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Covid-19 and high-yield emerging market bonds: insights for liquidity risk management

Mariya Gubareva[1,2]

Abstract

Around the apogee of the pandemic crisis in late March 2020, trading liquidity has evaporated out of high-yield (HY) bond markets across developing states. Concerned about this phenomenon, we assess emerging market (EM) debt liquidity as a combination of three metrics: (i) bid–ask spreads; (ii) relative liquidity score incorporating market depth, trading volumes, and time needed to liquidate an asset; and (iii) round-trip transaction costs—evidencing that all have worsened by the end of the first quarter of 2020. We complement our analysis by tracking the dynamics of the option-adjusted spreads of the EM HY bonds and document that the recovery trends of the credit and liquidity components in bonds spreads have decoupled in the aftermath of the Covid-triggered global meltdown. We evidence relevant differences in bond liquidity between chosen countries, representative of geopolitical regions. All the considered liquidity measures provide a coherent picture of the pandemic impact and allow for insights regarding the recovery from the crisis turmoil and the risk management of the EM HY bond portfolios throughout a systemic crisis.

Keywords Pandemic crisis · Coronavirus outbreak · Liquidity · Emerging markets · High-yield bonds · Bid–ask spread · Option-adjusted spread (OAS) · Relative liquidity score · Round-trip transaction cost

JEL codes G01 · G1 · G10 · G12 · G15 · G32

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Introduction

From the point of view of political economy, market is freedom, as access to it makes an individual free to trade or not to trade. In a more concrete context of the fixed-income securities market, liquidity in fact is a synonym of transparency and democracy. Better liquidity and transparency make investments in fixed income become more democratic, allowing for further transformation of the proper model of retail investing, including several electronic trading platforms, such as, for instance, MarketAxess and Tradeweb, among others. In this way, retail investors from both developed and developing countries have each time more real chances to become an important part in the financing of emerging market (EM) economies. A constant progress in this direction brings about an opportunity for fundamental shifts in the financial and political landscape, allowing for more sustainable and equitable economic and social policies.

However, this gradual process was severely disrupted by the Covid-19 pandemic, whose magnitude requires effective and timely responses from the developing states. For example, because of the disrupted macroeconomic conjuncture, commodity prices have fallen adversely affecting EM economies while the costs to access financing for their economic agents have significantly risen, see, e.g., Nuguer and Powell (2020). The willingness of the governments to intervene in the solution of the Covid-19 fueled crisis and to act decisively is nowadays of extreme importance especially for withstanding the negative impacts of the pandemic in developing and emerging economies. This is valid for all the sectors of economic activity, and an especially acute necessity currently exists regarding the financial industry, as money and funding could be compared to blood, required for the functioning of the entire economic body of the countries. In particular, the restoring of maker liquidity to the pre-crisis levels is one of the most urgent objectives of the state and monetary authorities, such as governments and central banks inter alia, in both the developed and developing states.

Moreover, prior to propose different types of official responses in a wake of the recently emerging new economic domain—the economics of liquidity,—it is necessary to perform an applied economic diagnostics of the impacts of Covid-19 on liquidity. The present paper aims to provide such assessment and discusses several insights, which could enable the economy to recover and make both the developed and developing countries and their financial systems more resilient for the future.

The Covid-19 economic consequences in EMs remain uncertain as the pandemic continues causing new cases. Since the beginning of 2020, the virus contagion has severely hit main EMs, which have already been adversely affected by a set of indirect impacts of the pandemic in developed markets, such as disruptions in trade and supply chains, as well as by falling commodity prices. Moreover, since March 2020, EMs have been also suffering from direct effects brought about by the Covid-19 contingency measures: social distancing, mobility restrictions, etc. Deteriorating financing conditions with significant capital outflows have caused EM currencies to fall and credit spreads to widen.

Global markets have been adversely impacted by the ongoing Covid-19 pandemic outbreak. The fast propagation of the coronavirus disease has paralyzed trading activities by installing an extreme volatility environment across financial markets, characterized by high levels of risk due to disruption of a common-place business of traders and investors fearing uncertain economic perspectives (see, e.g., Alfaro et al., 2020; Goodell, 2020; He et al., 2020; Rameli and Wagner, 2020; Zhang et al. 2020; among others). It is worth noting the extremely negative impact of the Covid-19 crisis on the developing states. The spread of the Covid-19 to the EM economies has put in evidence that they are excessively dependent upon foreign funding. As the Covid-19 pandemic has been exercising a negative influence on the growth perspectives and fiscal accounts of the developing states (Baldwin and Mauro, 2020), many investors have been escaping exacerbated uncertainty of the developing economies. They have been withdrawing their investments from the developing states and channeling their freed funds into the relatively safe developed markets, setting in motion a huge flight-to-quality vicious cycle, see, for instance, Gubareva and Borges, 2016, and Papadamou et al., 2021.

This move of international investors is comprehensible because the EMs have been profoundly impacted by the pandemic in the three principal dimensions (Hevia and Neumeyer, 2 020). The first strand comprises a profound first-order influence of social distancing and mobility restrictions on EM economies, heavily affecting tourism and leisure sectors of economic activities among many others. The second domain is linked to the collapse of foreign demand, provoking an abrupt slide in commodity prices, extremely harmful for GDP of the developing states, which are mostly exporters of the commodities. The third dimension of the pandemic impact is related to the liquidity squeeze in March 2020, which has deeply affected worldwide financial markets. In particular, trading liquidity has evaporated out of the EM HY bond markets. This lack of liquidity, meaning that the exit door for investors from EMs has suddenly become considerably smaller, has caused important changes in portfolio allocation strategies, which have begun privileging more liquid and safer assets of the developed markets, and, hence, making EM financing costs sensibly increase.

It is worth noting that the external, denominated in USD currency HY debt market of the developing countries is an essential market for financing their economies. According to Quinsonas, 2019, the HY bonds represent more than one third of the total external EM bond market, surpassing a three trillion figure. However, in spite of the importance of the EM fixed-income markets as a relevant channel of funding for their economic agents, the influence of the pandemics on this domain of global finance has not received a fully adequate coverage in the literature. Nonetheless, we acknowledge the existence of rather rare exceptions, such as Acharya and Steffen, 2020; Gubareva, 2020; Haddad et al., 2020; Hartley and Rebucci, 2020; Kargar et al., 2020; and Pandolfi and Williams, 2020. Still, major part of these studies is primarily focused on government debt and investment grade bonds, not addressing the most vulnerable high-yield (HY) debt, especially of corporate obligors.

Considering this, we are motivated to investigate in more detail the dynamics of the EM external HY bond market throughout the escalation of and the initial recovery from the pandemic meltdown, which have taken place in the first semester of

2020, being characterized, in particular, by the liquidity squeeze in March. Therefore, we are especially interested in the time behavior of the weight of liquidity component in the option-adjusted spreads (OAS) of EM fixed-income securities in line with Gubareva, 2020. However, we undertake a deeper dive into liquidity issues, as contrary to Gubareva, 2020, where only bid–offer spreads were used to gauge the whole credit spectrum of IG and HY bonds, we herein employ the three distinctive, and hence complementary metrics to carry out our liquidity studies focused now only on EM debt with credit ratings below investment grade. These newly employed in scientific literature metrics are relative liquidity scores and round-trip transaction costs. Differently from the purely holistic approach of Gubareva 2020, we herein zoom on selected geographies and evidence relevant differences in bond liquidity between chosen countries, representative of geopolitical regions.

Our motivational drivers comprise the importance of bond markets for providing a reliable and stable access to financing for corporate and sovereign entities from the developing countries with credit ratings below the investment grade. Therefore, the external HY debt market, playing a substantial role in fostering of the worldwide economic growth under normal market conditions, becomes of extreme relevance for orchestrating the recovery from the pandemic slowdown. Moreover, from the investors´ point of view, the EMs HY bonds, given their attractive risk-return ratios, have always been considered as assets possessing appealing attributes for the aggressively positioned strata of the investment community.

In line with our motivation, the present study contributes to the literature focused at the pandemic impacts on the EMs HY bonds market along the six following strands. First, our paper fills a void in empirical research in this domain. It is important as a well-functioning secondary market supports a better access of the EM issuers to funding through the primary market bond issues. Second, we add to the stream of the studies addressing the reaction of financial markets as a whole to the Covid-19 economic impacts. As the time span of our research spreads over the pandemic slowdown, our findings are capable of providing useful insights on this subject for financial professionals and regulators of fixed-income markets. Third, our study registers that the bid–ask spread of the HY debt issued by entities from the developing states abruptly widens while the relative liquidity plunges towards the end of the first quarter of 2020. The Covid-19 disruption in the EM bond trading across the globe triggers a drop-off in liquidity that further severely hits the EM bond market already affected by the pandemic-induced repricing of credit risk. Fourth, we observe that the round-trip transaction cost starts to climb along with the bid–ask spread metric and reaches its local maximum in late March, but then, differently from the bid–offer spread, exhibits the second local maximum in mid-June. This evidences that the economics of HY is deeply impacted by both, the rapid escalation of virulent disease, and then by an acute struggle of the EM HY entities to cope with the economic consequences of the pandemic, resulting in extreme uncertainty regarding their recovery perspectives. Fifth, we zoom our study on Brazil, Egypt, India, Mexico, and Turkey and report insightful differences between these countries, contributing in this way into country specific research activities. Six, finally yet importantly, the novel aspect of the presented empirical study resides in the proper fact that further to the bid–ask spread, we use two metrics widely employed

by market practitioners, namely the relative liquidity score and round-trip transaction cost, which have been completely overlooked in academy research and literature on liquidity of fixed-income markets.

The remaining part of our work is structured in the following manner. The employed data and methodology are discussed in "Methodology and data" section. Our results and their implications are presented in "Results" section. Section "Risk management considerations" section is dedicated to the most relevant considerations for the liquidity risk management. Section 5 finalizes the paper providing the main conclusions from our findings.

Methodology and data

Along the first half of 2020, we investigate liquidity patterns of HY debt issued by obligors from the developing states. The delta between the bid price and the ask price, known as bid–ask spread, is the most widely used measure for fixed-income market liquidity. In other words, it is the spread between the so-called buying and selling prices, which indicate, respectively, the willingness to purchase and to sell an asset (Kargar et. al., 2020). Acknowledging that different markets may need many distinctive liquidity metrics, several researchers show that the bid–ask spread provides a fairer metrics of assets liquidity differences in the markets whose main *modus operandi* is request-for-quote; for corporate and sovereign bond markets see, for instance, Fleming, 2003, and Gabrielsen et. al., 2011, among many others. In the first part of our analysis, we use this measure, as we are predominantly interested in a comparative liquidity study covering various types of issuers: corporate, financials, and sovereigns.

Herein, we investigate the HY debt issued by obligors from the developing states. This bond market is, inherently and by large, a perfect example of over-the-counter (OTC) market with privately quoted prices. Hence, our choice is to undertake the analysis based on the bid–ask spread metrics, using the Bloomberg Valuation Service (BVAL) prices, which are available from Bloomberg terminals. BVAL provides transparent and credible prices for a large gamma of fixed-income assets. Being independent form market players, BVAL offers neutral unbiased prices quotations, based on data sourced from many thousands of market players. These market data allow to compose objective third-party prices, reflecting fair value of financial instruments. In Annex I, for advanced reading, we present a description of the Bloomberg methodology for the Valuation Service in more detail.

Our data comprise bid and ask prices and option-adjusted spreads (OAS) of bonds, which are constituents of the Bloomberg-Barclays EM HY indices: BEBGOAS (EM HY OAS index) and BEBGTRUU (EM HY Total Return index), each of which aggregates more than seven hundred HY USD-denominated issues from 74 developing countries.

Apart from studying and reporting aggregated data for 74 EM, we zoom our research on five EM countries, representative of several geopolitical regions, namely Brazil, Egypt, India, Mexico, and Turkey, analyzing the respective samples of 15, 8, 8, 26, and 36 HY bonds issued by the obligors from these countries.

We measure bid–ask spreads on a twice-a-month basis, however, during the most turbulent March–April 2020, period, we switch to the once-a-week measures. Using BVAL bid and ask prices, at any date and for any security, we are able to determine the bid–ask spread. In fact, we compute the bid–ask spread for each bond on stand-alone basis and, hence, we are capable to track the time dynamics of bid–ask spreads either on individual or on aggregate basis.

In addition to the analysis based on the bid/offer spread, we employ the two other metrics, namely, the relative liquidity score and the round-trip transaction cost, which are rather rarely used in academia research, although they are very popular among portfolio managers and other market practitioners.

For a relative liquidity measure, we choose the main outcome of Bloomberg Liquidity Assessment (LQA) tool – the LQA Liquidity Score, further referred to as the LQA score. Measured on a scale from 1 to 100 (100 being the most liquid), the LQA score characterizes the relative liquidity of an instrument in the covered worldwide universe, which encompasses more than one hundred thousand bonds. In other words, the liquidity score gauges the ability to sell a security at the lowest cost for a comparable range of volumes. In Annex II, for advanced reading, we present a description of the Bloomberg LQA methodology in more detail.

Since five years ago, the LQA score has become the industry standard definition and the well-regarded measure for liquidity of fixed-income securities. The LQA score nowadays represents a widely used and robust alternative to several approaches in the market while academia continues merely centered on bid/offer spread. It is especially so, as, otherwise, liquidity is difficult to estimate due to the lack of data and transparency. We measure LQA score weekly during all the sample months.

In parallel, we assess an instrument-specific cost of a round-trip transaction, which is conceptually based on a simpler metrics of liquidity, usually referred to as "cost of transacting." This metrics is the spread between bid and the offer prices, at which dealers are potentially interested in buying and selling an instrument at the very same point in time; see, for instance, Kargar et al., 2020. However, in the markets that operate via request-for-quote, such as corporate and sovereign bonds, and where the prices are quoted privately, it is not an easy task to accomplish due to the lack of data and low frequency of transactions, see, e.g., Feldhütter, 2012.

Hence, to operationalize our study, we employ one more outcome of the Bloomberg LQA tool, namely, the liquidity cost, further in the text referred to as LQC. LQC is a percentage transaction cost estimate for fixed-income securities based on the Bloomberg's proprietary LQA methodology. LQC is a per-issue percentage round-trip transaction cost estimate for an institutional size trade, i.e., a value of 1 equals to 1% cost as percentage of price; therefore, a lower LQC indicates better liquidity. We measure LQC weekly during all the period considered for our analysis. In Annex III, for advanced reading, we present a description of the Bloomberg LQC methodology in more detail.

To complement our liquidity-focused research, we also use the OAS metric, as its comparison to the pure liquidity metrics could provide additional important insights, in particular regarding the decoupling of liquidity and credit risk after the pandemic

meltdown in March 2020. The OAS figures are obtained from Bloomberg´s yield and spread (YAS) calculator.

For the four above-mentioned parameters, namely the bid–offer spread, LQA score, LQC, and the OAS, we compute, for each of the chosen dates, the three important statistical metrics, namely mean, median, and standard deviation values. Such sample statistics allow us to ascertain that our results are robust and not skewed by a few outliers as qualitative conclusions, in our case does not depend on whether mean or median values are used in the analysis. In the next "Results" section, dedicated to the empirical findings, we present the statistical tables, with the three above-mentioned metrics. However, for the purpose of simplicity and laconicism, the graphs are based on mean values, as the market practitioners consider them as better proxies for financial performance.

We conduct our study for the HY EM debt both on the aggregated level and per type of issuers investigating separately sovereigns, financials, and corporates.

The next section is dedicated to the discussion of our results.

Results

Bid–offer spread versus OAS

Table 1 presents the descriptive statistics, which allows us to figure out that our results are robust and are not skewed by a few outliers to the point to distort our qualitative conclusions. It is so as the time behavior of the mean and median values is of the same kind: the local maxima in both bid–ask spread and OAS cases are observed at the same points in time. Nevertheless, the fact that the mean values are always superior to the median figures for the two analyzed herein distributions – bid/offer spread and OAS – indicates that all these distributions are positively skewed. However, our qualitative conclusions hold for the both analysis, remaining the very same independently of whether the mean and median values are used. Therefore, bearing in mind the effectiveness of the communication, the figures presented below are based on the mean values, as the market practitioners consider them as better proxies for financial performance.

Figure 1 presents the comparative, bid–ask versus option-adjusted spread analysis.

As could be seen in Fig. 1, liquidity squeeze and credit stress occur, in fact, simultaneously; during the two first decades of March 2020. After the observed illiquidity peak in March, the costs of transaction, as per the bid–ask metrics, exhibit a considerable retracement along the three following months: April, May, and June period. Though the pre-Covid levels are not reached yet, the transacting costs are already approaching those levels. Differently from this pattern, the OAS recovery is less convincing, as option-adjusted spreads, by the end of the first half of 2020, are still quite distant from their pre-Covid values. For example, after the recovery in the two consecutive months, the option-adjusted spread measurements seem to stabilize in June in a range of values higher than those observed during pre-pandemic times. This evidences that creditworthiness of EM HY debt has been severely impacted

Table 1 Sample statistic data: bid–ask and option-adjusted spreads

| Date	Mean bid/ offer spread (bps)	Median bid/ offer spread (bps)	Bid/offer standard deviation (bps)	Mean OAS (bps)	Median OAS (bps)	OAS standard deviation (bps)
12/30/2019	46.6	40.6	28.5	463.4	349.9	459.6
1/15/2020	38.6	34.8	22.2	484.8	340.1	547.8
1/31/2020	39.9	35.4	22.4	508.2	350.3	623.1
2/14/2020	38.9	33.6	25.1	506.9	330.2	667.5
2/28/2020	46.2	40.9	26.8	566.9	373.1	767.8
3/9/2020	75.1	54.2	89.4	645.8	438.9	802.2
3/16/2020	100.7	75.2	95.4	961.0	649.0	1096.5
3/23/2020	125.3	91.7	143.3	1289.6	907.2	1398.7
3/31/2020	106.6	78.4	116.2	1323.2	865.9	1488.0
4/8/2020	89.6	71.4	73.4	1301.0	901.5	1387.9
4/15/2020	90.0	67.7	81.0	1164.0	823.8	1196.4
4/23/2020	84.9	66.6	69.0	1224.2	760.2	1490.3
4/30/2020	81.4	67.3	63.2	1231.6	772.9	1484.1
5/15/2020	75.7	61.8	54.9	1167.9	706.8	1534.4
5/29/2020	68.0	57.2	40.5	1065.8	651.1	1508.1
6/15/2020	70.5	60.1	45.4	945.2	590.6	1313.0
6/30/2020	64.4	56.0	39.5	951.9	590.1	1434.8
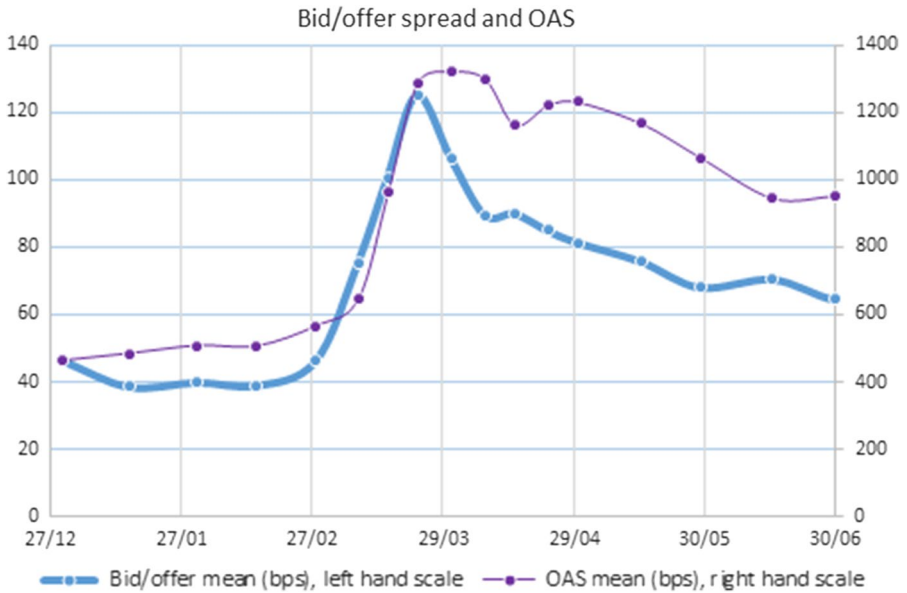
Fig. 1 Bid/offer spread and OAS, January—June 2020

by the pandemic-fueled meltdown. Moreover, since April 2020 onwards, we see that the recovery trends for credit and liquidity risks decouple. This phenomenon indicates that credit risk of HY debt, as per option-adjusted spreads, has been substantially repriced, being such repricing caused by the socioeconomic effects of the pandemic.

In addition, we report the quantification of the time-average figure of the bid–ask spread over option-adjusted spread ratio; it equals 8.0% for the entire analyzed period. However, during the liquidity squeeze observed in March, it reaches its maximum of 11,6%, evidencing that under financial stress conditions, the liquidity component becomes more pronounced and hence needs to be adequately accounted for both trading and risk management purposes.

Bid-ask spread for corporates, financials, and sovereigns

Figure 2 depicts time behavior of the average bid—ask spread per type of issuer: corporate, financial, and sovereign.

We observe that the most adverse impact on bid/offer spread during the liquidity squeeze in March 2020 was experienced by corporates. As analyzed through the prism of the bid–offer spread, the liquidity of sovereigns suffered slightly less. Interestingly, in January and February, before the peak of the pandemic meltdown in March 2020, and after it, in April, May, and June, the bid/offer spreads for corporates are slightly narrower than of sovereigns. However, sovereigns resist better than corporate to the extreme stresses, exhibiting a slightly better levels of liquidity through the crisis peak. Moreover, we find that the debt, issued by the HY obligors pertaining to the financial sector, as per our sample comprising sixty-five financials of the developing states, is more resilient vis-à-vis liquidity shocks, because the impact of the Covid-19 turmoil on them is less pronounced. Figure 2 evidences that,
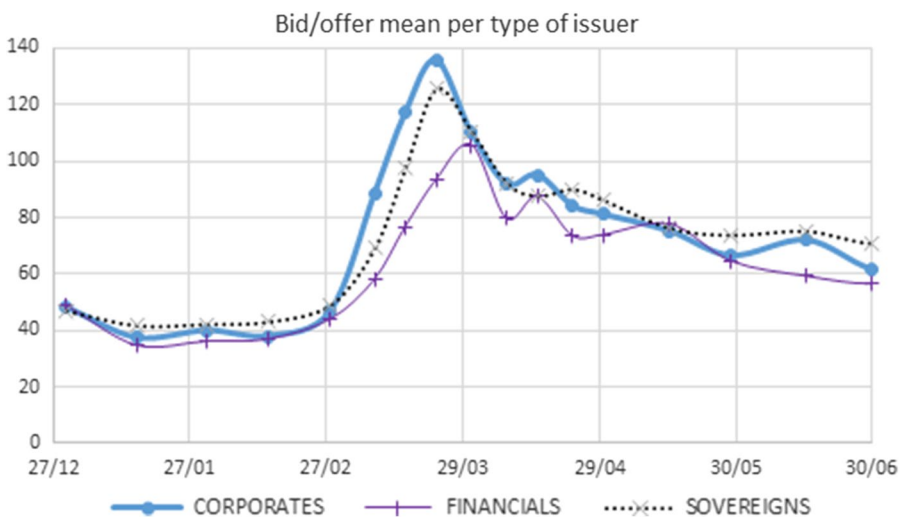

Fig. 2 EM HY bid/offer spread per type of issuer

for financials, bid–ask spread widening is less in degree and lags behind the trends exhibited by sovereigns and corporates. We also find that during the pre-Covid months of January and February, as well as since mid-May, EM HY sovereign bid—ask spread is wider than the values verified for corporate and, especially, financial sector debt, the latter with the difference of about 10 basis points. Highly likely that the adversely impacted sovereign liquidity component reflects several negative effects, arising from the complex and problematic restructuring of the Argentina's sovereign debt, which exercises a contagious influence over investors´ perception regarding both default and liquidity risks inherent to the sovereign bonds issued by the developing states.

The observed enhanced resilience of bonds issued by the financials to liquidity stress is expectable, as the financial sector represents not a vertical silo structure similar to other sectors of economy, but rather a kind of super-layer on top of the whole economy, or a kind of a "back-office" of a "front-end" corporate economy.

The financial sector is not immediately influenced by the "first wave" of the Covid-19 economic slowdown, as the obligors affected in the first place are the corporate borrowers who commence having difficulties to repay their debt to lenders from the financial sector. Hence, the financial sector becomes affected by the "second wave" of economic consequences, when massive delinquencies are observed with respect to debt servicing by the firms and individuals. In this way, the financial sector exhibits somewhat enhanced stability in comparison to other "front-end" sectors of economic activity. This resistance of financials to liquidity stress is correctly captured by our tracking of the bid/offer spreads.

Thus, the performance of both overall financial sector, in general, and debt issued by financial sector, in particular, represents a result of time integration of performance of all other economic sectors whose debt represents the asset of the financial sector. Hence, the performance of financial sector debt is to be smoother than the performance of corporate and sovereign debt even in the periods of extreme turmoil, such as the Covid-19 pandemic, meaning that both liquidity risk and credit risk of the financials are less extreme in comparison with sovereigns and corporates and, therefore, are easier to manage and mitigate.

LQA score and LQC analysis

Table 2 is a sample statistics table, which contains statistic measures – mean, median, and standard deviation – for each of the two analyzed herein parameters, characterizing an instrument-specific relative liquidity and round-trip transaction cost, namely: liquidity assessment (LQA) score and liquidity cost (LQC).

In line with the descriptive statistics for bid/offer spread and OAS, the presented sample statistics for LQA score and LQC allows us to conclude that our results are robust and not skewed by a few outliers to the point to distort our qualitative conclusions. It is so as time behavior of mean and median values are, by large, the same, with the local extrema verified on March 27, for both the LQA score (minimum) and the LQC (maximum). Interestingly enough, for the LQA score/ LCQ cost, the mean values are inferior/ superior to the median figures. Hence, the LQA score and LCQ

Table 2 Sample statistics: LQA score and LQC

Data	LQA Liquidity Score (units)			LQC Liquidity cost (%)		
	Median LQA Score	Mean LQA Score	Standard Deviation	Median LQC Cost	Mean LQC Cost	Standard Deviation
12/27/2019	64	62	22	0.44	0.59	0.99
1/3/2020	65	62	22	0.46	0.66	1.49
1/10/2020	62	60	21	0.49	0.67	1.35
1/17/2020	64	60	21	0.50	0.66	1.19
1/24/2020	66	62	21	0.51	0.63	1.04
1/31/2020	64	62	21	0.52	0.63	0.88
2/7/2020	67	64	21	0.47	0.58	0.65
2/14/2020	66	64	21	0.46	0.56	0.59
2/21/2020	65	63	20	0.44	0.54	0.62
2/28/2020	61	59	19	0.59	0.66	0.55
3/6/2020	62	59	19	0.62	0.71	0.51
3/13/2020	55	52	19	0.90	1.01	0.70
3/20/2020	49	47	20	1.06	1.28	1.10
3/27/2020	45	45	21	1.14	1.36	1.09
4/3/2020	46	45	22	1.09	1.32	1.09
4/10/2020	49	48	22	0.98	1.21	1.12
4/17/2020	52	51	22	0.83	1.07	0.99
4/24/2020	55	53	22	0.78	1.02	1.26
5/1/2020	58	55	22	0.74	1.02	1.27
5/8/2020	59	55	23	0.77	1.17	2.31
5/15/2020	57	53	23	0.81	1.27	3.14
5/22/2020	56	52	23	0.82	1.29	2.55
5/29/2020	55	51	23	0.86	1.39	2.81
6/5/2020	52	50	23	0.92	1.49	2.34
6/12/2020	50	48	23	0.98	1.57	2.45
6/19/2020	51	48	22	0.96	1.51	2.44
6/26/2020	53	49	22	0.90	1.33	2.08

distributions are differently skewed, which makes their joint consideration more robust, especially as they result in the very same conclusions regarding the liquidity conditions in the market.

Our conclusions remain the same, independently of whether the analysis is based on mean or median values. Nonetheless, the graphs presented below are based on mean values, as the market practitioners consider them as better proxies for financial performance.

Figure 3 compares the time dynamics of the LQA score and the LQC.

As could be seen in Fig. 3, the degradation of the relative liquidity score and the increase in the cost of round-trip transaction coincide with the escalation peak of the pandemic, which has provoked the liquidity squeeze occurred in late March. The
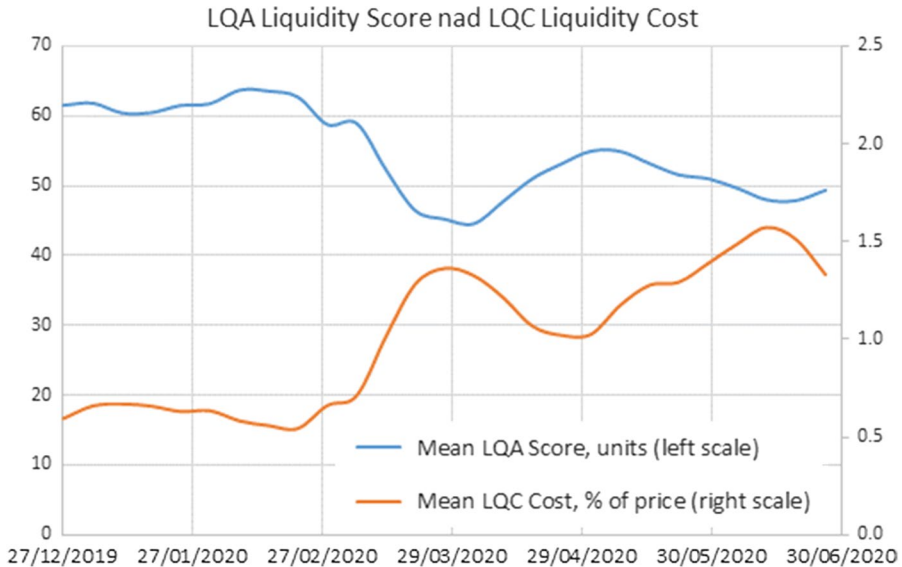
Fig. 3 LQA score and LCQ for the EM HY bonds, January—June 2020

abrupt increase in transaction costs has occurred in March 2020, as per the LQC metrics, along with the decay in a relative liquidity measure, i.e., LQA score; see Fig. 3. After that, both curves have bounced back. However, they were unable to demonstrate a sustainable recovery, and then due to the Covid-19 s wave uncertainties and unclear economic perspectives, the liquidity of the EM HY bond began to deteriorate once again and by the end of June was at the levels observed at the very apogee of the pandemic turmoil. Both the LQA score and the LQC are far from reaching the pre-Covid levels.

At this point, we extend our studies by zooming our research on five EM countries, representative of several geopolitical regions, namely Brazil, Egypt, India, Mexico, and Turkey. Figure 4 presents the evolution of Bloomberg LQA Liquidity Score for HY bonds by country.

According to Fig. 4, the LQA Liquidity Score metrics exhibit signs of deterioration of the considered set of countries. This observation corroborates with the conclusion derived from analysis, based on the aggregated data for 74 EM countries as per Fig. 3. However, the differences between the countries are clearly observable in Fig. 4. For instance, the HY bonds issued by Brazilian and Turkish obligors are more resilient to adverse market conditions, proved to be less vulnerable, than other countries, to the Covid-19 triggered credit crunch and liquidity squeeze in March 2020. The Bloomberg LQA Liquidity Score for bonds issued by obligors from Egypt has suffered a rapid a pronounced decline, but has recovered in April to the pre-pandemic levels, demonstrating, we posit, most likely an inadequate perception by market participants of a relative liquidity of HY Egyptian bonds in a situation of a halted trade, which, however, was relatively quickly remediated and restored by proper forces of the recovering market. With respect
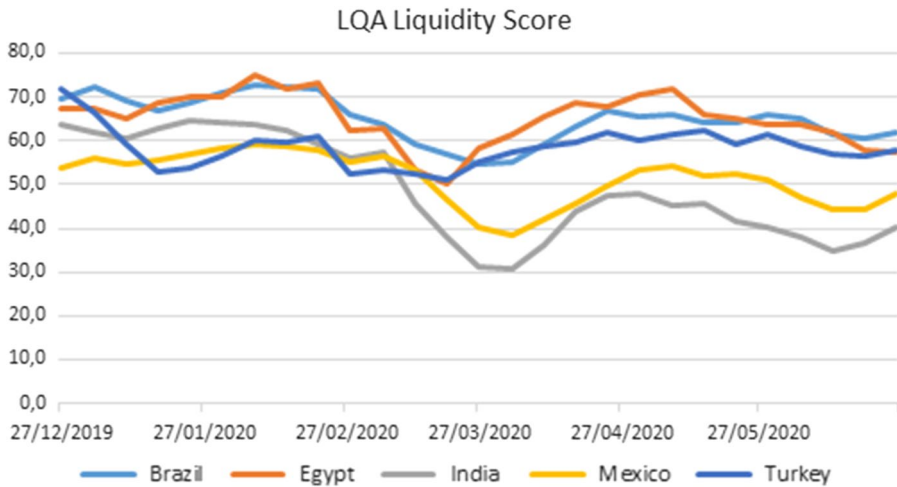
Fig. 4 LQA Liquidity Score on per country basis, January—June 2020

to India and Mexico, these countries were affected more strongly, than the others by the Covid-19 crisis, as could be inferred from Fig. 4 due to a wide deep around late March, observable in the two respective curves. The fragility of the HY bonds, issued by Indian and Mexican obligors, could be also seen taking into consideration a second depression in the respective LQA Liquidity Score curves in mid-June, most likely arising as a result of a second wave of Covid-19 pandemic, which was especially impactful for these two economies.

Figure 5 presents the evolution of Bloomberg LQC Liquidity Cost by country.
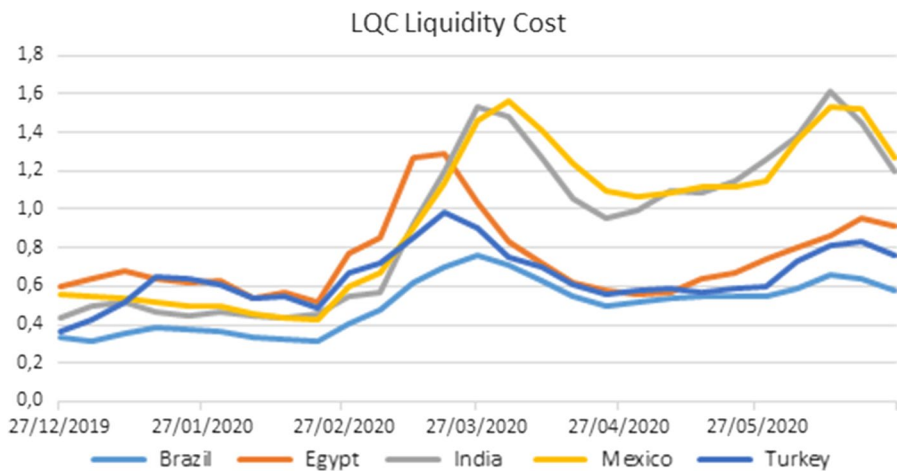

Fig. 5 LQC Liquidity Cost on per country basis, January—June 2020

Figure 5 further corroborates with the findings obtained from Fig. 4. Overall, LQA Liquidity Cost metrics has suffered during the first half of the pandemic year. However, one could clearly see that by the end of June 2020, the liquidity cost of Brazil, Egypt, and Turkey bonds has been impacted less than the liquidity cost of India and Mexico. In fact, we observe a spike in a liquidity cost relative to the bonds issued by the Egyptian obligors, but it was short lived, which is comprehensible, if one takes into consideration the explanation provided by us after the Fig. 4. On the other hand, the liquidity costs of India and Mexico exhibit two-hump profile, most likely evidencing a certain structural fragility of the economy of these two countries, which seems to be highly susceptible and vulnerable to the dynamics of a virulent disease, known as Covid-19, mirroring each wave of pandemics in their debt liquidity metrics.

Further research, hence, is desirable to get more insights into the time behavior of liquidity metrics and trends of their recovery from the pandemic-fueled market disruption, which has severely affected the most vulnerable part of the fixed-income instruments, namely the EM HY bonds.

Risk management considerations

The pandemic-triggered squeeze in liquidity of EM HY debt market, observed in March 2020, serves as indication that the fixed-income capital market data flows are inefficient in many aspects to enable resilient and accurate bond pricing. It is so, as these markets, until now, heavily rely on request-for-quote manual data operations between counterparties resulting in disparate datasets, which make over-the-counter fixed-income markets suffer from information asymmetry and decentralized *modus operandi*. Therefore, insights regarding the fair pricing, deducible from the available data, are fragmented from the very beginning and then spread out and absorbed through the over-the-counter operations between counterparties, which are unable to destroy the fragmented and disparate nature of the data available to counterparties, preserving in this way the ever-present *status quo* asymmetry of information. Such information asymmetry under financial stresses becomes hardly bearable, leading to a complete trading stalemate and liquidity evaporation, an example of which we have documented herein. Below we provide a few thoughts on why this happens.

Given this over-the-counter market landscape, the buy-side and sell-side traders and portfolio managers are inclined to consider several composite prices—e.g., provided by Bloomberg, such as CBBT, BGN, BVAL, and so on, and by other third-party pricing providers—for both trading execution and close-of-business reconciliation purposes. However, the main problem that the execution traders encounter during financial turmoil is a low confidence in these types of prices. It is so, as, in general, such composite prices are based on the registered trade prices, which could be just fire sells in the periods of crises, on the most reliable quotes – firm bids and firm asks – along with indicative quotations. In other words, composite prices are based on market activity relative to a chosen security. However, if fixed-income securities become illiquid, due to socioeconomic collapse, as we see during the pandemic, or due to bond-specific idiosyncratic reasons, the composite prices do not

convey, anymore, fair value of financial instruments, as there is no active market with going-on bond trading. It is especially so for HY securities, and even more so for EM debt, as even under normal market conditions they possess very vulnerable liquidity profiles, as EMs are not so deep as those of the developed economies.

Even if there is an imbedded pricing algorithms or methodologies, which is the case of BVAL, the problem is that such pricing methodologies and their assumptions are pre-defined, and are not sufficiently dynamic to withstand challenges of crisis times, thus resulting in incorrect pricing. All these cause low confidence of traders in electronic algorithms used in automated trading platforms, making them to switch to voice trading. Note that many price providers have deactivated their automated algorithms during the apogee of the pandemic in March 2020, aggravating bond liquidity problem even further. On the other hand, those providers, who have maintained their pricing service through the pandemic, have not gained a lot of confidence from market players and regulators either. So what are possible ways to approach this structural problem of over-the-counter fixed-income markets?

Perhaps, the focus should be made on artificial intelligence (AI) applications utilizing machine-learning algorithms. The AI algorithms represent self-learning systems, usually characterized by a complete absence of knowledge regarding the assumptions underlying the calculations. For sure, it requires a bit of cautiousness, however, allows avoiding exacerbated by conventional pricing algorithms problems of information asymmetry between the sell-side and the buy-side. The main goal of the AI techniques, applied to fixed-income capital markets, is to provide the most accurate price for a chosen security. AI algorithms can price securities automatically, allowing for automated traded workflows.

Commonly, price is attributed to each bond on a stand-alone basis, and spread and/or yield curves are constructed and maintained for individual issuers. Machine-learning algorithms, as a rule, work with huge amounts of market data, allowing to decipher such pricing drivers as historical trends, analyses of comparable issues, price volatility, trading volume, obligors´ fundamentals, market sentiment, credit, rating, sector of economic activity, among many others. Hence, AI-based pricing is potentially capable of pricing a large number of both liquid and illiquid bonds under normal market conditions, as well as through the crisis, when a vast cohort of bonds become illiquid, as illiquid bond pricing is business as usual in the normal times. Further research in this field seems to be highly desirable.

Conclusion

Amidst the pandemic outbreak, diverse types of lockdown, curfew, travel restrictions, and other policies, envisaging to increase social distance between people, have been put in place to save lives in both the developed and developing countries. Such lockdown and mobility restrictions have negatively impacted financial markets liquidity, in general, and fixed-income trading activities, in particular. Our research addresses the effects of the pandemic-triggered uncertainty on liquidity of HY debt of the developing countries. We analyze the bid–ask spread, OAS, relative liquidity measure, namely, LQA score, and the instrument-specific round-trip transaction

cost LQC. Our research is performed on a per-type-of-issuer basis for sovereigns, financials, and corporates. We find that liquidity and credit risks reach their apogee in March 2020. It is worth noting that whereas liquidity of HY debt of the developing states, as measured by bid/offer spread, has started to considerably improve towards the end of June, the pre-crisis levels have not been reached by that time. However, option-adjusted spreads exhibit a slower recovery, due to the Covid-19-fueled increase in default risk, accompanied by the respective repricing of bonds, compatible with higher than the pre-Covid widths of credit spreads. In addition, our study evidences that HY debt issued by obligors from finance industries of the developing states exhibits a stronger resilience to shocks in capital market liquidity in comparison to EM HY corporates and sovereigns.

We also investigate time dynamics of the commonly used in the recent years liquidity metrics, which have already become, in addition to the bid/offer spread, the market standard measures of liquidity. They are the LQA score and the LQC. We show that their joint consideration provides an additional robustness to our findings regarding the impact of the Covid-19 economic consequences on the EM countries.

Apart from studying and reporting aggregated data for 74 EM, we zoom our research on five EM countries, representative of several geopolitical regions, namely Brazil, Egypt, India, Mexico, and Turkey and report insightful differences between these countries. For instance, we document a stronger resilience from liquidity point of view of Brazilian and Turkish fixed-income securities, while the HY bonds issued by obligors from India and Mexico exhibit vulnerabilities, which we attribute to the structural problems of these emerging economies.

The findings of this research are potentially useful for market participants and policy makers in the fixed-income domain of global finance. In particular, our results are capable of providing valuable insights for elaborating policy solutions, aimed to help the EM economies recover from the ongoing severe systemic crises. Such recovery-targeting economic policies should be aimed at providing relief, assuring that the core of the economy is maintained preserved as much as possible for propelling the recovery, and, ultimately yet importantly, at guarantying financial stability, based in its turn on adequate levels of liquidity across financial markets. For instance, FED has helped to overcome the worldwide liquidity stress in March 2020, by ejecting liquidity into financial markets, by bringing the US interest rates close to zero, and by having announced an unconventional monetary policy of unlimited Quantitative Easing. Following the FED intervention, several central banks of the developing states have implemented a set of special programs and started purchasing diverse securities denominated in local currency; see Hartley and Rebucci, 2020. In battling the impacts of the Covid-19, we spotlight central banks of Indonesia, Poland, Philippines, South Africa and Turkey. The present paper evidences on an aggregate basis that the bazooka-style reactions of FED and EM central banks have managed to soften the adverse effects on EM liquidity brought about by the ongoing pandemic. Nonetheless, we are cautious and consider that EMs will need to see some stabilization, especially in view of the consecutive waves of the Covid-19 cases. Still we hope that the official macroeconomic policies will assure the maintenance or improvement of the current liquidity levels, allowing for sustaining confidence of businesses and individuals,

which is a *sin-qua-non* condition for the successful return to the normal business activity, which permits to heal the socioeconomic wounds of the pandemic outbreak and the triggered by it economic slowdown.

Annex I

Bloomberg methodology for the Valuation Service—BVAL

The BVAL is an evaluated pricing service that provides credible, transparent and highly defensible prices across a broad spectrum of fixed-income financial instruments. It is an independent information source that draws on market data collected from thousands of market participants to produce objective third-party price valuations. A real-time access to market quotes which form a vast universe of contributed sources represents a key advantage of BVAL's methodology. This accumulated mass of market data is the main driver of an innovative and quantitative BVAL valuation approach. It first defines market levels on actively traded bonds. For those securities that are less liquid, the BVAL valuation approach provides a comparable relative value price.

Another key feature of Bloomberg methodology for the Valuation Service—BVAL is that each price valuation also provides a subjacent BVAL Score, a Bloomberg proprietary, and innovative metric designed to gauge the amount and consistency of data used in calculating the BVAL Price. The BVAL Score is gauged on a scale of 1 (the lower data consistency) to 10 (the highest data consistency). Each BVAL price is also supported by additional related metrics that are linked to the market data that serve as a basis dataset for the respective valuation.

BVAL uses the highest-quality data, integrated across a wide universe of market providers numbering in the thousands. These data are cleansed and validated. Every input and output is tested for reliability, cohesion, and quality of basis information, assuring that BVAL provides consistent pricing for a security.

BVAL offers a distinctive *sui generis* opportunity to achieve data consistency. With BVAL, all market players, portfolio managers, traders, researchers, and academicians are enabled to use the same valuations that are being used in the front-, mid-, and back-office of diverse peer providers, which apart from consistency assure improved operational efficiencies, by substituting silo-like organizations by data-integrated financial institutions. This is an important feature from the point of view of advanced risk management practices, as it allows breaching the gaps between, finance, accounting, portfolio optimization, and risk management.

Wrapping up, BVAL provides credible and transparent prices for a broad spectrum of financial instruments, covering fixed income, derivatives, and structured finance. BVAL is an independent source of information, which uses market data contributed by thousands of market participants, i.e., providers. BVAL employs this broad global dataset of market snapshot observations together with market-leading analytics to produce objective third-party price valuations.

Annex II

Bloomberg methodology for Liquidity Assessment—LQA

Clear understanding of market liquidity exposure is a key component of a robust risk management framework of a financial institution. Bloomberg's LQA Solution for fixed-income securities aims to provide a fully accessible model in which one can evaluate liquidity along the three dimensions, namely, of cost, time, and selling volume. Bloomberg's LQA Solution takes a fully probabilistic approach to examining liquidity, where the data-driven model is able to statistically capture structural relationships between market conditions, available volume, and other factors that affect liquidity. At the center of Bloomberg's LQA model, there is the joint probability distribution over liquidation cost and liquidation horizon for given volumes across a vast universe of fixed-income securities.

Bloomberg LQA Liquidity Score is a relative measure between a universe of securities considering the relative 'average liquidation cost' incurred when liquidating a range of volumes. The Bloomberg LQA Liquidity Score methodology may be synthesized as follows. First, the liquidity cost for a range of volumes for a specific security is estimated. Second, the liquidity cost for all other securities in the same asset class or sector is calculated too. Third, the results from the most expensive average cost to the lowest average cost (considering the same range of volumes) are sorted in a due order, allowing for a relative measure between securities, i.e., for comparative metrics attribution. As the result, the LQA liquidity score reflects the centile ranking of the specified security within universe of securities (or within the same sector).

Hence, Bloomberg's solution for Liquidity Assessment (LQA) provides objective quantitative evaluation of market liquidity across multiple asset classes. The LQA methodology facilitates regulatory compliance and enhances risk management and investment processes in the two following important dimensions. First, it allows to estimate liquidation cost and horizon of liquidation at a position level. Second, it permits to compare liquidity analytics across asset classes and global coverage using consistent output.

Wrapping up, the Bloomberg´s LQA methodology leverages a robust financial dataset coupled with a big-data framework to ensure the relevant factors influencing liquidity are considered. Among other important features we mention a market depth up to $7.543 mm. This distinctive approach coupled with a unique dataset allows for liquidity estimation even for instruments with limited trading activity. Detailed quality assurance processes combined with a granular back-testing framework ensure the model output always provide reliable and consistent estimation of relative liquidity measure, i.e., LQA Liquidity Score.

Annex III

Bloomberg methodology for Liquidity Cost—LQC

Bloomberg Liquidity Cost metrics (LQC) is a transaction cost estimate for a fixed-income security. LQC is a percentage transaction cost estimate for fixed-income securities based on Bloomberg's LQA liquidity assessment methodology, synthetically described in Annex II. Whereas LQA provides comprehensive liquidity analytics including a price uncertainty distribution for a given transaction quantity and a time to liquidation model, LQC is a per-issue percentage round-trip transaction cost estimate for an institutional size trade. Hence, a lower LQC indicates better liquidity.

LQC has two components. The first component is a bid–ask spread. For a sake of gauging the LCQ metrics, the Bloomberg´s methodology uses a long-term average of the bid–ask spread as opposed to the instantaneous bid–ask spread, which is often too volatile for accurate estimates. The second component is the liquidation cost component of LQC, which measures the cost of a trade from the implied mid-price.

The LQC transaction cost estimate is the sum of half of the bid–ask spread and the liquidation cost for each security where liquidation cost is the liquidation cost for the model trade provided by the LQA tool:

$$LQC = 0.5 \times bid - ask\, spread\, +\, liquidation\, cost \tag{1}$$

where both *bid–ask spread* and *liquidation cost* are expressed in percentage.

Therefore, LQC is also expressed as a percentage of a bond's price and by design can be aggregated across securities and analyzed over time. LQC allows traders and portfolio managers to establish an intuitive transaction cost indicator for a basket of portfolio trades.

From the point of view of risk management, it is important to notice that portfolio managers can easily compare relative liquidity of their portfolio holdings versus a benchmark and introduce liquidity as an additional factor to decompose active returns.

Declarations

The author declares that there is no conflict of interest regarding the publication of this paper.

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