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The spillover of media sentiment on the sukuk bonds during COVID-19 pandemic

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ABSTRACT

This study focuses on the examination of the spillover impact of media sentiments (media coverage index, MCI), on the returns and volatility of the different investment graded sukuk bonds during the COVID-19 pandemic using the Time-varying Parameter Vector Autoregressive (TVP-VAR) model. We find that media sentiments have a stronger spillover impact on the bonds' returns than their volatilities. The impacts are also found to be higher around the first few months of 2020 and 2021. The lower investment grade sukuk bonds are net transmitters of spillovers to their higher investment grade sukuk bonds counterparts. Sukuk bond BBB becomes a net recipient of spillovers and its net directional spillover relationship with sukuk bond AAA becomes zero. The spillover relationship is generally time-varying, with exceptional spillovers occurring during the early periods of the outbreak of the pandemic and the rise of its second wave.

KEYWORDS

Media sentiments; Investment graded sukuks; TVP-VAR; Spillover effects; COVID-19; News sentiment

JEL CLASSIFICATION

G01; G12; G15; G18; E43

I. Introduction

The interest of researchers and investment analyst in delving into the workings and viability of Islamic assets have been growing since the 2008/2009 global financial crisis. The cause of this attention can be related to their distinctive features, which influence their investment quality (Adekoya and Oliyide 2021; Uddin et al. 2020; Umar and Gubareva 2021a; Shahzad et al. 2017; Umar and Suleman 2017 Umar 2015) and their recognition in serving as viable investment options (Mensi et al. 2017; Umar, 2017). Among all these assets, Sukuk, also known as Islamic bond, is peculiar because it serves both as a debt and equity instrument (Zakaria, Md Isa, and Abidin 2012; Umar, Gubareva, and Sokolova 2022a). Ismath Bacha and Mirakhor (2018) discuss that Sukuk is essential in reducing external borrowing, economic fluctuations, and the vulnerability of the countries to external shock[1]

Among other credits, the inherent characteristics, relative stability and low correlation with macroeconomic issues have made Sukuk to be recognized as a secure investment than conventional bonds (see Zakaria, Md Isa, and Abidin 2012; Yarovaya, Elsayed, and Hammoudeh 2021); nevertheless, it is not totally free from risks. One of the major risks associated with Sukuk is the default risk. Default risk occurs when there is a breach of any binding agreement or obligation under the original agreement between the issuer and Sukuk holder(s). Since the financial market is not wholly immune from complexity and the diversity of issuers, investors and market regulators are now depending on the opinions of credit rating agencies in accessing the level of risk associated with the asset by rating them (Riaz, Shehzad, and Umar 2019; Kenourgios, Umar, and Lemonidi 2020). Credit rating involves the assessment of the credibility of the issuer of the Sukuk to timely pay the principal and profit over the agreed duration. The rating is graded into the non-investment and investment grades. The investment grade category comprises sukuks rated into AAA, AA, A and BBB. In contrast, the non-investment grade consists of BB, B, C and D. It is important to note that the rating decreases as the default premium increases. Thus, higher-rated Sukuk are associated with lower default risk.

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[1]Ismath Bacha and Mirakhor (2018) document that in the quest of most Islamic countries to fund development infrastructure, they suffer from external debt due to inability to domestically source for resources. Some of the issues faced due to the dependent nature of these countries on borrowing from foreign countries and institutions ranges from the fluctuation of home currency to their economic fluctuation to commodity prices vulnerability as a result of reliance on commodity exports.

Most of the studies that have explore the viability of the Sukuks as an investment tool considered the Sukuks rated as investment grade to be homogenous (see Bhuiyan et al. 2020; Naifar et al., 2016; Hassan et al. 2018). However, looking from their heterogeneous nature is vital for policy makers and investment purposes in many instances. One, the importance of rating sukuk is to reveal the bonds associated with lower levels of risk and further guide investors in making suitable investment decisions. Therefore, a homogeneous analysis is not sufficient in revealing the Sukuk agreements that are worth delving into.

Two, there are tendencies for companies graded differently but under the same category to react heterogeneously to shocks since they have different issuers. A good example is the global financial crisis of 2008/2009. Ahmed and Elsayed (2019) note that Islamic assets were suitable diversifiers during the financial crisis due to their features that disassociates them from interest rate and link with other conventional investment structures. Notwithstanding, Kamarudin et al. (2014) document that the highest number of Sukuk defaults in 2009 occurred due to the financial crisis. A great implication of this is that Sukuks are not completely immune from crises. Thus, Sukuks under different ratings can react to crises differently. Three, although aggregating the indices comes from the understanding that they are under the same class of grade (in this case, investment grade) and operate under the same Islamic principles, these similarities can inform investors to make decisions towards options that favour them. For instance, it is logical for investors to enter obligations with companies that are less likely to default in agreement due to higher ratings. On the other hand, policy makers of companies with relatively lower ratings can quickly draw information from other companies with higher ratings to ensure their stability. These activities of investors and policy makers credit the possibility of information flow among companies under different ratings.

From the previous analyses, we do not only depart from the extant movement by utilizing the disaggregated investment graded indices; our analyses delve into the possibility of information spillovers among rated Sukuk during the COVID-19 pandemic period. In precise terms, we investigate the returns and volatility connectedness among the four investment grade indices and COVID-19 pandemic media coverage. Due to the lower liquidity of the Sukuk market, the report of FitchRating in 2020 reveals that the market was greatly influenced by the pandemic more than the conventional bonds market. The report further discloses that the international sukuk market was shut down in the first half of 2020 due to the market volatility induced by the pandemic. The news about the instability of the Sukuk market, the fall in the prices of assets, and other resultant effects of the pandemic tend to raise investors' sentiment towards investing in the Sukuk. In addition, the uncertainty about the future capital flow and the business prospect of companies might increase the tendency of the issuers to default. Thus, it becomes crucial to analyse the role of sentiments which is guided by media and news, in influencing the relationship among the investment grade. In a way, an increase in investors' perception that the pandemic can cause a sukuk issuer to default can influence investors' decisions in investing in Sukuk with another rating under the investment grade. In another way, sentiment towards the credibility of a Sukuk can further raise sentiment against the viability of other Sukuks due to the similar governing principles.

For a complete and well-detailed analysis, we approach the relationship between the pandemic media coverage and the four different investment grade sukuks using the time varying parameter vector autoregression (TVP-VAR) of Antonakakis, Chatziantoniou, and Gabauer (2020) and the network connectedness approach. The former will aid our insights by unveiling the receptive and transmitive nature of the rated Sukuks under the investment grade, whereas the latter is important in clearly understanding the direction of net spillover flows.

In addition to this introductory section, this paper has four other sections. The immediate section covers the methodology, while the next gives attention to the description of the underlying data. The last but one section discusses the main empirical results, while the conclusion and policy implications of the findings are rendered in the last section.

II. Review of past studies related to Islamic assets

The presence of Islamic assets in the financial markets has increased the numerous viable assets that investors can look into while making investment decisions. Studies, such as Zakaria, Md Isa, and Abidin (2012), Umar and Gubareva (2021b), Yarovaya, Elsayed, and Hammoudeh (2021), Umar et al. (2020), Adekoya et al. (2022), Umar et al. (2018), Umar, Gubareva and Sokolova (2022a), Umar et al. (2022) and Asl, Adekoya, and Oliyide (2022) claim that their increasing awareness and suitability for investment purposes could be attached to their immunity to fluctuations in macroeconomic fundamentals. Specifically, Sukuks, also called Islamic bonds, primarily used as debt instruments, have now extended to be considered viable investment options due to their low-risk features. Nonetheless, they are not entirely free of risks, as they can be influenced by shocks from assets with similar or different characteristics through the contagion effect (Samitas, Papathanasiou, and Koutsokostas 2021). This assertion is more evident in the conclusion of studies that delve into the shock transmission among Sukuks (Naeem et al. 2022; Billah, Balli, and Balli 2022; Balli et al. 2022) or between Sukuks and other conventional markets (Samitas, Papathanasiou, and Koutsokostas 2021; Arfaoui, Chkili, and Rejeb 2022; Gubareva et al. 2021; Ali, Yousaf, and Umar 2022).

Asutay and Hakim (2018) show that the Sukuk markets in the UK, Saudi Arabia, Qatar, Bahrain and the UAE are more integrated. In order to characterize the risk transmission between conventional and Sukuk bonds, Maghyereh and Awartani (2016) identify that returns and volatility spillovers between Sukuk and conventional bonds are weak. However, the study documents the importance of Sukuk in portfolio optimization, especially for international investors. Contrary to this, Ahmed and Elsayed (2019) identify a high interconnection between Islamic and conventional markets in Malaysia. As concluded by the study, the Sukuk market is the primary net receiver of shocks, while the conventional bond and stock markets are net transmitters of shocks. The findings of Samitas, Papathanasiou and Koutsokostas (2021), based on the TVP-VAR methodology, are quite similar in part to that of Ahmed and Elsayed (2019). The study concludes that Sukuk and conventional bonds are highly connected, with Dow Jones and the Malaysian Sukuk indices being the primary shock transmitters to other markets. This findings credit the superior hedging ability of the Sukuk market. Karim and Naeem (2022) delve into how global factors influence the interconnectedness among green, Islamic and conventional financial markets. The study finds Sukuk, commodity index, bond market, clean energy, green bonds as net recipients of spillovers, while Islamic stocks, sustainability index and S&P500 index are net transmitters. Nasreen et al. (2020), on the other hand, find that the degree of connectedness between these GCC Sukuk bond and shariah stock indices varies across time and scale.

Generally, financial markets have been noted to be faced with undeniable instability during various crises (Umar and Gubareva 2020, 2021a). Engelhardt et al. (2021), Umar et al. (2021 and Naeem et al. (2022) identify that crises such as the global financial crisis of 2008 and the COVID-19 pandemic caused instability in the financial market. Specifically, the study of Bossman et al. (2022); Esparcia, Jareño, and Umar (2022), Umar et al. (2021), Akhtaruzzaman, Boubaker, and Umar (2021), Akhtaruzzaman et al. (2022), Umar, Aziz, and Tawil (2021), Adekoya and Oliyide (2021), Bouri et al. (2021), Goodell (2020); Umar et al. (2022b), Costa, Matos, and da Silva (2021 and Umar, Gubareva and Sokolova (2022a) and so on, attest to the influence of the COVID-19 pandemic on conventional financial markets. Although studies such as Arif et al. (2021) and Naeem et al. (2022) attest to the relatively resilient nature of Islamic assets to shocks during the COVID-19 pandemic, they still felt the impact of the pandemic (Khan et al. 2022). Coming from this, a number of studies have gauged the volatility transmission among Islamic assets and/or between Islamic assets and other conventional assets((Umar, Mokni, and Escribano 2022; Umar, Gubareva, & Sokolova, 2022a).

For the G7 stocks, the study of Arif et al. (2021) finds supporting evidence for the safe-haven property of Islamic assets during the global financial crisis of 2008 and the COVID-19 pandemic. They offer insight into how the COVID-19 pandemic influences the connectedness of Sukuk bonds of different countries at different market states. The study identifies that connectedness at the extreme quantiles is different from the one observed in the middle quantile. Billah, Balli and Balli (2022), however, document that the global Sukuk markets greatly influence the Sukuk indices at country levels. The sub-sample analysis for the COVID-19 sample unravels that there is spillover of returns on the Sukuk issued by financial corporations during the COVID-19. Arfaoui, Chkili and Rejeb (2022) identify the presence of asymmetric shock effects and volatility spillovers between Sukuk and stocks in the GCC countries during the COVID-19 pandemic. An exciting finding by this study is that Sukuk provides the best profit-making portfolio. Opposing the resilient nature of Sukuks to crises, Khan et al. (2022) identify that the COVID-19 pandemic had a similar initial shock on both Islamic and conventional market volatilities, especially in the long-term investment bands.

Following the consistent evidence of the influence of news and media coverage in raising sentiments in investors during crises (Umar and Gubareva 2021a; Adekoya and Oliyide 2021; Umar et al. 2022; Naeem et al. 2020; Gubareva and Umar 2020), the study of Umar et al. (2022b) utilizes a wavelet approach to assess the impact of media sentiment on the returns of Sukuks during the COVID-19 pandemic. The findings reveal that there is an attractive diversification attribute of investing in Islamic-related assets during financial stress or turmoil like the one caused by the COVID-19 pandemic.

While the studies in the connectedness framework are essential in deducing necessary insights on Sukuk for investment and policy-making purposes, additional evidence on how Sukuks at different grades respond to shocks is lacking. Owing to this, we utilize the investment grade Sukuk indices. Furthermore, we contribute to the literature by delving into the returns and volatility connectedness between media sentiment and the investment grade sukuks.

III. Methodology

In modelling the spillover nexus between the media coverage index (MCI) and investment grade sukuk, we employ the dynamic connectedness approach of Antonakakis, Chatziantoniou and Gabauer (2020). Just like other studies (Aharon et al. 2021; Umar, Jareño, and Escribano 2022; Aharon et al. 2022; Oliyide, Adekoya, and Khan 2021; Fasanya et al. 2021; Adekoya and Oliyide 2021; Umar et al. 2022), we find this methodology more suitable due to its ability to reveal connectedness without arbitrarily choosing the optimal size of the rolling window and losing observations as in the case of Diebold and Yilmaz (2014, 2016). The TVP-VAR methodology is formed through the Kalman Filter estimation process that allows a time variance with forgetting factors. Following the specification of Antonakakis, Chatziantoniou and Gabauer (2020), the TVP-VAR(1) model is specified as follows:

$$y_t = C_t v_{t-1} + \mu_t; \mu_t|\rho_{t-1} \sim N(0, \tau_t) \quad (1)$$

$$vec(C_t) = vec(C_{t-1}) + \gamma_t; \gamma_t|\rho_{t-1} \sim N(0, \varepsilon_t) \quad (2)$$

In the equations specified above, C_t and τ_t are m × m dimensional matrices, andy_t,v_{t-1} and μ_t are m × 1 dimensional vectors. $Vec(C_t)$ and γ_t are also dimensional vectors but of order is $m^2 \times 1$. $\varepsilon_t$is another dimensional matrix of $m^2 \times m^2$. To further calculate the generalized impulse response functions (GRIF) and generalized forecast error variance decomposition (GFEVD) (see Koop, Pesaran, and Potter 1996; Pesaran and Shin 1998), which are important in revealing the shock effect of a variable on another variable, we transform the TVP-VAR to a vector moving average (TVP-VMA). The method of transformation is the Wold representation theorem, $y_t = \sum_{i=1}^{p} C_{it} z_{t-i} + \mu_t = \sum_{j=0}^{\infty} A_{jt} \mu_{t-j}$. It is essential to highlight that the GIRF is necessary to uncover the influence a variable has on another variable due to responses of all other variables to a shock in a particular variable. GFEVD, on the other hand, helps reveal the influence a variable has on another variable in terms of its forecast error variance share. The GIRF and GFEVD are respectively computed in equations (3) and (4):

$$\delta_{\mathrm{ij,t}}(H) = \sum_{jj,t}^{-\frac{1}{2}} A_{H,t} \sum_{t} b_j, \tag{3}$$

$$\tilde{\rho}_{ij,t}(H) = \frac{\sum_{t=1}^{H-1} \alpha_{\mathrm{ij,t}}^2}{\sum_{j=1}^{m} \sum_{t=1}^{H-1} \alpha_{\mathrm{ij,t}}^2} \tag{4}$$

with

$$\sum_{j=1}^{m} \tilde{\rho}_{ij,t}(H) = 1 \text{and} \sum_{i,j=1}^{m} \tilde{\rho}_{ij,t}(H) = m$$

From equation 3, b_j is a m × 1 selection vector with unity in the jth position and zero otherwise. Also, J represents the forecast horizon. Through the GFEVD, as in equation (4), we can calculate and extract the total connectedness index.

$$\begin{aligned} C_t(H) &= \frac{\sum_{i,j=1, i\neq j}^{m} \tilde{\rho}_{ij,t}(H)}{\sum_{i,j=1}^{m} \tilde{\rho}_{ij,t}(H)} * 100 \\ &= \sum_{i,j=1, i\neq j}^{m} \tilde{\rho}_{ij,t}(H) * 100 \end{aligned} \tag{5}$$

Equation 5 reveals how a shock in one variable spills over to another variable under investigation. However, to be specific in detail about the spillover among the graded sukuk bonds in the framework, there is a need to reveal the direction of the connectedness, that is, the case where a particular variable i transmits its shocks to other variables j, and where variable i receives from variables j. The former is called total directional connectedness to others (specified in equation 6), while the latter is called total directional connectedness from others (defined in equation 7).

$$C_{i\rightarrow j,t}(H) = \frac{\sum_{i,j=1, i\neq j}^{m} \tilde{\rho}_{ji,t}(H)}{\sum_{i,j=1}^{m} \tilde{\rho}_{ji,t}(H)} * 100 \tag{6}$$

$$C_{i\leftarrow j,t}(H) = \frac{\sum_{i,j=1, i\neq j}^{m} \tilde{\rho}_{ij,t}(H)}{\sum_{i,j=1}^{m} \tilde{\rho}_{ij,t}(H)} * 100 \tag{7}$$

Also, it is vital to reveal the net total directional connectedness (specified in equation 8), which is calculated by subtracting the 'total directional connectedness to others' from 'total directional connectedness from others'.

$$C_{i,t} = C_{i\rightarrow j,t}(H) - C_{i\leftarrow j,t}(H) \tag{8}$$

If $C_{i,t} > 0$, then variable i influences the network more than itself being influenced. However, if $C_{i,t} < 0$, then variable I is driven by the network.

On a final note, there is a need to dissect the total directional connectedness index to reveal the bidirectional relationships further. We call this the net pairwise directional connectedness (NPDC). This is done in equation (9)

$$NPDC_{ij}(H) = \left(\tilde{\rho}_{jit}(H) - \tilde{\rho}_{ijt}(H)\right) * 100 \tag{9}$$

If $NPDC_{ij}(H) < 0 [NPDC_{ij}(H) > 0]$, it means that variable i is dominated by [dominates] variable j.

IV. Data and preliminary results

To address the empirical problem of how media sentiments have a spillover effect on the investment grade sukuk bonds during the COVID-19 pandemic, we utilize the Media Coverage Index (MCI) that was constructed by RavenPack, a data analytics provider. The index ranges from 0 to 100, as it is calculated as the percentage of the news related to the COVID-19 pandemic in the overall news sources. On the other hand, we consider four investment grade sukuk bonds ranked in the order of their as 'AAA', 'AA', 'A', and 'BBB'. We use daily data covering sample period from January 2020 – October 2021 and is motivated by the availability of matched series. The data for MCI is available from January 2020. We compute log returns following extant literature, whereas the historical 10 day volatility for our analysis.

Table 1 reports the descriptive statistics and Figure 1 depicts the graphical trends. The average daily returns of the sukuks are approximately zero, and they seem to exhibit low volatility as evidenced from their standard deviation values and the small differences between their minimum and maximum values, thus underscoring the lower relative risk characteristics of sukuks. Figure 1 further supports the evidence of the low volatility in the sukuk returns, except around the first quarter of 2020 when the news about the COVID-19 pandemic was gaining momentum. The returns are also seen to exhibit negative skewness (except sukuk AAA) and excess kurtosis, thus confirming their non-normal distribution property as confirmed by the Jarque-Bera test. These are the usual characteristics of the financial time series. The high average value of MCI (67.23) suggests that media sentiment is very high during the COVID-19 pandemic. Reaching a maximum of 82.95 as against its least value of 0.20, MCI exhibits a high degree of volatility, thus confirming the high standard deviation

Table 1. Descriptive statistics.

	AAA	AA	A	BBB	MCI
Mean	0.0001	0.0002	0.0002	0.0002	67.2310
Maximum	0.0044	0.0094	0.0101	0.0096	82.9500
Minimum	−0.0044	−0.0114	−0.0152	−0.0164	0.2000
Std. Dev.	0.0009	0.0014	0.0019	0.0021	14.9433
Skewness	0.1281	−1.7857	−2.1421	−2.9428	−2.8407
Kurtosis	7.6243	26.6260	21.7218	23.5265	11.5270
Jarque-Bera	402.1827	10705.1500	6916.0790	8549.5610	1968.5030
Probability	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	450	450	450	450	450

This table shows the descriptive statistics of the returns on sukuks with different ratings (AAA, AA,A, BBB) and Medica coverage index (MCI).

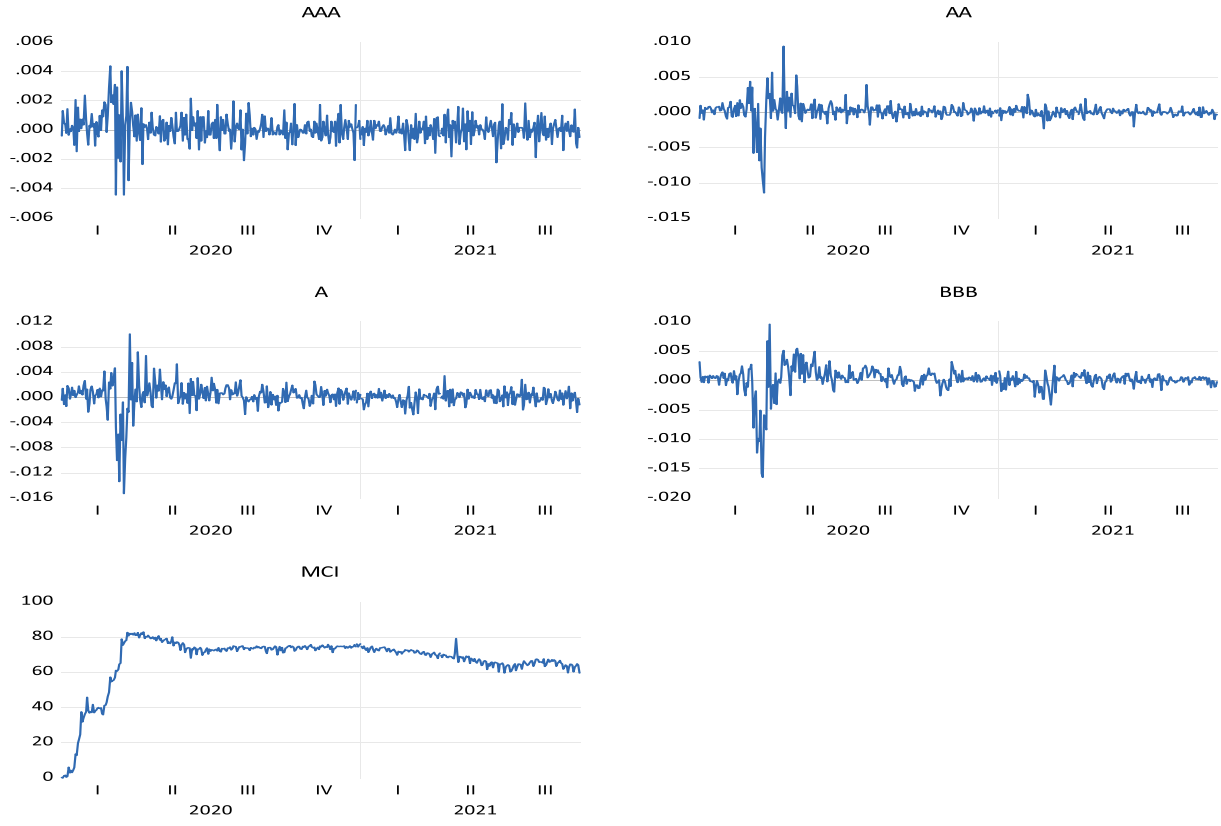

Figure 1. Trends in investment grade sukuk bonds returns and MCI. This figure shows the time series of the returns on sukuks with different ratings (AAA, AA,A, BBB) and Medica coverage index (MCI)

statistic value (14.94). The abysmal rise in the MCI trend in the first quarter of 2020 and its fluctuation between 82.95 and 60 afterwards further lends credence to its volatile behaviour. The MCI also exhibit similar distribution properties as the sukuk bond returns.

V. Empirical results

Following the idea identified in the previous sections, we utilize the returns and volatility series in the connectedness framework through the approach provided by Antonakakis, Chatziantoniou, and Gabauer (2020). A number of spillover parameters are necessary for insights in this study. These are the unidirectional spillovers measures (the total spillover from and to a categorized graded sukuk), the net directional spillovers for each of the categorized graded sukuk, and the total connectedness index. As provided in section 5.1, our investigation starts by exploring the connectedness analysis using the investment graded returns series, while that of the investment grade sukuk returns volatility are offered in section 5.2.

Connectedness between media sentiments and investment grade sukuk returns

Table 2 presents the average connectedness between MCI and the returns of the four variants of investment grade sukuk bonds. Putting the overall connectedness into perspective first, the observed 36.078% total connectedness index suggests that MCI has a relatively strong connection with the sukuk bond returns. To be more explicit, the net directional spillover indices point out some interesting information. The higher investment grade sukuk bonds AAA and AA are net receivers of spillovers on the whole (−15.6% and −15%, respectively), whereas the lower investment grade sukuk bonds A and BBB, and MCI are net transmitters of spillovers (8.6%, 4.3%, and 17.6%, respectively). This finding is similar to the study of Umar et al. (2022) whose focus was on how media sentiment affects returns of aggregated sukuks during the COVID-19 crisis. Although, the study aggregated sukuk bonds without offering insights into their classification based on grading, it supports an increase in returns and volatility connectedness during the pandemic. Another supporting study is that of Ahmad and Radzi (2011) which documents that the financial crisis influenced sukuks through their susceptibility to deterioration.

More interestingly, the assessment of intra-connectedness among the sukuk bonds indicates that the sukuk bond with the highest investment grade AAA is the receiver of the highest net spillovers, while the investment grade sukuk BBB is associated with the highest net spillover transmission. However, MCI is a net transmitter of spillovers to all the sukuk bonds, as it transmits more than it receives. For instance, while it receives 0.5%, 0.6%, 0.5%, and 0.4% spillovers from the investment grade sukuk bonds AAA, AA, A, and BBB, respectively, it transmits as much as 10%, 4.7%, 2.5%, and 2.5% to them respectively. It can also be seen that the investment grade sukuks receive spillovers from MCI in the order of their credit worthiness, i.e. the one with grade AAA receives the highest, followed by grade AA, while the least graded sukuks receive the least.

The directional net pairwise connectedness is now vividly revealed in Figure 2. Both lower investment grade sukuks A and BBB are net spillovers of shocks to the higher investment grade sukuks AAA and AA. However, all the sukuk bonds are net receivers of shock spillovers from MCI. These evidences are not out of place. The net spillover recipient status of the higher investment grade sukuk bonds is a reflection of their high credit worthiness, but low yield. Due to the high-yieldedness of the lower investment grade sukuks, they tend to attract investors, especially profit-maximizing and risk-taking investors. Thus, they play leadership role

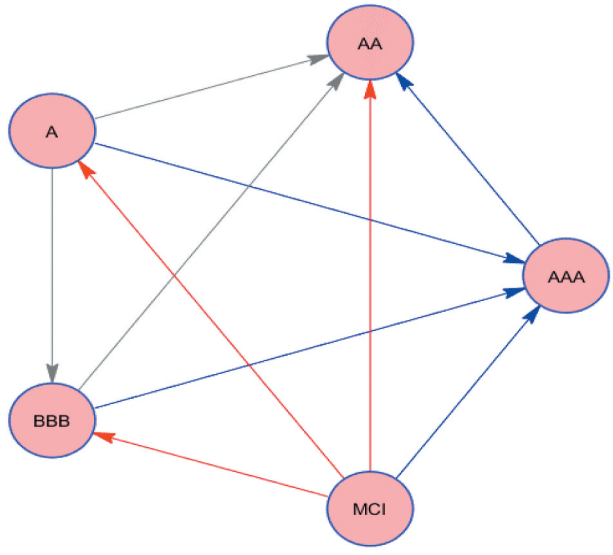

Figure 2. Network-based net pairwise directional returns connectedness results. This figure shows the pairwise connectedness of returns of sukuks with ratings AAA, AA, A, BBBB and media coverage index (MCI). The direction of spillover (transmission) is from source to the edge of each arrow.

Table 2. Average returns connectedness results.

	AAA	AA	A	BBB	MCI	FROM
AAA	87	9.8	9.6	8.7	10	38
AA	9.9	64.6	22.5	23.3	4.7	60.4
A	7.4	18	62.5	34.5	2.5	62.5
BBB	4.6	17	38.5	62.4	2.5	62.6
MCI	0.5	0.6	0.5	0.4	123	2
Contribution to others	22.4	45.4	71.1	66.9	19.6	225.5
NET directional connectedness	−15.6	−15	8.6	4.3	17.6	TCI = 36.078

This table shows the static connectedness of the returns on sukuks with different ratings (AAA, AA,A, BBB) and Medica coverage index (MCI).

in the general sukuk market and influence others. Bringing MCI into the discussion, it exerts a clear-cut influence over all the sukuk bonds. It suggests that the sukuk bonds significantly react to media sentiments. This spillover impact exerted by media sentiments is in tandem with related studies, such as Umar, Aziz and Tawil (2021) which establish that short stocks are net recipients of returns and volatility spillover shocks from media sentiments during the COVID-19 pandemic, and Umar et al. (2022) which supports the influence of media sentiment on sukuk bonds during the same health crisis. Contrarily, Naifar (2022) identify that COVID-19 news only affects returns when the Sukuk markets are bearish. Naifar (2022) further adds that news about medical and vaccine information and the aggregated COVID-19 index do not affect sukuk returns. Similarly, Naifar and Hammoudeh (2016) reveal that the global financial distress only has a negative impact on the GCC sukuk when sukuk returns are high (upper quantiles).

We further conjecture that the spillover connectedness between MCI and the investment grade sukuk bonds could be dynamic or subject to time variation. In other words, the transmission of risk from MCI to the underlying graded assets could vary over time following since the intensity of the pandemic and the sentimental reaction of investors also vary. Thus, we graphically trace out the connectedness across the time period of study. As expected, we find evidence of high spillovers during some periods, whereas other periods only experience mild spillovers. For the overall connectedness graph in Figure 3, the early period of the 2020 indicates a significantly high connectedness between MCI and the sukuk bonds, with the total spillover index being as high as 53% around April, 2020. This period overlaps with the period of intense market fear and sentiment caused by the emergence of the COVID-19 pandemic. Consistent with past studies on general market connectedness during this period, media news regarding the pandemic was at its peak around March and April, 2020 (Umar, Aziz, and Tawil 2021; Naeem et al., 2022; Adekoya and Oliyide 2021; Umar and Gubareva 2021a; Fasanya et al. 2021). The news generated intense sentimental behaviour among investors, leading to some strategic actions by investors, such as quick selling of assets, buy-and-hold plan, and so on. The end result was high risk transmission across financial markets, with the most vulnerable or those with low-credit worthiness being mostly at the receiving end. Going further, it is observed that from the middle of the second quarter of 2020 when the news about the pandemic reduced in momentum, the total connectedness began to reduce, reaching an all-time minimum of about 31%. However, it began to rise afterwards, also just steadily, and this could be associated with the media news about the second wave of the pandemic as was being experienced by some countries.

Turning to the individual series (Figure 4), the higher investment grade sukuk bonds are net receivers of spillovers throughout the study period. This is unlike the lower investment grade sukuk bonds, especially BBB, whose net spillover values are mostly positive, but sometimes fluctuate across the positive and negative axes over the months. Observing keenly, the net spillovers of the lower investment grade sukuk bonds become negative during the periods when the media news on COVID-19 was peaking. Hence suggesting that the grade bond Both sukuk bonds A and

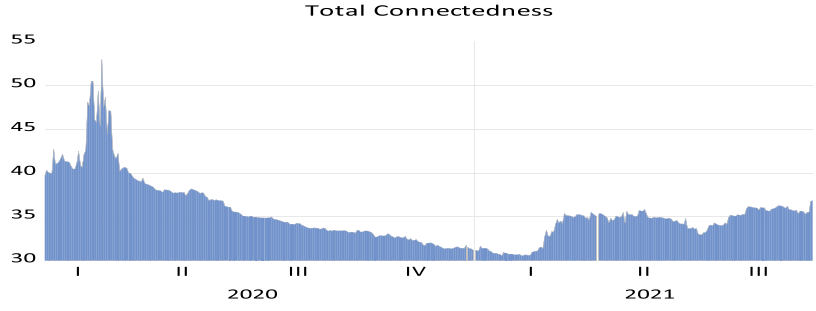

Figure 3. Total returns connectedness result. This figure shows the time-varying total connectedness of the return of sukuk and media coverage index (MCI) over the sample period.

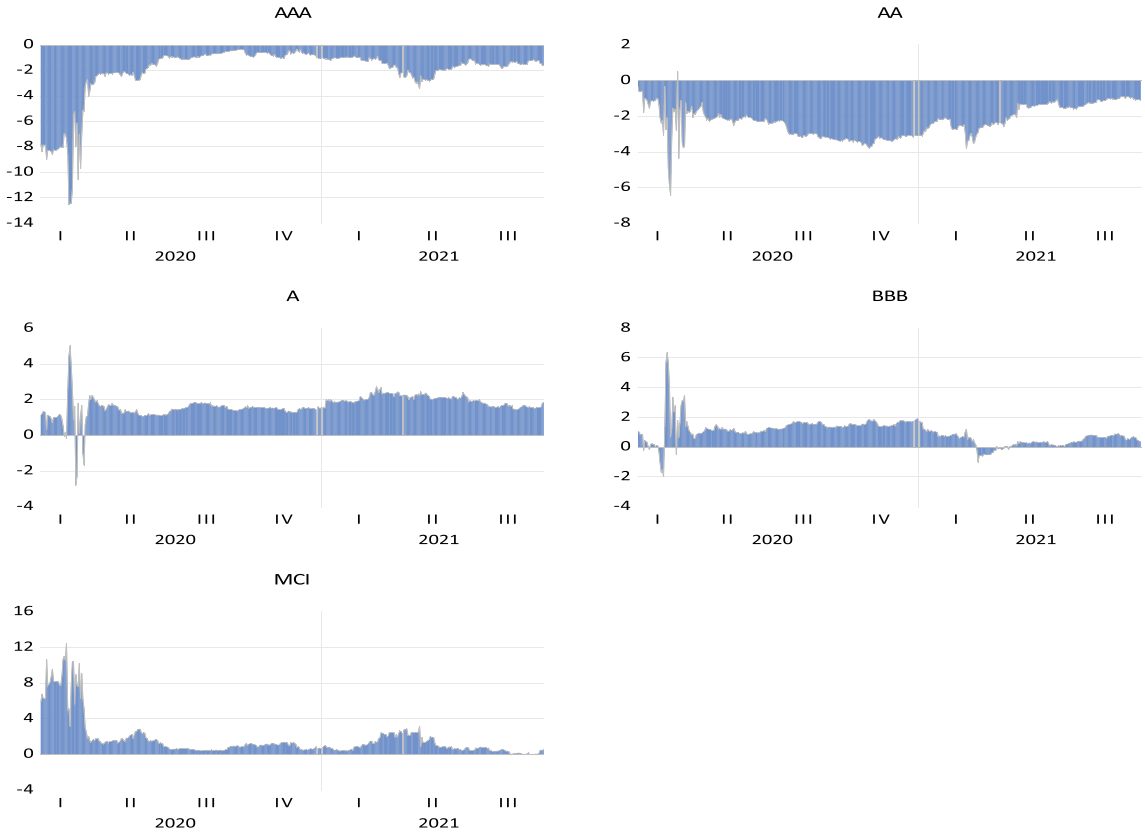

Figure 4. Total net returns connectedness results. This figure shows the time-varying net connectedness of the return of sukuk and media coverage index (MCI) over the sample period. A positive value shows transmitter of shocks and a negative value shows recipient of shocks.

BBB demonstrate this around late March, 2020, while the latter also strengthens this fact in the early period of 2021. It thus appears that although the lower investment grade sukuk bonds are, to some extent, resilient to the adverse influence of the pandemic, their strength wanes in the presence of high degree of media carriage on the pandemic. Hence, whereas they are suitable hedgers against the higher investment grade sukuk bonds during such pandemic, all the investment grade sukuk bonds are at the mercy of media sentiments during such occurrence. However, their inability to hedge against media sentiments could be contingent on the degree of the media sentiment, as demonstrated by the MCI total connectedness graph in Figure 4. The net spillover impact of MCI was high at the early months of 2020 and 2021. These periods have been justified above as when the news of the outbreak and second wave of the pandemic was globally high. Periods other than these experienced very low net spillover from MCI.

Connectedness between media sentiments and investment grade sukuk returns volatility

Investors are sometimes concerned about the degree of risks exhibited by their investments, rather than their actual returns. Volatility is thus a closer measure of the riskiness of financial assets. It is important therefore to take the connectedness analysis to the second-order moment (i.e. volatility connectedness).The first observation we make from Table 3 is that the overall volatility connectedness among the series is not as strong as the overall returns connectedness. Compared to the value of the latter given as 36.08%, the value of the overall volatility connectedness is 20.51%. This weaker connectedness is further revealed in the drop in the values of the directional spillovers. Although the higher investment grade sukuk bonds AAA and AA are still net recipients of volatility spillovers, their net values are 7% and 4.2%, respectively. Similarly, lower investment grade sukuk bond A and MCI retain their status as net transmitters of spillovers, but with lower values of

Table 3. Average volatility connectedness results.

	AAA	AA	A	BBB	MCI	FROM
AAA	106.3	8	4.3	2.2	4.2	18.7
AA	4.3	97.6	11.4	7.8	3.9	27.4
A	5	8.6	84.6	24.1	2.8	40.4
BBB	2.2	6.5	25.5	84.1	6.7	40.9
MCI	0.2	0.2	0.2	0.1	124.3	0.7
Contribution TO others	11.7	23.2	41.5	34.2	17.6	128.2
NET directional connectedness	−7	−4.2	1.1	−6.7	16.9	TCI = 20.51

This table shows the descriptive statistics of the volatility on sukuks with different ratings (AAA, AA,A, BBB) and Medica coverage index (MCI).

1.1% and 16.9%, respectively. The most significant change in the net spillover status of the assets pertains to the lower investment grade sukuk bond BBB which now becomes a net receiver of spillovers to the tune of 6.7%.

A clearer pictorial analysis of the net directional volatility spillovers is provided in Figure 5. While we detect many features similar to the patterns of the returns connectedness, there are still some relative distortions. For instance, the net spillover between the highest and the lowest investment grade sukuk bonds (AAA and BBB) is zero, as evidenced from the absence of a linking arrow between them. Also, investment grade sukuk bond AAA is now a net transmitter of spillover to investment grade sukuk bonds A, whereas it is a net receiver of spillover from investment grade sukuk bond AA.

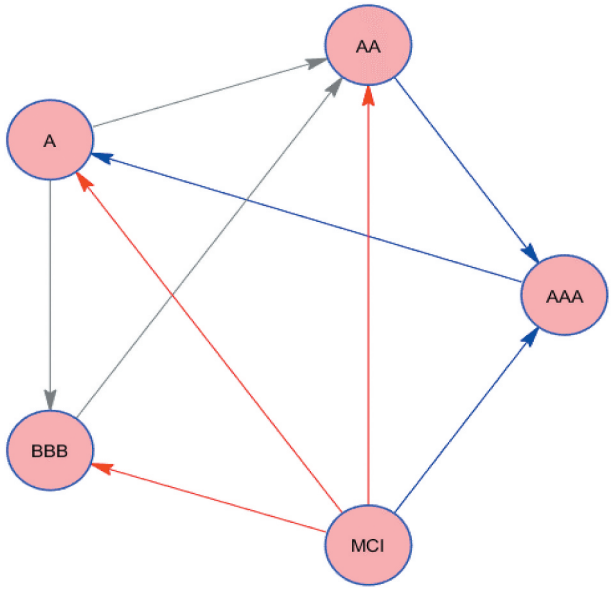

Figure 5. Network-based net pairwise directional volatility spillover results. This figure shows the pairwise connectedness of volatility of sukuks with ratings AAA, AA, A, BBBB and media coverage index (MCI). The direction of spillover (transmission) is from source to the edge of each arrow.

The next question we ask is if the volatility connectedness is time-varying, and whether it observes similar pattern as the returns connectedness. Figure 6 shows that the volatility connectedness was quite high at the early period of the COVID-19 pandemic (i.e. early 2020) after which it began to fall till around January, 2021. The mild increase afterwards also mirrors the spread of the news regarding the second wave of the pandemic. Across all the periods, however, the connectedness is low, indicating that the volatility spillover is weaker than the returns spillover. Turning in the direction of the net directional spillovers, there are more oscillations across positive and negative net spillovers (Figure 7). Investment grade sukuk bond AAA is largely a net receiver of spillovers except around the second quarter of 2021. This is unlike the next higher investment grade sukuk bond AA which exhibits a net transmitting status around March and April of 2020, and from the second quarter of 2021. The least investment grade sukuk bond BBB follows a similar pattern as sukuk bond AA, except that its net spillover value from the second quarter of 2021 revolves around the zero axis. However, investment grade sukuk bond A appears to exhibit a completely opposite behaviour as investment grade sukuk bonds AA and BBB. At the two highlighted periods for the sukuk bonds AA and BBB, sukuk bond A is a net receiver of spillovers, but a net transmitter at other periods. MCI remains a net transmitter of spillover across all the periods.

The dynamic or time-varying analysis of the volatility connectedness appears to display some intrinsic information for the period under study more than the returns connectedness. For the sukuk bonds, their unique spillovers around March and April, 2020 and the second quarter of 2021 are clear depiction of the reaction of investors to the

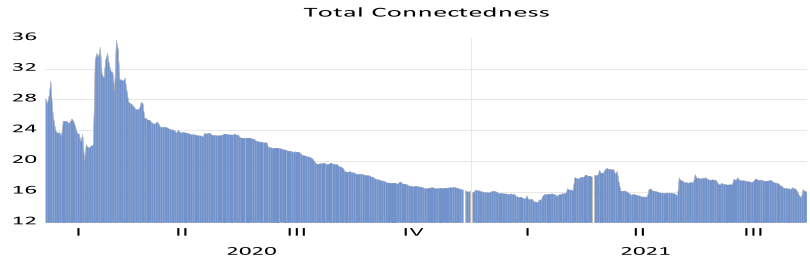

Figure 6. Total volatility connectedness result. This figure shows the time-varying total connectedness of the volatility of sukuk and media coverage index (MCI) over the sample period.

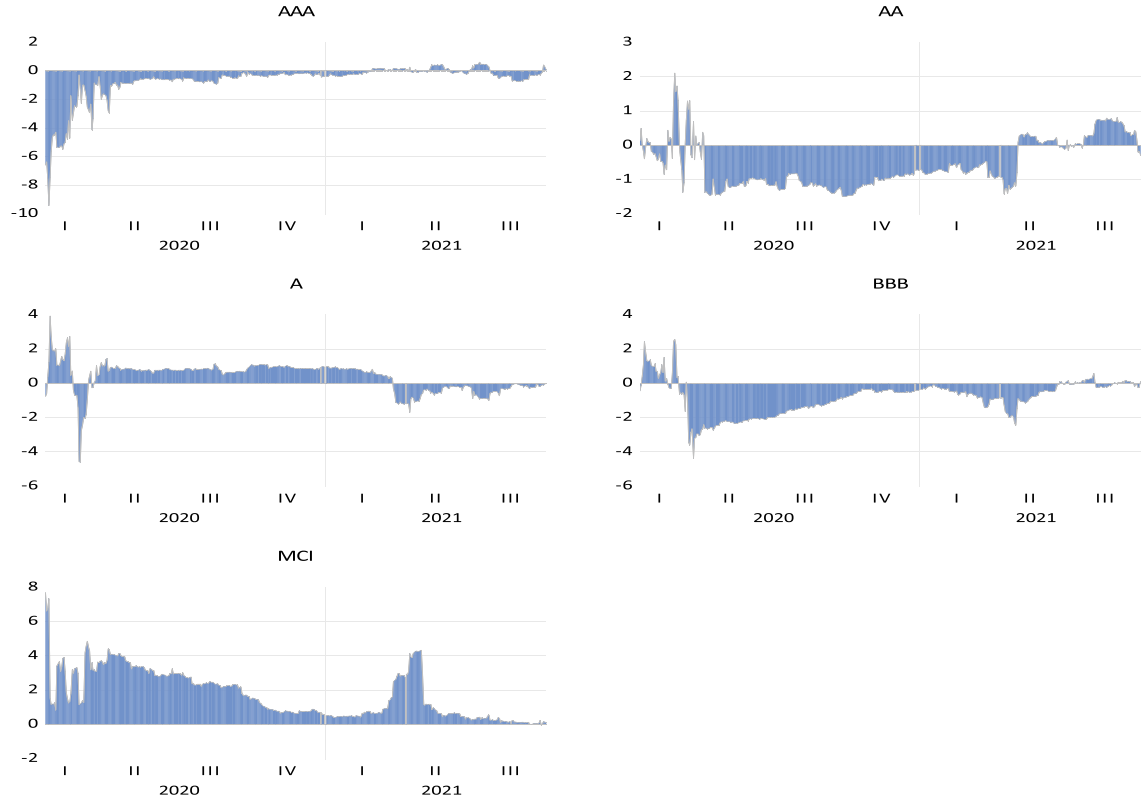

Figure 7. Total net volatility connectedness results. This figure shows the time-varying net connectedness of the volatility of sukuk and media coverage index (MCI) over the sample period. A positive value shows transmitter of shocks, and a negative value shows recipient of shocks.

media news regarding the outbreak and the second wave of the pandemic, respectively. In particular, sukuk bonds AA and BBB tend to be relatively resilient to shocks from other fellow assets during both periods, and sukuk bond AAA during the latter period only. However, sukuk bond A is susceptible to shocks during both periods. Flipping the coin over, when the market tends to be free of intense pressure of market news, sukuk bond A is a stable asset with positive net spillovers, whereas others, except sukuk bond BBB in the early months of 2020, are susceptible to spillover shocks. As such, it can be inferred that sukuk bond A is a better investment asset during reduced market pressure, whereas the sukuk bonds AA and BBB are more viable in the presence of heightened market pressure. However, none of the bonds seem to have a hedging power against the exact media sentiments.

VI. Conclusion

In this study, we examine the returns and volatility spillover effects of media sentiments on four different investment grade sukuk bonds, namely AAA,

AA, A, and BBB during the COVID-19 pandemic period. An analysis of this sort becomes important in the presence of different crises that alter financial market performance, generate sentimental behaviour by investors, and causes risk transmission across markets. Thus, investors are often more concerned about the assets that are able to serve as hedging tools and provide stable returns during a turbulent market state, whether the highly or lowly graded sukuk bonds. Our findings reveal that the returns of the sukuk bonds are more influenced by the media sentiments relative to their volatilities. In both cases, however, media sentiments exert significant spillover effects on the sukuk bonds, but is greater for their returns and higher during the periods of penetrating media news on the outbreak and second wave of the COVID-19 pandemic. Among the sukuk bonds, we observe for the returns connectedness that the low graded sukuk bonds are net transmitters of spillovers to the high graded sukuk bonds. Similar evidence holds for the volatility spillovers, except that sukuk BBB changes to being a net recipient of spillovers, and its net directional spillover relationship with sukuk AAA is zero, among a few other differences. Finally, we observe that the spillover relationship is time-varying, with exceptional spillovers happening during the periods of intense media news that followed the outbreak and the second wave of the COVID-19 pandemic. This is more revealing for the volatility connectedness, as the sukuk bonds AA and BBB tend to be more resilient to spillover shocks during these periods of intense media news, while sukuk bond A shows a higher resilience during reduced media pressure.

The above findings provide suitable grounds for investors to take prudent investment strategies during similar health crisis. At the forefront of the policy implications of these findings is the understanding that the media sentiments consistently impose spillover effects on all the sukuk bonds. However, the fact that the intensity is relatively lower during the periods of reduced media news is suggestive of the possibility of the sukuk bonds to provide relative hedging against media sentiments during those periods. The resilience of the sukuk bonds AA and BBB during these periods of high media news implies the hedging attributes of these bonds against media induced sentiments.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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