

SPECIAL ISSUE ARTICLE

Are Islamic investments still safe assets during the COVID-19 pandemic?

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Abstract

While looking for safe-haven assets, the literature obtained mixed and varying results, changing from one period to the next, or one geographical area to another. Recently, this field of research grew even more, motivated by the changing environment resulting from the global financial crisis and the current COVID-19 pandemic. We compare five Islamic and five conventional leading financial indexes for the period 2004–2020, covering both global and regional data (Asia-Pacific, Europe, GCC, and the United States). By employing DCC GARCH and extended GARCH (1,1) models, we find a lower volatility and higher persistence in Islamic indexes when compared to their conventional alternatives, holding also when traditional safe-haven assets are included in comparative terms and across geographical areas. We therefore provide robust evidence on the consistent behavior of Islamic assets: Their defensive properties remain and are even stronger in the current unprecedented and ongoing crisis.

KEYWORDS

COVID-19, dynamic conditional correlations, GARCH, global financial crisis, Islamic finance

JEL CLASSIFICATION

G01; G11; G15; D53

1 | INTRODUCTION

The identification of safe-haven assets, under different potential definitions (McCauley & McGuire, 2009), represents a long-dated research question applied to a number of investment classes, from stocks, bonds, and currencies, to gold, commodities, and Bitcoin, in advanced as well in emerging countries (f.i. Baur & Lucey, 2010; Baur and McDermott, 2010; Flavin et al., 2014; Fleming et al., 1998; Gürgün & Ünalımsı, 2014; Habib & Stracca, 2015; Hood & Malik, 2013; Kopyl & Lee, 2016; Lawrence, 2003; Rinaldo & Söderlind, 2010; Shahzad et al., 2019).

More recent contributions, in particular, are motivated by the global financial crisis (GFC): Traditional outcomes in the literature were questioned by unprecedented market conditions, above all the intervention of central banks pushing interest rates even beyond the zero-level bound for a long while.

A number of extremely recent papers, following this perspective, are exploring the new market conditions triggered by the COVID-19 emergency (Goodwell, 2020), testing the safe-haven properties of traditional (f.i. gold, commodities) and more exotic assets (f.i. crypto-assets), as well as economic and financial contagion effects across markets. The literature in this area is growing rapidly (f.i. Ashraf, 2020; Akhtaruzzaman et al., 2021; Conlon & McGee, 2020; Corbet, Hou, et al., 2020; Corbet, Larkin, et al., 2020; Ji et al., 2020; Ramelli & Wagner, 2020; Zhang et al., 2020).

Notwithstanding differences in research questions, samples, timeframes, datasets, and methodologies, the bottom line of this research stream points at the lack of a consistent safe haven across time and geographical areas. New crises or changing market conditions seem to question the very existence of a consistent safe asset, whereas hindsight may bias a non-negligible number of papers. We are motivated by this main research question: Does Islamic Finance show safe assets characteristics that persist both across the GFC and the COVID-19 pandemic period?

A substantial number of papers deal with similarities and differences between traditional and Islamic assets (Ahmed, 2019; Hkiri et al., 2017; Rizvi et al., 2015). However, to the best of our knowledge, no study exists on their long-term dynamic conditional correlations, including the GFC and the COVID-19 pandemic.

To fill this gap, we analyze daily data for five Islamic and five conventional leading financial indexes for the period 2004–2020 and across several geographical areas: World, Asia-Pacific, Europe, Gulf Cooperation Council countries (GCC), and the United States. We therefore differentiate from existing literature by investigating both an extensive global dataset and a substantially long time period.

Our methodological approach includes both a DCC GARCH and an extended GARCH (1,1) models, with robustness checks encompassing alternative model definitions and alternative indexes.

We find strong evidence of the risk-hedging properties of Islamic investments, even stronger during the COVID-19 pandemic and at the regional level, and above traditional safe-haven assets. This consistent behavior of Islamic assets may represent a direction worth the consideration of asset managers and institutional investors.

The remainder of the paper is organized as follows. In Section 2, we review the literature on the interconnectedness of Islamic and conventional financial markets, especially during crises, and describe our expected results. In Section 3, we illustrate the sample built for empirical testing, including its descriptive statistics. In Section 4, we detail our methodological approach, while in Section 5, we analyze our findings, with robustness checks summarized in Section 6. Finally, Section 7 concludes our paper.

2 | LITERATURE REVIEW

Financial markets have been increasingly intertwined by cross-border investments and lending for several decades. Such interconnectedness provides benefits to savers and borrowers, but also bears a dark side: Financial markets are more vulnerable to the transmission of shocks. This exposure to contagion eventually incentivizes portfolio managers to search for safe-haven investments.

In this regard, Islamic Finance emerged as an alternative to conventional systems with peculiar operating features: the mutual risk-sharing, the prohibition of interest-bearing transactions, and the avoidance of excessively speculative operations.

After the GFC, Islamic financial markets became increasingly researched to understand their risk-return characteristics (Ahmed, 2019; Al-Yahyaee et al., 2020; Hkiri et al., 2017; Majdoub et al., 2016; Nazlioglu et al., 2015; Shahzad et al., 2017; Umar & Suleman, 2017;), spillover and contagion effects (Majdoub & Sassi, 2017; Rizvi et al., 2015; Saiti et al., 2016) and dynamic linkages and co-movements between Islamic equity markets and their conventional counterparts (Alaoui et al., 2015; Dewandaru et al., 2014; Hammoudeh et al., 2014; Mensi et al., 2017).

Ahmed (2019) documents strong mean and volatility spillover effects from conventional equity markets to their Islamic counterparts, invalidating the dichotomous difference between traditional and Islamic capital markets. Similarly, Nazlioglu et al. (2015) investigate the volatility transmission and spillover dynamics between three conventional markets (the United States, Asia, and Europe) and the Dow Jones Islamic stock market along with oil prices, US monetary policy, uncertainty, and global financial risk factors. By applying the causality-in-variance test, they unveil the contagion effect between the aforementioned markets in all periods, with short-run volatility in the first period and long-run volatility in the second, albeit in Islamic equity markets it is driven by global financial risk factors across both periods. Shahzad et al. (2017) report similar findings. In contrast, Umar and Suleman (2017) and Hkiri et al. (2017) identify the decoupling of the Islamic stock market from its peers, suggesting the former to be a safe haven for investors, especially during bad times.

Using a dataset of 22 Islamic and conventional Dow Jones stock markets, Al-Yahyaee et al. (2020) analyze their risk-return characteristics during normal and economic turmoil times: They find that Islamic equity markets perform better in both circumstances. Nonetheless, co-movement differences are observed across sectors and frequencies. Moreover, portfolios based on both Islamic and conventional stocks of utilities and industrial sector firms reduce risks in terms of value at risk (VAR), while technologies, basic materials, consumer services, and aggregate equities offer lower diversification

during the whole sample period. In contrast, few studies find no differences in the risk-return features of Islamic and conventional stock markets (Abbes, 2012; Girard & Hassan, 2008).

Majdoub et al. (2016) discuss the integration of traditional and Islamic stock returns in France, Indonesia, the UK, and the United States from 2008 to 2013. They find that all countries show long-run relationships, except the UK. From the perspective of correlations, the Indonesian equity market shows poor linkages to developed markets for both traditional and Islamic stocks, indicating that investors should diversify their investments in both markets. Nevertheless, the Islamic index is closely related to its counterpart in each economy.

Majdoub and Sassi (2017) investigate the volatility spillover between the Islamic equity market of China, Thailand, India, Korea, Malaysia, and Indonesia. Their results reflect a significant positive and negative return spillover effect from China to all Asian economies, while the volatility spillover effect is bidirectional between China, Thailand, and Korea. In contrast, Saiti et al. (2016) report no evidence of contagion and spillover both in the subprime crisis of 2007–2009 and the collapse of Lehman Brothers in 2008. In related research, Arshad and Rizvi (2013) study the co-movements between financial markets and Islamic indexes of global, Asian, and emerging markets from 1997 to 2011, and reveal that Islamic stock markets are more stable and resistant to negative shocks.

Another stream of literature also shows that Islamic stocks are more profitable and efficient than their counterparts (Alam et al., 2016; Ashraf & Mohammad, 2014) and they remained profitable with safe-haven properties throughout the GFC-era (Hassan et al., 2019; Ho et al., 2014). Recent studies also demonstrate the safe-haven features of Islamic stocks during COVID-19 pandemic. Chowdhury et al. (2021) report the lower drawdown for Islamic stocks along with faster recovery during COVID-19. Further, Islamic stocks also provided global diversification benefits during the pandemic (Alqaralleh & Abuhommous, 2021). Nonetheless, a few studies also report that Islamic stocks are not immune to pandemic effects and do not reflect safe-haven features (Hasan et al., 2021; Arif et al., 2021).

A handful of studies investigate dynamic linkages and co-movements between Islamic and conventional equity markets. Rizvi et al. (2015) explore this topic for the United States and the Asia-Pacific through a wavelet decomposition approach, in order to unravel the multi-horizon existence of contagion. Their results show that global shocks were driven by the high level of linkages across markets, while Islamic stocks are the least exposed to contagion. Likewise, Mensi et al. (2017), Alaoui et al. (2015), and Dewandaru et al. (2014) report similar findings for Dow Jones Islamic and conventional sectoral indices, GCC markets, and equity markets of Asia-Pacific, U.K., the United States, and the Eurozone. In contrast to the aforementioned studies, Hammoudeh et al. (2014) empirically find a strong dependence of the global Islamic market index from its counterparts for the United States, Europe, and Asia; however, this dependence varies across time with some asymmetries between bear and bull markets.

The recent pandemic crisis brought economic systems worldwide under extreme pressure, regardless of countries, business models, and sectors. Despite the unprecedented global and local political, fiscal, and monetary responses, its impact will last for a long time, since the emergency phase is far from being over yet.

So far, studies in finance focused on the impact of the pandemic on stock markets (Ahmar & Boj del Val, 2020; Baker, Bloom, Davis, & Terry, 2020; Baker, Bloom, Davis, Kost, et al., 2020; Sharif et al., 2020; Wagner, 2020; Zaremba et al., 2020), spillover effects (Akhtaruzzaman et al., 2021; Corbet, Larkin, et al., 2020), stock market liquidity (Haroon & Rizvi, 2020), and contagion (Al-Awadhi et al., 2020; Baig et al., 2020). However, none of the aforementioned studies assessed the dynamic relations of the pandemic along with the GFC within Islamic stock markets. We aim at filling this gap and at understanding if the reaction differs in comparison with the GFC.

More specifically, we hypothesize that the structure and business models of Islamic equity markets are significantly different. Evidence shows that Islamic equity markets are more resilient (Rizvi et al., 2015) and profitable (Alam et al., 2016; Ashraf & Mohammad, 2014) during the GFC, while providing diversification benefits (Abu-Alkheil et al., 2017; Nagayev et al., 2016). Such behavior is so far attributed to the prohibition of interest-based activities (Hassan et al., 2019; Paltrinieri et al., 2020), that eventually reduces the strength of channels that might provide contagion effects (Gupta et al., 2014). The COVID-19 crisis, however, differs significantly from the GFC. In this case, there is little room for blaming lax regulation or supervisory intervention, or the greed of too-big-to-fail institutions resulting in excessively speculative and financially toxic activities (Crotty & Moshirian, 2011; Mishkin, 2011).

Therefore, we expect three main results: a lower volatility and higher persistency for Islamic indexes, holding both for the GFC and the COVID-19 pandemic across geographical areas, and stronger effects than shown by traditional safe havens, such as oil and gold.

3 | SAMPLE AND DESCRIPTIVE STATISTICS

We build our dataset by collecting daily data from Bloomberg Professional Services for the major Islamic and conventional financial indexes provided by Dow Jones (DJ), from January 2004 to August 2020 (the last data available at the time of this study). The selected indexes are related to the following geographical areas: World, Asia-Pacific, Europe (EU), Gulf Cooperation Council countries (GCC, covering Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), and the United States (US). Further details are disclosed in [Table 1](#).

Then, we computed the daily return of the selected indexes as follows:

$$R_d = \ln \frac{P_d}{P_{d-1}} \quad (1)$$

where R_d is the return for day d , and P_d is the price. As in Scip et al. (2016), we use daily returns in order to capture all possible interactions, unlike weekly or monthly frequencies would allow. All data are obtained from Bloomberg Professional Services.

In order to test our hypotheses, we consider a very long sample period (from January 2004 to August 2020) that allows us to include both the GFC of 2008 and the recent COVID-19 pandemic period.

In [Figure A1](#) in the Appendix, we plot daily prices and returns of all DJ conventional and Islamic selected indexes used in our analysis over the period January 2004–August 2020. The two series denote a spike in prices and returns during both the GFC crisis and the COVID-19 pandemic eruption for all indexes, as expected (Corbet, Larkin, et al., 2020 and Onali, 2020).

[Table 2](#) presents descriptive statistics for all selected indexes. We observe that mean daily returns are always positive. Similarly, both Islamic and conventional indexes exhibit a left skewness, while Islamic indexes always show a higher average return if compared to their conventional counterparts. Finally, looking at the kurtosis, we notice high values, confirming that returns present some extreme values. This evidence is confirmed by the Shapiro–Wilk test for normality (S-W test), which rejects the null hypothesis of normality for the distributions of returns.

Aiming at further analyzing the relationships existing across indexes, in [Table 3](#) we show unconditional correlations between conventional and Islamic indexes. As expected, all are positively correlated, indicating a preliminary high unconditional correlation between all regional Islamic and conventional financial markets.

4 | ECONOMETRIC METHODOLOGY

We employ a two-step statistical methodology. In the spirit of the literature (Al-Yahyaee et al., 2020; Corbet, Larkin, et al., 2020; Paltrinieri et al., 2018), we firstly build a multivariate GARCH model, where volatilities and correlations are related to past returns. As stated by recent contributions (Al-Yahyaee et al., 2020; Corbet, Larkin, et al., 2020; Paltrinieri et al., 2018), the GARCH model is the most suitable to measure correlations and to capture their dynamics in lack of a normal

TABLE 1 Selected leading conventional and Islamic indexes

Conventional index	Ticker	Islamic index	Ticker
Dow Jones Global Index (DJ World conventional)	W1DOW	Dow Jones Islamic Market World Index (DJ World Islamic)	DJIM
Dow Jones Asia-Pacific region (DJ Asia conventional)	P1DOW	Dow Jones Islamic Market Asia-Pacific (DJ Asia Islamic)	DJIAP
Dow Jones Europe Index (DJ EU conventional)	E1DOW	Dow Jones Islamic Market Europe (DJ EU Islamic)	DJIEU
Dow Jones GCC (DJ GCC conventional)	DJGCC	Dow Jones Islamic Market GCC (DJ GCC Islamic)	DJIGCC
Dow Jones US Index (DJ US conventional)	DJUS	Dow Jones Islamic Market US index (DJ US Islamic)	IMUS

Note: This table reports the names and the relative tickers of the major conventional and Islamic indexes provided by Dow Jones (DJ) and collected by Bloomberg database relative to the following geographic areas: World, Asia-Pacific, Europe (EU), the Gulf Cooperation Council (GCC) region, and the United States (US). The Gulf Cooperation Council (GCC) region covers Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates.

TABLE 2 Summary statistics of selected conventional and Islamic indexes

Index	N. of obs.	Mean	SD	Min	Max	Skewness	Kurtosis	S-W test
DJ World conventional	4345	0.024	0.999	-9.488	9.049	-0.623	15.995	0.867***
DJI World Islamic	4345	0.032	1.002	-9.188	1.026	-0.469	16.412	0.870***
DJ Asia conventional	4345	0.021	1.091	-9.010	9.426	-0.372	10.592	0.920***
DJ Asia Islamic	4345	0.028	1.085	-9.233	1.017	-0.378	10.614	0.928***
DJ EU conventional	4345	0.019	1.337	-1.305	1.108	-0.205	13.340	0.897***
DJ EU Islamic	4345	0.028	1.280	-1.111	1.213	-0.000	13.902	0.900***
DJ GCC conventional	4345	0.017	1.098	-1.507	9.836	-1.900	27.230	0.740***
DJ GCC Islamic	4345	0.020	1.231	-1.431	1.416	-1.420	27.245	0.722***
DJ US conventional	4345	0.034	1.214	-1.227	1.152	-0.330	17.509	0.847***
DJ US Islamic	4345	0.039	1.178	-1.000	1.245	-0.137	17.923	0.862***

Note: This table illustrates descriptive statistics and normality test (Shapiro-Wilk test, S-W test) for daily returns of the Dow Jones (DJ) conventional and Islamic indexes used in our analysis over the period January 2004–August 2020. Index definitions are provided in Table 1.

TABLE 3 Unconditional correlations between selected conventional and Islamic indexes

Index	1	2	3	4	5	6	7	8	9	10
1 DJ World conventional	1									
2 DJ World Islamic	0.981	1								
3 DJ Asia conventional	0.457	0.390	1							
4 DJ Asia Islamic	0.572	0.515	0.863	1						
5 DJ EU conventional	0.850	0.801	0.411	0.500	1					
6 DJ EU Islamic	0.825	0.797	0.405	0.496	0.977	1				
7 DJ GCC conventional	0.228	0.204	0.180	0.251	0.208	0.186	1			
8 DJ GCC Islamic	0.210	0.189	0.162	0.225	0.189	0.168	0.976	1		
9 DJ US conventional	0.881	0.907	0.139	0.234	0.582	0.555	0.136	0.130	1	
10 DJ US Islamic	0.872	0.922	0.143	0.242	0.573	0.557	0.133	0.128	0.984	1

Note: This table reports unconditional correlations of daily returns between the Dow Jones (DJ) conventional and Islamic indexes used in our analysis over the period January 2004–August 2020. Index definitions are provided in Table 1.

distribution of returns. Moreover, we follow Engle and Sheppard (2005), adopting a Dynamic Conditional Correlation (DCC) methodology, able to offer the best performance among those applicable to large panel models.

Therefore, the DCC GARCH model can be specified as follows:

$$\varepsilon_t = \sigma_t \eta_t, \quad (2)$$

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_{0j} h_{t-j}, \quad (3)$$

where σ_t^2 is the univariate GARCH model, α_0 and β_0 represent non-negative constant terms, ω is a strictly positive constant, ε_t are the innovations, and η_t represents the standardized residuals. Finally, the DCC parameters are estimated by a quasi-maximum likelihood approach.

As a second methodological step, we use the extended version of GARCH (1,1), as in Judge et al. (1985) and Onali (2020), to investigate daily returns and conditional heteroskedasticity (*Het*) between selected Islamic and conventional financial market indexes during both the entire sample period (from January 2004 to August 2020) and the two following significant sub-periods: the GFC period (from January 2008 to December 2009, as in Lins et al., 2017); and the COVID-19

pandemic period (from December 31, 2019 to August 2020, as in Corbet, Larkin, et al., 2020, and starting with the announcement of the new pneumonia detected in Wuhan, China).

We then investigate the dynamic correlation between our Islamic and conventional indexes, using the GARCH (1,1) model of Bollerslev (1986), as summarized in the following specification for the conditional mean and variance equations:

$$Y_d = \alpha_0 + \beta_1 \text{IslamicIndex}_d + \beta_2 X_d + \varepsilon_d \quad (4)$$

$$\sigma_d^2 = \exp(\lambda_0 + \lambda \text{IslamicIndex}_d) + \gamma_0 \varepsilon_{d-1} + \gamma_1 \sigma_d^2 \quad (5)$$

where Y_d is the first difference of prices (in logs) of the conventional indexes at day d , ε_d are the innovations and σ_d^2 is the conditional variance. IslamicIndex is the variable representing each distinct Dow Jones (DJ) Islamic index used in our analysis (Table 1), while X_d is a vector of WTI and Gold indexes, both collected from Bloomberg Professional Services.

Most importantly, we employ the extended common GARCH (1,1) model with a multiplicative heteroscedasticity component, as a proxy of volatility (Judge et al., 1985; Onali, 2020), to capture the impact of Islamic indexes on returns and volatility of each respective conventional index. This second procedure allows us to split the sample into three different periods (the whole sample period, the GFC years, and the COVID-19 pandemic period) testing the risk-hedging properties of Islamic indexes compared to traditional safe havens, such as WTI and Gold.

5 | EMPIRICAL RESULTS

5.1 | The multivariate DCC GARCH model

The first step of our econometric strategy consists of a multivariate DCC GARCH model to investigate volatility linkages between Islamic and conventional financial indexes. Table 4 summarizes the information resulting from the DCC GARCH model and the estimated parameters. In particular, we focus on the α (ARCH) and β (GARCH) parameters, where the former shows how a volatility shock today affects the next period's volatility, while the sum of $\alpha + \beta$ reveals the rate at which this event continues over the time period.

We observe a lower α value for each of the Islamic indexes compared to their conventional counterpart, indicating their remarkably lower volatility. Consistently, considering its combination with β , we obtain a slightly higher persistence in the conditional volatility, except for the DJ GCC Islamic index.

Table 5 reports the basic correlation across pairs of conventional and Islamic indexes, both at the global (World) and at the regional (Asia-Pacific, Europe, GCC, and the United States) levels. In the spirit of previous research (Paltrinieri et al., 2018), we report quasi-correlations across selected indexes, together with their Λ adjustment. Table 5 shows the

TABLE 4 DCC GARCH Model

Index	ω	α	β
DJ World conventional	.060***	.095***	.889***
DJ World Islamic	.066***	.092***	.890***
DJ Asia conventional	.048***	.086***	.893***
DJ Asia Islamic	.050***	.085***	.895***
DJ EU conventional	.057***	.080***	.903***
DJ EU Islamic	.062***	.073***	.909***
DJ GCC conventional	.070***	.068***	.923***
DJ GCC Islamic	.074***	.068***	.921***
DJ US conventional	.066***	.087***	.895***
DJ US Islamic	.069***	.085***	.896***

Note: This table reports parameters and log-likelihood values for the two asymmetric DCC GARCH models during the whole period of analysis (January 2004–August 2020). Index definitions are provided in Table 1. The ω , α , and β represent the constant, the ARCH and GARCH terms, respectively. Significance codes: *** express significance at the 0.999 level, ** at .99, * at .95.

TABLE 5 DCC GARCH results

Correlation	World	Asia-Pacific	Europe	GCC	US
C-I	0.980***	0.910***	0.970***	0.970***	0.980***
Adjustments:					
Lambda 1	0.058***	0.080***	0.047***	0.033***	0.049***
Lambda 2	0.540***	0.913***	0.927***	0.945***	0.931***

Note: This table reports the dynamic conditional correlation (DCC) between the Dow Jones (DJ) conventional (C) and Islamic (I) indexes used in our analysis during the whole period considered (January 2004–August 2020). Index definitions are provided in TABLE 1. Significance codes: “***” express significance at the .99 level, “**” at .95, “*” at .90.

ARCH test statistics confirming a statistically significant heteroscedasticity, allowing us to conclude that a GARCH (1,1) model perfectly fits the conditional variance distribution of the DCC series.

Consistent with previous contributions (Hkiri et al., 2017; Paltrinieri et al., 2018; Sclip et al., 2016), we predict pairs of conditional variances between Islamic and conventional indexes both at regional and global levels.

In Figure 1, where we plot the volatility of each index during the GFC and COVID-19 crises, we show how conditional variances differ. For example, looking at the DJ World conventional and DJ World Islamic indexes, we find a lower volatility for the latter during both crises. As stressed in previous research (Paltrinieri et al., 2018), we observe a spike in conditional covariances in late 2008 (September) and at the beginning of 2020 (February), which correspond to the days of greater turmoil for each crisis. Moreover, during the COVID-19 shock, we see the higher difference in conditional variances, suggesting the presence of risk-hedging properties of Islamic investments.

This trend strongly emerges in regional indexes: Conditional variances of Islamic indexes are significantly lower than their conventional counterpart, again mainly in the COVID-19 period. Despite these differences are confirmed also for the GCC and US regions, they are less pronounced.

Overall, our results are consistent with earlier findings. Islamic equity markets are more stable, less volatile and offer diversification opportunities with safe-haven features, especially during crises (Hkiri et al., 2017; Ho et al., 2014; Rizvi et al., 2015). The main reasons for this behavior are usually found in two features of Islamic investments. Firstly, *Sharia* screenings exclude firms with leverage ratios above 33%: This leads to a greater resilience to absorb negative shocks. Secondly, the GFC was exacerbated by an overlooked accumulation of risks in financial institutions through the use of derivatives and structured products, such as credit derivative swaps (CDSs) and collateralized debt obligations (CDOs). Islamic indexes do not include mainstream financial institutions (Rizvi et al., 2015), while *Sharia* principles prohibit instruments with excessive risks, such as derivatives: These factors contribute to limiting their fragility in bad times.

5.2 | The extended version of GARCH (1,1)

As a second step in our analysis, we further investigate our data through an extended version of GARCH (1,1), with a multiplicative heteroscedasticity component as a proxy of volatility (Judge et al., 1985; Onali, 2020).

More precisely, this method allows us to estimate the risk-hedging properties of Islamic indexes compared to traditional safe-haven assets, such as oil and gold (Corbet, Larkin, et al., 2020), during the whole sample period, as well as focusing on the GFC and the COVID-19 pandemic periods. Additionally, it allows an economic interpretation of the coefficients of interest by showing the magnitude of potential hedging effects of Islamic indexes.

Table 6 provides the related results. We observe a statistically significant correlation between Islamic and conventional indexes in terms of returns (positive) and volatility (negative). This trend is consistent for all five selected Islamic indexes during the whole period.

While the stronger effect on volatility emerges for the DJ Asia Islamic (Asia region: -1.370^{***}), we notice a quietly slow positive correlation during the GFC period (0.208^*). In other words, it shows that an increase of 1% in the return of the Islamic index in Asia is associated with a reduction of 1.37% in the related conventional index. For all other indexes, we notice only risk-reduction benefits during the COVID-19 pandemic period, as well as a strong negative and statistically significant correlation for the DJ GCC Islamic (GCC region) also during the GFC crisis (-0.290^{***}).

This evidence is robust to the inclusion of oil (WTI, West Texas Intermediate) and gold as safe-haven assets and potentially alternative risk hedges. If we look at control coefficients, we observe that oil and gold offered hedging opportunities

only during the GFC period. Only for world indexes (Panel A of Table 6), gold seems to maintain some risk-hedging properties.

6 | ROBUSTNESS CHECKS

In this section, we run a set of robustness checks to strengthen the validity of our results. Firstly, we re-run our baseline approach by employing the GJR—GARCH model of Glosten et al. (1993) under dynamic conditional correlation

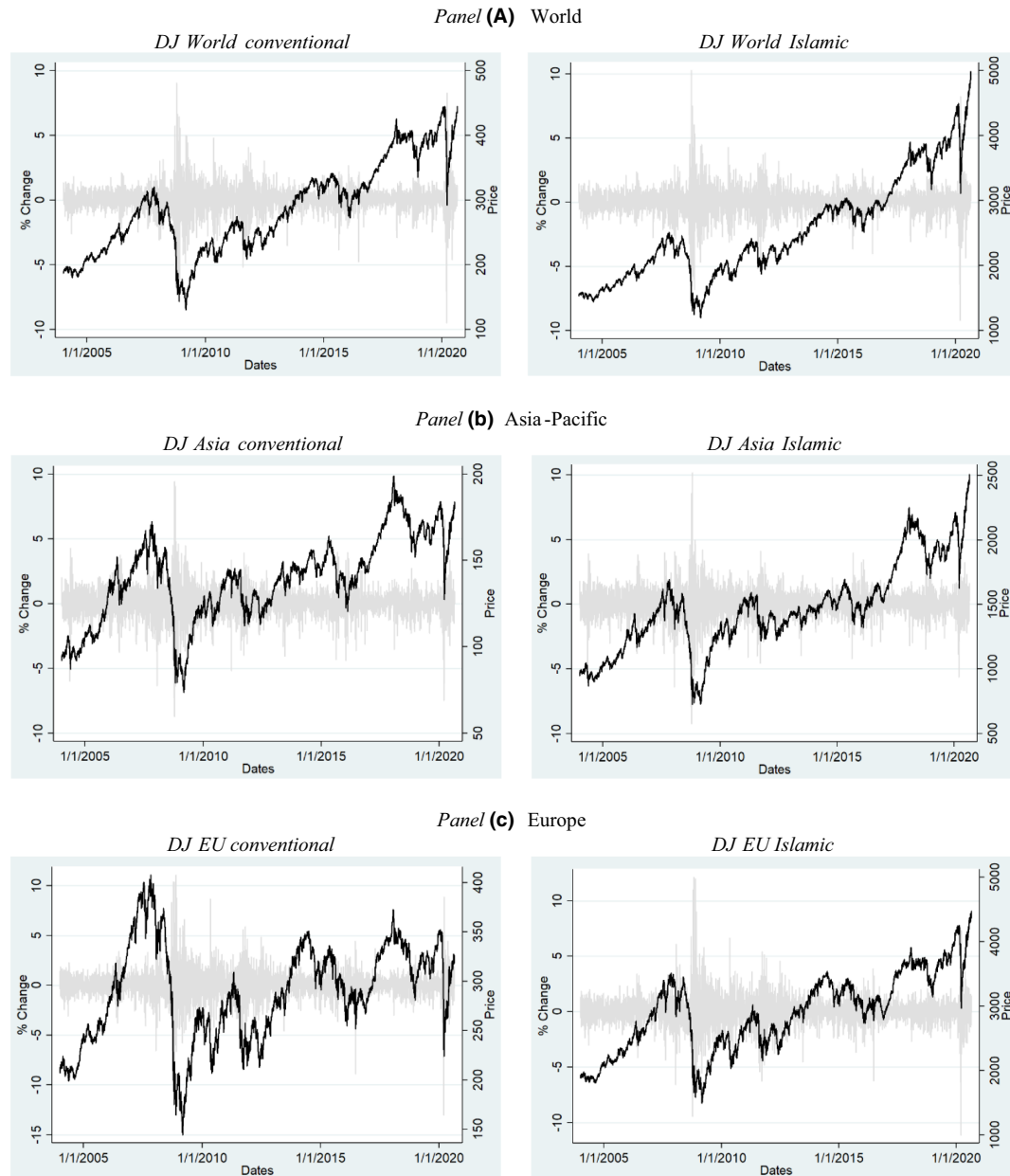


FIGURE 1 Conventional and Islamic indexes volatility during the GFC and the COVID-19 pandemic. This figure provides a comparison of volatility for the Dow Jones (DJ) conventional and Islamic indexes used in our analysis between the global financial crisis (left) and the COVID-19 pandemic period (right). The two periods are representative of the GFC (from January 2008 to December 2009—as in Lins et al., 2017) and the COVID-19 pandemic period (from December 31, 2019 to August 2020—as in Corbet, Larkin, et al., 2020). Each panel focuses on a geographical area (World, Asia-Pacific, Europe, GCC, and the United States). Data are provided by Dow Jones (DJ) and collected by Bloomberg database. Index definitions are provided in Table 1

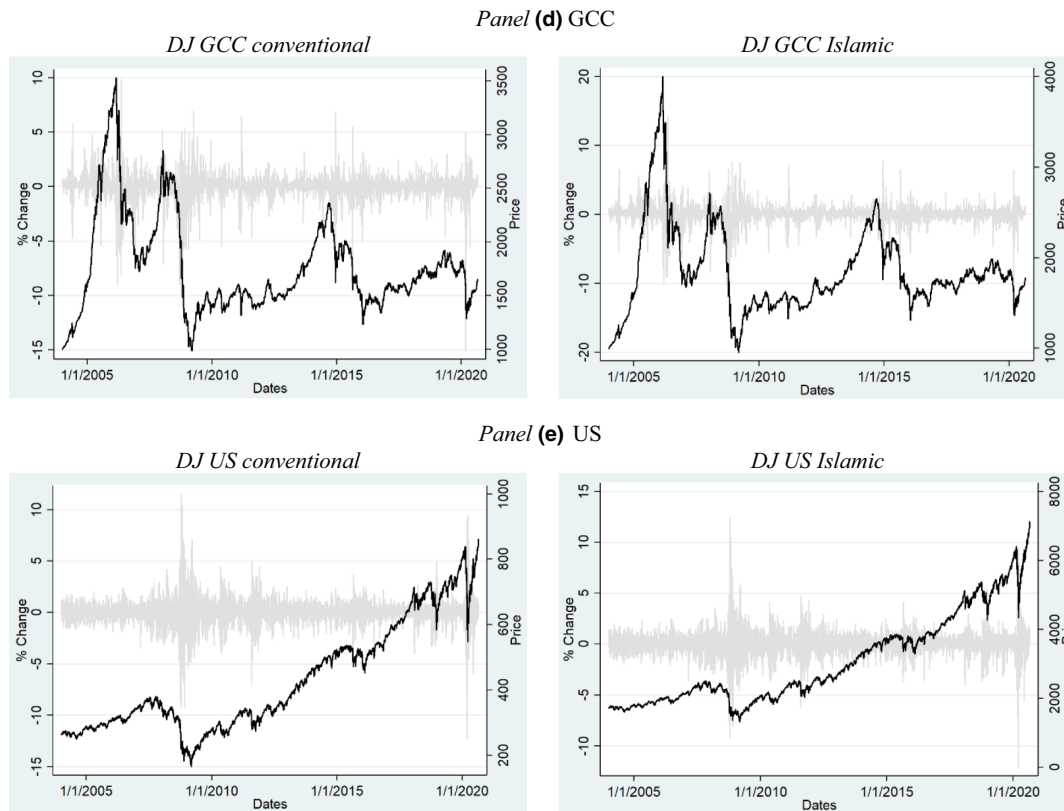


FIGURE 1 (Continued)

(DCC), for the selected conventional and Islamic indexes and the whole period of analysis (January 2004–August 2020).

According to recent literature on financial properties of Islamic indexes (Aloui et al., 2020), this approach is robust to model the asymmetries of financial assets, non-linear volatilities, and correlations (Guesmi et al., 2019). Our results are provided in Table 7. We observe again a lower volatility (γ term) for each of the Islamic indexes if compared to their conventional counterparts, confirming their greater resilience to shocks.

Secondly, we run again our baseline DCC GARCH model by investigating two alternative conventional and Islamic indexes for the whole period of analysis: the S&P 500 (ticker: SPX) and the S&P 500 Shariah indexes (ticker: SHX), as well as the DJ Emerging Markets (ticker: W5DOW) and the DJ Islamic Emerging Markets indexes (ticker: DJIEMG).

The selection of these two alternatives allows us to further address the robustness of our baseline findings both at the global (S&P 500) and regional (DJ Emerging markets) levels. Results, provided in Table 8, document a lower volatility (α term) for Islamic indexes once more.

7 | CONCLUSIONS

A substantial amount of research explores the safe-haven features of different asset classes across geographical areas and in distinct time periods. The GFC originated a number of additional contributions to this field, motivated by the exceptional market conditions characterizing the last decade. More recently, the COVID-19 pandemic renewed the interest on this stream, suggesting that previous findings may be questioned under the current unprecedented economic and financial turmoil. Among assets showing resilience during the GFC, Islamic investments are a currently underexplored category, despite available results point at their ability to protect portfolios during downturns.

This paper investigates whether assets compliant with Islamic precepts provided consistent defensive features also during the COVID-19 pandemic, similarly to those documented for the GFC. No study currently provides evidence on dynamic conditional correlations between Islamic and traditional assets for both periods of economic and financial turmoil.

TABLE 6 GARCH(1,1) extended version for conventional and Islamic indexes

<i>Panel A: World</i>												
DJ World conventional												
Whole period												
Index	Return			Het			ARCH			COVID-19 pandemic period		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
DJ World Islamic	0.962*** (0.003)	-0.868*** (0.050)		1.036*** (0.009)	0.162 (0.119)		0.964*** (0.016)	-0.276* (0.158)				
Gold	0.001 (0.002)	0.445*** (0.063)		-0.028*** (0.007)	-0.566*** (0.178)		0.005 (0.020)	-0.547* (0.322)				
WTI	-0.001 (0.001)	0.121*** (0.019)		-0.012*** (0.003)	-0.188** (0.083)		0.001 (0.003)	-0.004 (0.022)				
LARCH			0.074*** (0.008)			0.095*** (0.027)					0.246* (0.132)	
L.GARCH			0.870*** (0.011)			0.853*** (0.030)					0.690*** (0.101)	
Constant	-0.002 (0.002)	-6.889*** (0.121)		-0.013 (0.010)	-6.214*** (0.421)		-0.053** (0.021)	-5.156*** (0.395)				
N. of obs.	4345	4345	4345	521	521	521	172	172	172	172	172	172
<i>Panel B: Asia-Pacific</i>												
DJ Asia conventional												
Whole period												
Index	Return			Het			ARCH			COVID-19 pandemic period		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
DJ Asia Islamic	0.953*** (0.004)	-0.700*** (0.058)		0.976*** (0.009)	0.208* (0.109)		0.492*** (0.071)	-1.370*** (0.236)				
Gold	-0.001 (0.004)	0.489*** (0.092)		-0.010 (0.010)	-0.978*** (0.185)		0.018 (0.072)	0.494* (0.254)				
WTI	-0.008*** (0.001)	-0.020*** (0.007)		-0.014** (0.005)	0.308*** (0.049)		-0.001 (0.009)	-0.006 (0.004)				

TABLE 6 (Continued)

Panel B: Asia-Pacific											
DJ Asia conventional											
Whole period				GFC period				COVID-19 pandemic period			
Return	Het	ARCH	Return	Het	ARCH	Return	Het	Return	Het	ARCH	
(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(I)	(II)	(III)	
L.ARCH		0.207*** (0.008)			0.001 (0.004)					0.130* (0.073)	
L.GARCH		0.791*** (0.005)			0.977*** (0.008)					0.662*** (0.092)	
Constant	0.002 (0.003)	-5.844*** (0.087)	-0.014 (0.016)	-7.561*** (0.874)		0.065 (0.076)	-2.659*** (0.527)				
N. of obs.	4345	4345	521	521	521	172	172	172	172	172	172
Panel C: Europe											
DJ EU conventional											
Whole period				GFC period				COVID-19 pandemic period			
Return	Het	ARCH	Return	Het	ARCH	Return	Het	Return	Het	ARCH	
(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(I)	(II)	(III)	
DJ Europe Islamic	1.012*** (0.003)	-0.622*** (0.029)	1.015*** (0.009)	0.144 (0.095)		1.048*** (0.022)	-0.808** (0.411)				
Gold	-0.038*** (0.003)	0.254*** (0.047)	-0.054*** (0.010)	-0.666*** (0.150)		-0.043 (0.029)	0.471 (0.634)				
WTI	0.006*** (0.001)	-0.019*** (0.004)	0.001 (0.005)	0.160** (0.062)		0.003 (0.003)	-0.017 (0.014)				
L.ARCH		0.067*** (0.006)			0.097*** (0.032)					0.128*** (0.047)	
L.GARCH		0.888*** (0.009)			0.855*** (0.036)					0.840*** (0.037)	
Constant	-0.004 (0.003)	-6.195*** (0.129)	-0.006 (0.016)	-5.507*** (0.449)		-0.062** (0.030)	-6.548*** (2.079)				

(Continues)

TABLE 6 (Continued)

<i>Panel C: Europe</i>												
DJ EU conventional												
Whole period				GFC period				COVID-19 pandemic period				
Return	Het	ARCH		Return	Het	ARCH		Return	Het	ARCH		
(I)	(II)	(III)		(I)	(II)	(III)		(I)	(II)	(III)		
N. of obs.	4345	4345	4345	521	521	521	521	172	172	172	172	172
<i>Panel D: GCC</i>												
DJ GCC conventional												
Whole period				GFC period				COVID-19 pandemic period				
Return	Het	ARCH		Return	Het	ARCH		Return	Het	ARCH		
(I)	(II)	(III)		(I)	(II)	(III)		(I)	(II)	(III)		
DJ GCC Islamic	0.894*** (0.002)	-0.483*** (0.015)		0.883*** (0.008)	-0.290*** (0.065)			1.000*** (0.011)	-0.367*** (0.093)			
Gold	0.002 (0.002)	0.315*** (0.071)		0.028*** (0.009)	-0.257*** (0.083)			0.004 (0.014)	0.874*** (0.213)			
WTI	0.001 (0.001)	0.020** (0.008)		-0.003 (0.005)	-0.306*** (0.028)			-0.0003 (0.001)	0.004 (0.027)			
L.ARCH			0.034*** (0.002)							-0.004 (0.008)		0.224*** (0.077)
L.GARCH			0.945*** (0.002)							0.936*** (0.014)		0.524*** (0.101)
Constant	0.002 (0.002)	-7.411*** (0.085)		-0.025* (0.013)	-5.771*** (0.227)			0.001 (0.012)	-5.365*** (0.351)			
N. of obs.	4345	4345	4345	521	521	521	521	172	172	172	172	172

TABLE 6 (Continued)

Panel E: US		DJ US conventional								
		Whole period			GFC period			COVID-19 pandemic period		
		Return (I)	Het (II)	ARCH (III)	Return (I)	Het (II)	ARCH (III)	Return (I)	Het (II)	ARCH (III)
DJ US Islamic	0.971*** (0.002)	-0.725*** (0.047)		1.111*** (0.010)	0.062 (0.083)		1.003*** (0.009)	-0.186*** (0.046)		
Gold	-0.011*** (0.002)	0.521*** (0.083)		-0.036*** (0.008)	-0.504*** (0.145)		-0.013 (0.014)	-0.092 (0.066)		
WTI	-0.001 (0.001)	0.113*** (0.029)		-0.016*** (0.004)	-0.292*** (0.062)		0.001 (0.002)	0.051*** (0.006)		
L.ARCH			0.087*** (0.006)			0.098*** (0.027)			0.094 (0.061)	
L.GARCH			0.881*** (0.008)			0.855*** (0.031)			-0.481*** (0.107)	
Constant	-0.001 (0.002)	-7.374*** (0.135)		-0.011 (0.014)	-5.942*** (0.465)		-0.001*** (0.0002)	-17.130*** (1.239)		
N. of obs.	4345	4345	4345	521	521	521	172	172	172	172

Note: This table reports parameters estimates for the common GARCH (1,1) extended models. Each panel focuses on a geographical area (World, Asia-Pacific, Europe, GCC, and the United States). Index definitions are provided in Table 1. Columns (I), (II) and (III) show the Return, the Het (conditional heteroskedasticity), and the ARCH coefficients, respectively, during the whole period (from January 2004 to August 2020), the GFC period (from January 2008 to December 2009—as in Lins et al., 2017), and the COVID-19 pandemic period (from December 31, 2019 to August 2020—as in Corbet, Larkin, et al., 2020), respectively. Significance codes: *** express significance at the .999 level, ** at .99, * at .95.

TABLE 7 GJR-GARCH-DCC Model estimation

Index	ω	γ	β
DJ World conventional	.044***	-.165***	.848***
DJ World Islamic	.044***	-.170***	.885***
DJ Asia conventional	.019	-.144***	.881***
DJ Asia Islamic	.028**	-.167***	.983***
DJ EU conventional	.027*	-.151***	.925***
DJ EU Islamic	.028*	-.153***	.938***
DJ GCC conventional	.014***	-.403***	.111***
DJ GCC Islamic	.004	-.366***	.095***
DJ US conventional	.037***	-.238***	.794***
DJ US Islamic	.039***	-.252***	.806***

Note: This table reports parameters and log-likelihood values for the asymmetric GJR-GARCH-DCC model during the whole period of analysis (January 2004–August 2020). Index definitions are provided in Table 1. The columns labeled ω , γ , and β represent the constant term, the GJR ARCH and GARCH term, respectively. Significance codes: *** express significance at the .99 level, ** at .95, * at .90.

TABLE 8 DCC GARCH Model of alternative indexes

Index	ω	α	β
S&P 500	.001***	.087***	.894***
S&P 500 Islamic	.001***	.086***	.895***
DJ Emerging Markets	.001***	.080***	.909***
DJ Islamic Emerging Markets	.001***	.077***	.913***

Note: This table reports parameters and log-likelihood values for the two asymmetric DCC GARCH models during the whole period of analysis (January 2004–August 2020) for the conventional and Islamic counterpart of S&P 500 and Dow Jones (DJ) Emerging Markets index. The ω , α , and β represent the constant, the ARCH and GARCH term, respectively. Significance codes: *** express significance at the .99 level, ** at .95, * at .90.

We compare daily data for five Islamic and five conventional leading financial indexes for the period 2004–2020, covering at the same time global indexes and major geographical areas (Asia-Pacific, Europe, GCC, and the United States), by means of a DCC GARCH and an extended GARCH (1,1) models.

Our findings are strong and robust in highlighting the risk-hedging properties of Islamic investments, showing both a lower volatility and higher persistence than their conventional counterparts. Moreover, these effects that are even stronger during the COVID-19 pandemic and at the regional level, and are robust to the inclusion of traditional safe-haven assets in comparative terms.

Our results confirm the literature indicating that Islamic indexes stand below the long-run equilibrium when compared to conventional alternatives, however, on a longer time period and through a different methodological approach.

In terms of policy implications, this may suggest to asset managers and institutional investors to consider a greater potential role of Islamic assets within portfolios, especially considering their defensive characteristics during financial and economic crises.

As a main limitation, and thereby a suggestion for future research, one should bear in mind that the current COVID-19 pandemic is far from being over, will continue impacting global and regional markets, and therefore should be subject to additional scrutiny to verify whether our findings hold throughout its entire development.

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APPENDIX

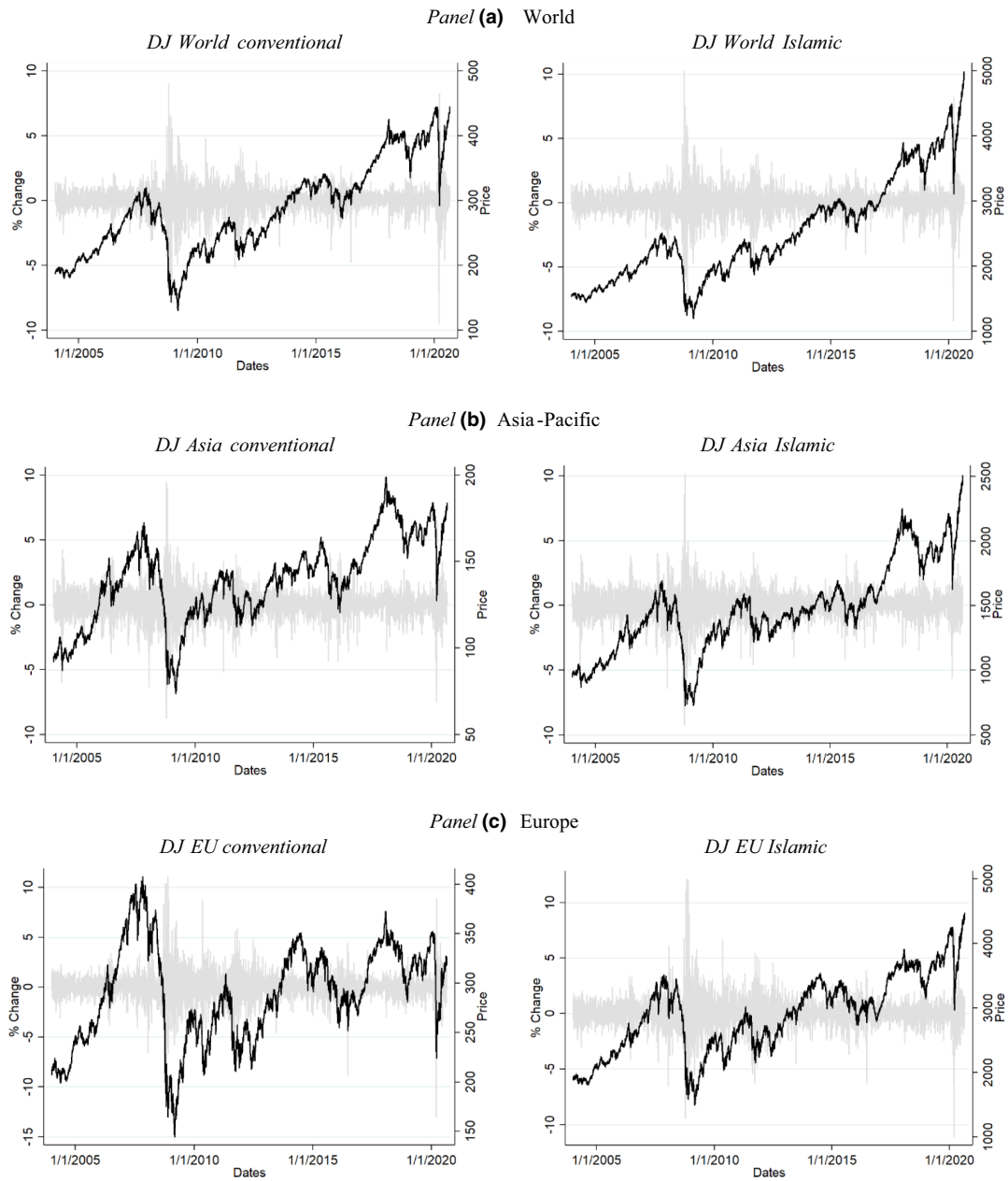


FIGURE A1 Prices and returns of selected conventional and Islamic indexes. These figures provide daily prices (right hand scale) and returns (left hand scale) of the Dow Jones (DJ) conventional and Islamic indexes (left and right figures, respectively) used in our analysis. The period spans from January 2004 to August 2020. Index definitions are provided in [Table 1](#). Each panel focuses on a geographical area (Global, Asia-Pacific, Europe, GCC, and the United States). Data are provided by Dow Jones (DJ) and collected by Bloomberg database

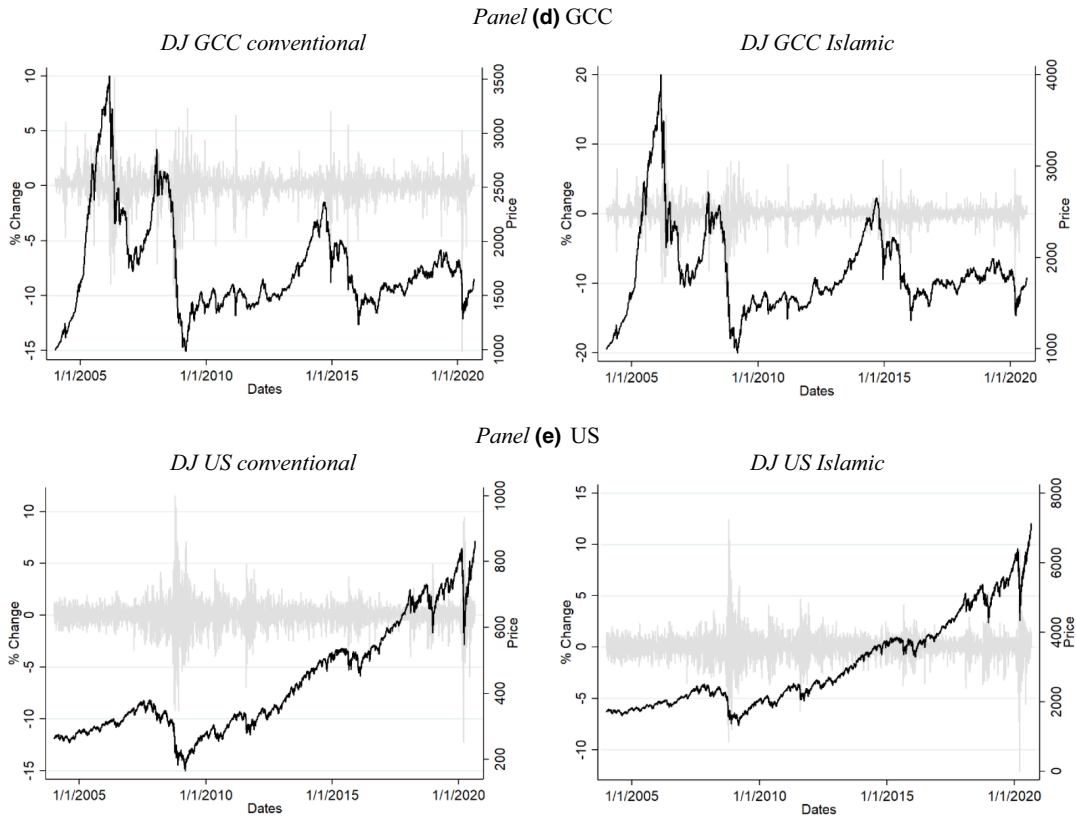


FIGURE A1 (Continued)