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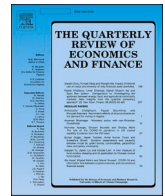
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Sukuk liquidity and creditworthiness during COVID-19

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ABSTRACT

This paper presents the empirical liquidity study of Islamic fixed-income securities during 2020–2021. Using bid-ask and Z-spread metrics we demonstrate that the apogee of both, liquidity and credit stresses in international sukuk market is reached in early April 2020. Contrasting results for non-Islamic fixed-income instruments, we show that sukuk credit spreads recover to pre-Covid levels faster than their bid-ask spreads. However, we find that the share of liquidity component in the yield spread of sukuk always remains below 1%, revealing that Covid-19 does not worsen in relative terms the economic attractiveness of this financing channel for Shariah-concerned entities and investors.

1. Introduction

The COVID-19 global outbreak has impacted economies and capital markets around the planet in an unprecedented manner (Gubareva, 2021a; b; Liu & Su, 2021; Zhou et al., 2021; Umar, Gubareva & Sokolova, 2021; Umar et al., 2022a; b; Gubareva et al., 2023). However, the sukuk market has been largely remaining afloat during the Covid-19 pandemic as a valuable funding source, allowing governments to foster the recovery of their economies and an important channel of corporate finance for Shariah-concerned companies (Naifar, 2022). The faith-based nature of Islamic fixed-income securities makes them distinct from non-Shariah-compliant instruments (Umar & Gubareva, 2021; Bossman et al., 2023). Therefore, the decision to use sukuk for sovereign and corporate financing is influenced by both, religious and economic reasons (Minhat & Dzolkarnaini, 2017; Uddin et al., 2020).

One of the important aspects relative to both Islamic and non-Islamic fixed-income markets, is liquidity of the instruments on the secondary market (Said et al., 2018; Ariyana et al., 2020; Balli et al., 2021). However, whereas the effect of the COVID-19 pandemic on non-Islamic fixed-income markets has been studied in the recent literature (Kargar et al., 2020; Zarembo et al., 2021; Gubareva et al., 2022; Umar et al., 2022b; Gubareva & Umar, 2023; Gubareva et al., 2023), liquidity of Islamic fixed-income securities remains not addressed. Therefore, this study fills this void by performing extensive empirical research of USD-denominated sukuk liquidity over the two first years of the Covid-19 pandemic, 2020 and 2021. This is an essential sector with significant source of financing for sovereign and corporate entities, representing appealing opportunities for both Shariah-conscious and solely bottom-line driven investors.

We contribute to the literature on the pandemic impact on the sukuk

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market in the four following ways. First, this paper provides empirical evidence that sheds light on sukuk liquidity during the pandemic period. Second, this manuscript contributes to the advancement of the contemporaneous knowledge on Islamic finance response to the Covid-19 effects, lending support to market participants, traders, investors and policymakers. Third, we show that the bid/ask spread of sukuk securities abruptly widens around March, 2020, indicating a temporary contraction in trading activity. Fourth, we find that the share of liquidity component in the yield spread of sukuk always remains below 1%, revealing that Covid-19 does not worsen in relative terms the economic attractiveness of this financing channel for Shariah-concerned entities and investors.

2. Methodology and Data

Bid/Ask spread is one of the commonly used measures of market liquidity of fixed income securities (Kargar et al., 2020; Balli et al., 2021; Gubareva, 2021a; b; Gubareva et al., 2022). The bid/ask spread allows to assess how liquid is the fixed-income market: the higher the spread, the lesser liquid is the security. It provides a superior metric of differences in liquidity across the fixed-income markets (Gabrielsen et al., 2011). Hence, we employ this measure for an in-depth analysis of liquidity across various types of sukuk encompassing diverse sectors of economic activity.

We employ the Bloomberg Generic Prices (BGN) for analyzing the USD-denominated sukuk market, which is primarily an over-the-counter segment. BGN price is a real-time composite price for corporate and government fixed-income securities, based on executable and indicative quotes from multiple dealers. BGN source provides credible and transparent pricing across a wide range of fixed-income securities and allows gauging available consensus-forming prices.

Our dataset includes 70 most liquid sukuk fixed-income securities, which are the constituent members of SP Funds Dow Jones Global Sukuk ETF and for which there are available BGN prices for the 2020–2021. These instruments are issued to finance sovereign states and diverse corporations from 9 sectors of economic activity, namely: Communications, Financials, Food and Beverage, Fossil Energy, Industrials, Materials, Real Estate, Technology, and Utilities. In what concerns the covered geographies of the subjacent risk, they comprise 8 economies, namely, United Arab Emirates, Saudi Arabia, Indonesia, Malaysia, Qatar, Dubai, Kuwait, and Hong Kong. All considered sukuk securities possess credit ratings in the investment-grade (IG) range, thus, being qualified as investment-suitable instruments.

We gauge liquidity levels for the secondary international sukuk market during 2020–2021 on a daily basis. At each date and for each security we extract BGN bid and ask prices, and the respective zero-volatility (Z-spread) subjacent to the BGN prices. Thus, we can calculate the bid/ask spread for each security and compare its time dynamics to the Z-spread behavior. The zero-volatility spread (Z-spread) is a useful measure to assess the value of a security. Z-spread is a credit spread metric, which is the amount of additional yield that an investor aspires to gain over the entirety of the spot rate US Treasury yield curve to be justly rewarded for taking the risk inherent in a non-risk-free (non-US-Treasury) security. The Z-spread calculation is performed by discounting future cash flows at the spot rate curve, which allows to iteratively determine the constant spread, i.e., Z-spread, needed to make the sum of discounted cash flows equal to the market price of the analyzed instrument. In order not to indulge in resources demanding mathematical simulations, we extract Z-spread value from Bloomberg's Yield and Spread (YAS) calculator. Z-spread represents an insightful measure in the fixed-income markets. It acts as a useful gauge for pricing and valuing fixed-income instruments in the situations when inherent risk can substantially influence security valuation.

The knowledge of Z-spread together with the bid/ask spread allows us to determine the liquidity component, i.e., the liquidity share, in the yield spread as a ratio of the bid/ask spread, i.e., liquidity-dependent

Table 1
Sample Statistics.

	Bid-Ask spread (bps)	Z-spread (bps)	Liquidity component in yield spread (%)
Mean	0.77	140.0	0.60
Median	0.63	113.9	0.63
Minimum	0.53	56.7	0.38
Maximum	1.49	344.0	0.88
Standard Deviation	0.21	66.7	0.12
Observations	501	501	501

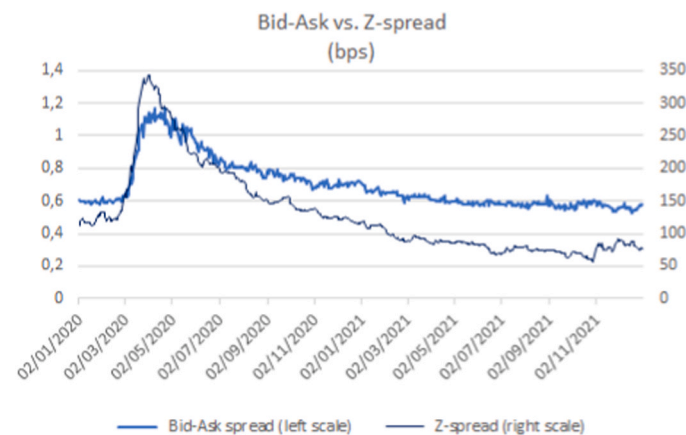


Fig. 1. Sukuk's bid-ask spread and Z-spread dynamics.

margin, to the entirety of the Z-spread. We calculate the liquidity component as a percentage representing the share of the bid/ask spread in the total width of the Z-spread.

For the bid/ask spread, Z-spread, and for the liquidity component in the yield spread we calculate the following relevant metrics, namely: the aggregate mean of the measurements from Bloomberg for each sukuk security, the median, the minimum, the maximum and the standard deviation. Table 1 represents sample statistics.

Our findings are the same for the analysis based on mean and median values. Below we follow the median-backed optics.

3. Results and Discussions

Fig. 1 presents the comparative bid-ask versus Z-spread analysis. We observe the liquidity squeeze and abrupt credit deterioration, occurring almost simultaneously in March 2020, with the apogee of both type of stresses reached in early April 2020. However, the maximum width of the Z-spread of 341.9 bps attained on April 02 precedes, the two local maxima for the bid-ask spread both equal to 1.17 bps, reached on April 08 and then two weeks later on April 22. These results contrast to the findings obtained for non-Islamic fixed-income market, where the highest stresses for both liquidity and credit risk are registered on March 23, 2020 (Gubareva, 2021a; b). Hence, we can conclude that sukuk instruments are more resilient to the advancement of the pandemic than the non-Islamic fixed-income securities. It is also worth noting that the two major squeezes in sukuk liquidity occur on Thursdays, i.e., just before Friday, which is a holy day for Muslims. Although international sukuk, studied in our paper, are traded also on Fridays, we ascribe the observed phenomena to the compliance by Islamic investors with Shariah teachings, and highlight a need for further study of the day-of-the-week effects in trading Islamic fixed-income instruments.

As per Fig. 1, it could be seen that the Covid-19 effects produce considerable influence of the liquidity cost, causing the bid-ask spread almost double from the 0.59 bps level in the first half of January 2020 to 1.17 bps three months later in April. However, the Covid-19 impact on

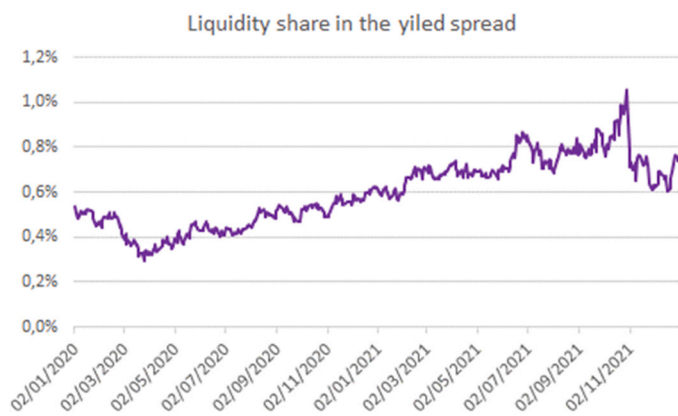


Fig. 2. Evolution of the bid-ask to Z-spread ratio.

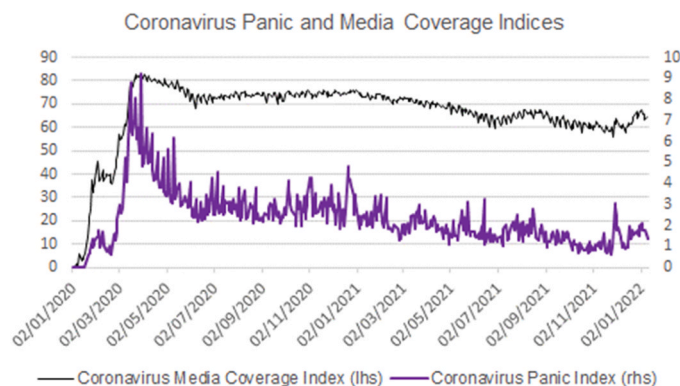


Fig. 4. Ravenpack Coronavirus Panic and Coronavirus Media Coverage Indices.

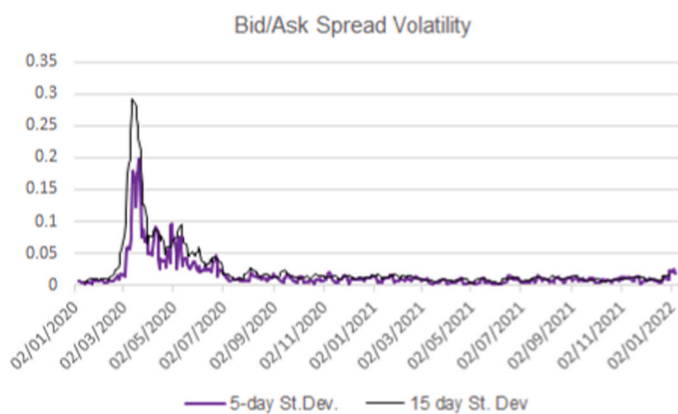


Fig. 3. Volatility dynamics of the Bid/Ask spread.

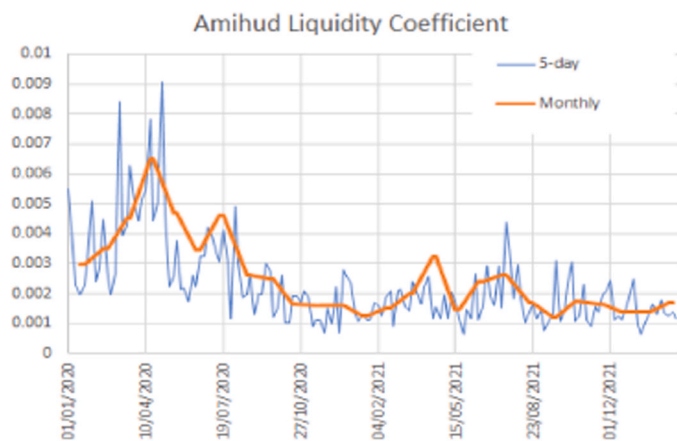


Fig. 5. Amihud Ratio: 5-day and monthly calculations.

the overall creditworthiness of the sukuk is even more drastic. The Z-spread not doubles but triples due to the pandemic outbreak, widening from the 116 bps level in the first half of January to 342 bps on April 02, 2020. Comparing the behavior of the two plotted curves in Fig. 1, we conclude that the Z-spread widening is more abrupt than the broadening of the gap between the bid and ask prices. The same finding holds, for the recovery from the peak of the crisis, when Z-spreads recedes to the pre-Covid-19 levels at least half a year swifter than the bid-ask spread. The latter retreats to the pre-pandemic values only in the second half of 2021, and since then remains fairly stable as in January-February, 2020. These findings differ from the previous results obtained for the non-Islamic fixed-income market when credit spreads recover to pre-pandemic levels more slowly than bid-ask spreads (Gubareva, 2021a; Gubareva et al., 2022). Hence, we conclude that there is no considerable sukuk's credit risk repricing after COVID-19-ignited turmoil. In addition, we see that Z-spread in the second half of 2020 dwells at values 40 bps below the pre-Covid-19 levels. We ascribe this observed phenomenon to employing the very same set of sukuk along the whole period, making residual maturity at the end of the period become 2 years shorter than at the beginning. This also results in the fact that the share of liquidity component in the yield spread at the end of the period is larger than before and during the Covid-19 induced crisis.

Fig. 2 presents the time dynamics of the ratio of bid-ask spread to the Z-spread, representing the share of liquidity component in the all-in spread.

The meaning of the ratio between bid-ask and Z spreads is the weight of liquidity component in the all-in yield of sukuk, allowing to gauge a relative portion of liquidity risk vis-à-vis the whole premium, i.e., additional yield, which an investors demands over the spot rate US Treasury yield curve to be fairly compensated for taking the risk

inherent in a non-risk-free sukuk security. From the chart in Fig. 2 we infer that the relative share of liquidity risk in the yield spread, representative of the weight of liquidity component vis-à-vis all other risks, is reduced during the most turbulent times of the Covid-19 crisis in the first half of 2020. We attribute this finding to the less speculative nature of sukuk market trades, as even deteriorating creditworthiness of issuers, although still affecting the bid-ask spread, does so to lesser extent in relative terms. We find that the share of liquidity component in the yield spread of sukuk almost always remains below 1%, thus, revealing that Covid-19 does not worsen the economic attractiveness of this financing channel for Shariah-concerned entities and investors, supporting contemporary sukuk importance in economic development and implying that previous findings of Minhat & Dzolkarnaini (2017), continue valid throughout the pandemic.

Fig. 3 presents the volatility dynamics of the liquidity measures. The volatility behavior is gauged by the 5-day and 15-day standard deviation of the bid-ask spread values.

From the two curves depicted in Fig. 3 we infer that the major spikes in volatility of the liquidity metrics coincide with the abrupt upsurge, observed in the very beginning of April 2020 for the proper liquidity component as gauged by the bid-ask spread; see Fig. 1. In what concerns the specific event explaining these maxima observed in April 2020, we ascribe these dynamics to the extreme uncertainty regarding the further escalation of the Covid-19 pandemic, which could be observed by analyzing the behavior of the Ravenpack Coronavirus Panic Index¹ and of the Ravenpack Coronavirus Media Coverage Index,² which we depict

¹ <https://coronavirus.ravenpack.com/worldwide/panic>

² <https://coronavirus.ravenpack.com/worldwide/media-coverage>

Table 2
Descriptive statistics for COVID-19-related variables.

Statistics	N	Mean	St. Dev.	Min	Median	Max
pct_BID-ASK arperup	494	-0.17	2.41	-13.44	-0.07	8.86
pct_Z-spread arperup	494	-0.19	1.83	-6.98	-0.30	9.01
pct_max bid-ask	494	2.07	27.50	-87.76	-0.11	300.16
pct_min bid-ask	494	3.07	32.91	-71.68	-0.18	329.58
pct_max z-spread	494	-0.09	1.75	-7.58	-0.10	18.74
pct_min z-spread	494	2.37	33.53	-82.41	-0.47	529.63
pct_total_cases	436	4.24	16.76	0.00	0.75	223.53
pct_new_cases	436	4.80	28.41	-54.10	2.65	159.78
pct_total_deaths	436	2.59	9.35	0.00	0.50	112.90
pct_new_deaths	436	10.92	53.94	-80.00	0.00	500.00
pct_Stringency index	494	0.82	4.53	-3.58	-0.04	59.52
pct_Containment health index	494	0.82	3.91	-2.45	0.01	53.71
pct_Government response index	494	0.82	3.84	-2.10	0.01	50.39
pct_Economic support index	494	1.36	15.62	-5.61	0.00	300.00
pct_PANIC_INDEX	494	3.13	27.77	-66.67	-1.06	134.06
pct_MEDIA_COVERAGE_INDEX	494	1.51	23.25	-58.49	0.17	495.00

for visual analysis in Fig. 4.

Analyzing the shape of the curves in Fig. 4, we observe that the maximum value of the Coronavirus Media Coverage Index is registered on March 25, 2020, while the absolute maximum of the Ravenpack Coronavirus Panic occurs on March 30, 2020. The extreme uncertainty installed around the globe by the end of March, 2020, has resulted in a global meltdown of financial markets. The markets halted by predominance of uncertainty and panic mood, would enter into a downside spiral and would have provoked even greater uncertainty and panic. However, this vicious circle has been ruptured by the Federal Reserve, which in late March, 2020, has ejected liquidity in capital markets, cut interest rates, and announced unlimited Quantitative Easing, thus softening the Covid-19 adverse influence on global market liquidity (Gubareva, 2021a; b). In this paper, we provide empirical evidence that such dynamic is also observed for the sukuk markets.

Continuing our studies of the liquidity dynamics, we also compute the Amihud (2002) ratio for the stocks of the sukuk issuers; see Fig. 5. This is an alternative approach to independently certify the qualitative correctness of our conclusions based on the direct bid-ask metrics of the sukuk liquidity (see Fig. 1). It helps to understand the factors affecting illiquidity as the Amihud (2002) ratio is based on the two meaningful parameters, namely, the volume traded on a certain day and the respective daily return. We estimate the 5-day and monthly Amihud (2002) ratio using the returns and the daily respective daily volumes.

In Fig. 5, the two plots tell us the same story with the only difference being the excess volatility of the 5-day curve vis-à-vis the monthly Amihud (2002) ratio measure. We clearly see that illiquidity increases in March and in the first half of April, 2020, and then decays to the pre-Covid-19 levels and even to lower levels starting from September, 2020, onwards. Thus, the results presented in Fig. 5 corroborate the results from the direct bid-ask based methodology, as per Fig. 1.

In addition, we have undertaken econometric analyses to understand the factors affecting sukuk's illiquidity and creditworthiness. We used COVID-19 database, which includes relevant time series such as the number of cases, number of deaths, stringency policy, among many others; see the following link: <https://github.com/owid/covid-19-data>. Our analyses have allowed us to understand how the sukuk liquidity and creditworthiness react to some specific COVID-19-related variables. According to the ADF test for stationarity, at the 1% significance level, all series are not stationary. Therefore, we estimate the ARIMAX models for the time series increments (pct). For the sake of clarity and brevity we in this investigation employ the single-factor models. Table 2 provides descriptive statistics for the time series increments of the.

The single-factor ARIMAX models reveal the relationship between the daily changes in the dependent variable (period t) and the growth rate of various factors with a lag (period $t-1$).

Here we present our principal findings for the bid-ask liquidity measure. At the 5% level, a significant positive impact on the increase in the bid-ask liquidity measure is recorded for the increase in COVID-19 deaths and in the COVID-19 Ravenpack Media Coverage index. For other variables, namely the increase in Panic index, Stringency index, Cumulative number of disease cases, Containment and Health index, Government Response Index, the effect on the bid-ask measure is positive, but the statistical significance is low.

Now we proceed to the description of our main finding for the Z-spread creditworthiness measure. At the 5% level, a significant positive impact on the increase in Z-spread creditworthiness measure is observed for the increase in the total number of the COVID-19 cases and in the COVID-19 Containment and Health Index. Moreover, at the 10% level, a significant positive impact on the increase in the Z-spread creditworthiness measure is observed for the increase in the Government Response Index. For the increase in other variables such as Panic index, Stringency index, and Deaths, the effect on the Z-spread measure is positive, but the statistical significance is low.

It is important to note, that differently from previous studies, our results distinguish between impacts on liquidity and creditworthiness, providing the factors that are most impactful for each of the metrics, being, thus impactful for diverse types of market players using sukuk in their portfolios and trades.

4. Conclusion

This paper investigates impacts of the COVID-19 pandemic on sukuk liquidity, performing the comparative analysis of the bid/ask and Z-spread. Our research provides the first-ever empirical evidence that sheds light on sukuk liquidity during the Covid-19 pandemic and fills-in the respective gap literature. We find that the apogees of the liquidity squeeze and credit stress are reached almost simultaneously in early April 2020. However, credit spreads recover to the pre-pandemic levels more swiftly than the bid-ask spread indicating that credit risk of sukuk issuers has not been considerably repriced in the aftermath of the COVID-19 crisis. From economic point of view, we find that the share of liquidity component in the yield spread of sukuk, always remains below 1%, revealing that Covid-19 does not worsen in relative terms the economic attractiveness of this financing channel for Shariah-concerned entities and investors.

Moreover, we employ the single-factor ARIMAX models to analyze the factors affecting illiquidity and creditworthiness of sukuk. For the bid-ask liquidity measure we find that at the 5% level, the increase in COVID-19 deaths and in the COVID-19 Ravenpack Media Coverage index produce a significant positive impact on the increase in the bid-ask liquidity measure. For the Z-spread creditworthiness measure, at the 5%

level, the increase in the total number of the COVID-19 cases and in the COVID-19 Containment and Health Index produce a significant positive impact on the increase in Z-spread creditworthiness measure. Furthermore, at the 10% level, a significant positive impact on the increase in the Z-spread creditworthiness measure is observed for the increase in the Government Response Index.

Our results are of potential use for diverse types of sukuk-related financial practitioners, including traders, risk managers, and regulators of fixed-income markets operating with Islamic law compliant securities.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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