islamic stocks, this association is at higher quantiles (0.80–0.95) i.e. in the bullish market conditions, whereas, in conventional stocks, this association exists at lower quantiles (0.05–0.10) i.e. in bearish markets conditions. Further, a positive association can also be seen only at one lower quantile (0.20) i.e. under the bearish market trend. Lastly, current and lagged variations in EPU are significant but negatively associated with current Islamic stock prices at lower quantiles (0.05–0.10) i.e. when the market trend is bearish. In the case of conventional stocks, this negative and significant association can be seen at lag 1 at higher quantiles (0.80–0.95) i.e. under bullish market conditions.

Table 4
Results of descriptive statistics.

Variables	Mean	Min	Max	Std. Dev.	JB Test	P-Value
DJIM	3.313	3.023	3.595	0.139	17.892	0.000
DJCM	3.080	2.786	3.407	0.143	18.105	0.000
OIL	1.684	1.053	2.127	0.254	15.812	0.000
GP	2.841	2.408	3.248	0.287	30.736	0.000
GPR	1.907	1.407	2.736	0.245	11.020	0.004
EPU	2.030	1.707	2.494	0.175	9.598	0.008

Source: Authors' Estimation

Table-5
Results of Unit root test.

Variables	ADF (Level)	ADF (Δ)	ZA (Level)	Break Year	ZA (Δ)	Break Year
DJIM	−4.825	−17.821	−4.025	2000 M10	−5.583	2012 M04
DJCM	−3.543	−13.950	−6.438	2008 M09	−7.311	2015 M02
OIL	−1.971	−12.368	−3.221	2008 M11	−6.948	2014 M05
GP	−0.510	−11.703	−2.559	2001 M03	−6.448	2018 M10
GPR	−1.180	−15.507	−3.205	2008 M02	−7.311	2010 M01
EPU	−0.857	−15.460	−3.849	2005 M11	−5.984	2017 M01

Note: The values in the table specify the statistical values of the ADF and ZA test. The asterisk ***, **, and * represent the level of significance at 1%, 5%, and 10%, respectively.

4.1. Comparative analysis of Islamic & conventional securities from QARDL findings

Quite a few insights can be inferred from Table 8, which shows the summary of the comparison between Islamic & conventional securities in the long term as well as in the short term. First of all, the controlling variables have hardly any impact on Islamic as well as conventional securities during the sideways movement of financial markets (except the effect of gold price on conventional securities). This finding is also intuitively appealing, as a stagnant market with a lower level of activities is not expected to react on exogenous shocks. Let's see the above-

Table-6
Results of quantile autoregressive distributed lag (QARDL) for Islamic stock prices.

Quantiles (τ)	$\alpha_*(\tau)$	$\rho_*(\tau)$	$\beta_{OIL}(\tau)$	$\beta_{GP}(\tau)$	$\beta_{GPR}(\tau)$	$\beta_{EPU}(\tau)$	$\partial_1(\tau)$	$\theta_0(\tau)$	$\kappa_0(\tau)$	$\psi_0(\tau)$	$\omega_0(\tau)$	$\omega_1(\tau)$
0.05	0.048	−0.051***	−1.178	1.768	0.188	−0.817***	−0.15	0.154***	−0.191	0.01	−0.044***	0.003
	(0.10)	(0.01)	(1.23)	(1.48)	(0.21)	(0.19)	(0.16)	(0.05)	(0.23)	(0.23)	(0.01)	(0.04)
0.10	−0.017	−0.016***	−2.474	2.201	0.121	−1.152***	−0.312***	0.105***	−0.028	−0.018	−0.046***	−0.032
	(0.06)	(0.00)	(4.89)	(6.63)	(0.73)	(0.21)	(0.16)	(0.03)	(0.19)	(0.03)	(0.01)	(0.03)
0.20	0.018	−0.027***	−1.19	1.471	0.351	−0.935***	−0.102	0.034	0.073	−0.019	−0.016	−0.007
	(0.07)	(0.01)	(1.73)	(1.23)	(0.42)	(0.23)	(0.17)	(0.05)	(0.14)	(0.02)	(0.04)	(0.03)
0.30	0.072	−0.039***	−0.787	1.203***	0.461	−0.806***	−0.127	0.05	−0.05	−0.02	0.002	0.003
	(0.05)	(0.01)	(0.59)	(0.60)	(0.32)	(0.29)	(0.11)	(0.04)	(0.11)	(0.02)	(0.02)	(0.02)
0.40	0.045	−0.027***	−0.692	1.15	0.289	−0.485	0.061	0.041	−0.04	−0.006	0.018	0.008
	(0.04)	(0.01)	(0.60)	(0.79)	(0.30)	(0.76)	(0.09)	(0.04)	(0.10)	(0.01)	(0.03)	(0.02)
0.50	0.071	−0.030***	−0.782	1.057	0.252	−0.516	0.134	−0.013	−0.035	−0.007	0.021	0.007
	(0.05)	0.01	(0.65)	(0.79)	(0.24)	(0.64)	(0.10)	(0.04)	(0.10)	(0.01)	(0.03)	(0.02)
0.60	0.137***	−0.053***	−0.555***	0.824***	0.148	−0.394	0.027	0.013	−0.02	−0.009	0.024	0.014
	(0.05)	(0.01)	(0.30)	(0.29)	(0.14)	(0.31)	(0.08)	(0.03)	(0.09)	(0.01)	(0.03)	(0.02)
0.70	0.135***	−0.045***	−0.409***	0.551***	0.037	−0.182	0.069	0.02	−0.016	−0.007	0.023	0.015
	(0.03)	0.02	(0.23)	(0.22)	(0.11)	(0.33)	(0.08)	(0.04)	(0.12)	(0.01)	(0.02)	(0.02)
0.80	0.135***	−0.041***	−0.591***	0.675***	−0.173***	−0.143	−0.017	0.049	−0.060***	−0.007***	0.01	0.015
	(0.04)	0.02	(0.34)	(0.24)	(0.05)	(0.36)	(0.08)	(0.05)	(0.01)	(0.00)	(0.02)	(0.02)
0.90	0.151***	−0.041***	−0.676***	0.727***	−0.275***	−0.111	−0.118	0.086	−0.044	−0.007***	0.016	0.008
	(0.06)	0.01	(0.24)	(0.25)	(0.07)	(0.35)	(0.10)	(0.03)	(0.14)	(0.00)	(0.03)	(0.02)
0.95	0.116***	−0.028***	−0.463***	0.627***	−0.691***	0.693	−0.172	−0.08	−0.062	−0.007***	0.012	0.025
	(0.04)	0.01	(0.14)	(0.21)	(0.19)	(0.89)	(0.10)	(0.02)	(0.15)	(0.00)	(0.03)	(0.03)

Note: The table reports the quantile estimation results. The t-statistics are between brackets. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
Source: Authors' Estimations

Table-7
Results of quantile autoregressive distributed lag (QARDL) for conventional stock prices.

Quantiles (τ)	$\alpha_*(\tau)$	$\rho_*(\tau)$	$\beta_{OIL}(\tau)$	$\beta_{GP}(\tau)$	$\beta_{GPR}(\tau)$	$\beta_{EPU}(\tau)$	$\partial_1(\tau)$	$\theta_0(\tau)$	$\kappa_0(\tau)$	$\psi_0(\tau)$	$\omega_0(\tau)$	$\omega_1(\tau)$
0.05	−0.039	−0.032	1.137	1.635	0.148	0.150***	−0.208	0.183***	0.016	−0.250***	−0.006	−0.051
	(0.063)	(0.026)	(1.365)	(1.433)	(0.487)	(0.023)	(0.224)	(0.039)	(0.091)	(0.064)	(0.034)	(0.056)
0.10	−0.048	−0.009	3.151	2.725	−0.024	1.800***	−0.217	0.110***	−0.016	−0.208***	0.002	−0.090
	(0.045)	(0.024)	(9.261)	(6.722)	(1.156)	(0.022)	(0.173)	(0.036)	(0.076)	(0.060)	(0.023)	(0.058)
0.20	−0.015	−0.028	1.269	1.373	0.392	0.330***	−0.050	0.052***	0.025	0.239***	−0.023	−0.018
	(0.065)	(0.025)	(1.172)	(1.031)	(0.412)	(0.089)	(0.151)	(0.026)	(0.066)	(0.053)	(0.016)	(0.048)
0.30	0.022	−0.028***	0.866	1.300	0.476	−0.479	−0.064	0.052	0.009	−0.041	−0.012	−0.001
	(0.046)	(0.017)	(0.650)	(0.914)	(0.392)	(0.791)	(0.080)	(0.031)	(0.051)	(0.127)	(0.013)	(0.031)
0.40	0.016	−0.020	0.775	1.153	0.317	−0.146	0.044	0.046	0.018	−0.001	−0.007	−0.005
	(0.038)	(0.016)	(0.780)	(1.103)	(0.424)	(0.888)	(0.055)	(0.033)	(0.047)	(0.099)	(0.012)	(0.030)
0.50	0.030	−0.022	0.671	0.865***	0.285	0.029	0.137	−0.006	0.025	−0.014	−0.007	0.004
	(0.042)	(0.017)	(0.592)	(0.199)	(0.376)	(0.699)	(0.091)	(0.031)	(0.043)	(0.107)	(0.009)	(0.032)
0.60	0.073***	−0.029***	0.527	0.510***	0.150	−0.010	0.086	0.015	0.012	−0.002	−0.004	−0.001
	(0.037)	(0.016)	(0.497)	(0.160)	(0.258)	(0.315)	(0.104)	(0.031)	(0.049)	(0.088)	(0.009)	(0.021)
0.70	0.089***	−0.033***	0.488	0.577***	0.064	−0.072	0.075	0.013	0.022	−0.030	−0.005	0.012
	(0.023)	(0.012)	(0.376)	(0.129)	(0.251)	(0.292)	(0.093)	(0.032)	(0.039)	(0.091)	(0.007)	(0.018)
0.80	0.085***	−0.030***	0.436***	0.466***	−0.121***	0.230	−0.007	0.023	−0.005	−0.046	−0.003	−0.099***
	(0.027)	(0.012)	(0.141)	(0.113)	(0.031)	(0.337)	(0.058)	(0.049)	(0.038)	(0.104)	(0.009)	(0.017)
0.90	0.117***	−0.035***	0.448***	0.666***	−0.293***	0.173	−0.095	0.017	−0.010	−0.047	−0.001	−0.082***
	(0.030)	(0.015)	(0.134)	(0.110)	(0.048)	(0.314)	(0.066)	(0.047)	(0.038)	(0.134)	(0.007)	(0.021)
0.95	0.096	−0.033***	0.375***	0.960***	−1.859***	2.301	−0.186***	−0.025	0.001	0.062	−0.010	−0.163***
	(0.041)	(0.013)	(0.103)	(0.105)	(0.092)	(2.850)	(0.108)	(0.051)	(0.047)	(0.109)	(0.009)	(0.020)

Note: The table reports the quantile estimation results. The t-statistics are between brackets. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
Source: Authors' Estimations

tabulated comparison from another angle, the significant values for both the types of securities are concentrated in the extreme quantiles on both directions, which means that the market with strong sentiments or trends is likely to react more prominently in case of change in real economic indicators, such as geopolitical situation, and economic policy uncertainty. Secondly, the impact of independent variables on both types of securities is more evident in the long term than in the short term.

Coming to the behavior of Islamic securities vis-à-vis to conventional securities, there are several situations where both the securities are behaving differently. For instance, during the bullish trend and under the influence of oil price change, Islamic and conventional securities moved in the opposite direction in the long run. Mohanty et al. (2011) have also shown similar findings of contrasting movement of conventional and Islamic stock returns due to oil price changes. Inverse relation of oil with Islamic stocks was also found by Ciner (2001), Ghouri (2006), and Miller and Ratti (2009). Whereas, during the bearish trend and in the presence of economic policy uncertainty, Islamic and conventional securities again behaved differently in the long run. These results suggest that conventional and Islamic stocks can be used for the diversification of equity portfolios. Changes in gold prices are positively influencing Islamic and conventional securities in bearish as well as bullish trends of the financial markets. This finding confirms the argument of gold as a weak hedge of equity portfolio, presented by Śmiech

Table-8
Summary of Comparison between Islamic & Conventional Securities in a Long term as well as in Short term.

Market Conditions	Long term Effect							
	Oil Price		Gold Price		GPR		EPU	
	Islm	Con	Islm	Con	Islm	Con	Islm	Con
Highly Bearish Q = 0.05 - 0.20	–	–	–		–	–	Sig. -ve	Sig. +ve
Bearish Q = 0.30 - 0.40	–	–	Sig. +ve		–	–	Sig. -ve	–
Stagnant/Sideways Q = 0.50	–	–	–	Sig. +ve	–	–	–	–
Bullish Q = 0.60 - 0.70	Sig. -ve	–	Sig. +ve	Sig. +ve	–	–	–	–
Highly Bullish Q = 0.80 - 0.95	Sig. -ve	Sig. +ve	Sig. +ve	Sig. +ve	Sig. -ve	Sig. -ve	–	–
Market Conditions	**Short term Effect**							
Highly Bearish Q = 0.05 - 0.20	Sig. +ve	Sig. +ve	–	–	–	Sig. -ve	Sig. -ve	–
Bearish Q = 0.30 - 0.40	–		–	–	–	–	–	–
Stagnant/Sideways Q = 0.50	–		–	–		–	–	–
Bullish Q = 0.60 - 0.70	–		–	–	–	–	–	–
Highly Bullish Q = 0.80 - 0.95	–		Sig. -ve	–	Sig. -ve	–	–	–

Note: "**Islm**" represents the DJ Islamic stock market index whereas, "**Con**" represents the DJ conventional stock market index.

and Papież (2017) but it does not support the conclusion made Tuna (2019), and Maghyereh et al. (2019). As far as geopolitical risk is concerned, it is showing a negative impact in the bullish market for both types of securities, which is logically appealing as an increase in geopolitical risk should have deteriorating efforts on equity prices. This significant impact of GPR on stocks is confirmed by Demiralay & Kilincarslan (2019). Balcilar et al. (2018) found a nonuniform association between GPR and stocks in BRICS markets.

In the short term, there is no diversification opportunity as such between Islamic securities and conventional ones. The selected exogenous factors of this study are hardly affecting Islamic or conventional securities in the short run, and this is true for usual market conditions unless there are extremely bullish or bearish trends in the market. In a highly bearish market, the oil price is positively associated with both types of securities in the short term. Mishra et al. (2019) have presented a similar conclusion of the positive influence of oil price changes on the Islamic stock index in the short term. GPR is negatively effecting conventional securities, whereas EPU is negatively effecting Islamic securities. As far as the bullish trend is considered in the short term, gold prices have a negative relation with Islamic stocks, whereas GPR has a negative relationship with conventional securities. Summing up the results of short term analysis suggests that the diversification potential between Islamic and conventional stocks is diluted in the short run. This finding is similar to the conclusion as presented by Hammoudeh et al. (2014).

4.2. Analysis of asymmetric relation between variables and securities (Islamic & conventional)

After finding out the direction and significance of relationships through QARDL between exogenous variables, i.e. oil price, gold price, GPR and EPU, and prices of securities, i.e. Islamic and conventional, Wald test has been applied in order to check asymmetries in the relationship. In general, the Wald test doesn't have standard asymptotic distribution, but it allows detection of instability for both the intercept and coefficients. Identification of structural change with known as well as unknown breakpoints is another advantage of the Wald test. Findings of the Wald test for both types of securities viz. Islamic and conventional are presented in Table 9:

Table-9
Results of the Wald test for the constancy of parameters.

Variables	DJ Islamic Stock	DJ Conventional Stock
ρ*	8.283***	12.438***
	[0.000]	[0.000]
βOIL	5.342***	3.778***
	[0.000]	[0.000]
βGP	3.994***	5.338***
	[0.000]	[0.000]
βGPR	6.581***	15.932***
	[0.000]	[0.000]
βEPU	4.790*	2.140**
	[0.000]	[0.024]
∂1	1.740*	4.274***
	[0.075]	[0.000]
θ0	2.230**	1.231
	[0.018]	[0.475]
θ1	–	0.273
		[0.999]
κ0	4.146***	1.710*
	[0.000]	[0.082]
ψ0	4.302***	2.280**
	[0.000]	[0.016]
ω0	4.119***	3.201***
	[0.000]	[0.000]
ω1	0.911	–
	[0.524]	
Summative Short-term effect		
θ*	–	3.773***
		[0.000]
ω*	1.331	–
	[0.215]	

p-values with ***, ** & * indicate significance at 1%, 5% and 10% levels.
Source: Authors' Estimation

Findings of Wald test suggest that in the long run, there are asymmetric relations between each of the exogenous factors viz. oil price, gold price, GPR, and EPU with the prices of Islamic as well as conventional securities. These findings are indicated through the significance of all long term parameters for both types of securities. Although, EPU is significant at 90% and 95% level for Islamic and conventional stocks respectively, while the other three factors are significant at 99% level. Dependability of parameters for short term association is also rejected as most of the short term coefficients are significant for both types of securities. But, when the short term collective effect is analyzed, there is a change in the nature of the behavior of Islamic securities as compared to conventional ones. As indicated by the Wald test, the collective short term effect of variables is not asymmetrical on Islamic stocks, whereas there is an asymmetry in the relationships between conventional stocks and the variables of study on a collective basis as well.

5. Conclusion and policy implication

This paper has examined the quantile cointegration association between the constructs of oil prices, gold prices, EPU, and GPR with the stock prices as indexed by Dow Jones Islamic Market (DJIM) and Dow Jones Conventional Market. The selection of the constructs is based on their empirical significance as well as theoretical support from literature to influence the prices of stocks. Quantile Autoregressive Distributed Lags Error Correction Model (QARDLECM) has been applied to the monthly data from January 1997 to July 2019, which was extracted from the website of Thomson Reuters. The normality of data was checked but rejected by the Jarque-Bera test, hence allowed authors to apply the QARDL framework. Although QARDL is simply the extension of the classical least square estimate of conditional mean, it is robust to the presence of outliers. Quantile regression also allowed to analyze the behavior of Islamic and conventional stocks against the aforementioned

factors under different market conditions. Finally, asymmetric relationships have also been checked through the Wald test.

Considering Islamic securities as a different asset class from conventional stocks, authors have presented a comparative analysis of the temporal (contemporary as well as legging) impact of exogenous factors on both types of securities through QARDL. The analyses have captured the association under different market conditions, which will be helpful for investors and regulators in developing the panoramic view of the behavior of Islamic securities vis-à-vis to the conventional stocks. Results can be concluded as conventional and Islamic stocks can diversify each other in long run only; if market conditions are bullish, Islamic securities can diversify away oil price shock from the investment in conventional stock, and if market conditions are bearish, returns of Islamic securities can absorb the vibes of the changes in economic policy uncertainty as far as short term paradigm is considered, although the nature of the relationship of Islamic stocks and conventional stocks with the variable of the study is different (conventional securities have collective asymmetric short term association), but there is no evidence to support Islamic securities as a hedging instrument for conventional stocks in the short run. Nevertheless, there are minor diversification potentials for both types of securities with the gold price, GPR, and EPU in the short-run under different market conditions.

CRediT authorship contribution statement

Danish Iqbal Godil: Conceptualization, Writing - original draft. **Salman Sarwat:** Methodology, Writing - original draft. **Arshian Sharif:** Formal analysis, Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resourpol.2020.101638.

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