

Corporate Bond Markets – Drivers of Liquidity During COVID-19 Induced Market Stresses

Discussion Paper



IOSCO

The Board

OF THE

INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS

OR02

APRIL 2022

Table of Contents

Executive Summary	1
Part A - Background of corporate bond markets globally	9
A1 - Corporate bonds are essentially buy and hold instruments	9
A2 - Issuance and market growth over the past decade.....	9
A3 - The role of primary markets	11
Part B - Liquidity during the COVID-19 induced stress	12
B1 - Measure of liquidity – level of primary markets issuance	12
B2 - Measure of liquidity - level of activity	13
B2.1 - The level of activity varied across jurisdictions	13
B2.2 - The level of activity varied across types of bonds.....	14
B2.3 - The level of activity was impacted by the central bank interventions	14
B3 - Measure of liquidity - price/transactions costs	15
Part C - The drivers of liquidity - supply, demand, and market participant behaviors. 16	
C1 - The demand for liquidity.....	16
C1.1 - The role of long-term investors	16
C1.2 - The role of open-ended funds	22
C1.3 – The role of the official sector	23
C1.4 – The role of distressed buyers	24
C2 - The supply of liquidity - the role of dealers	26
C2.1 - Dealer behavior during and since the March 2020 turmoil.....	27
C2.2 - Dealer inventory and central bank intervention:.....	28
C2.3 - Drivers of dealer behavior	30
Part D - Corporate bond markets’ structure and implications on liquidity provision ..	32
D1 – General features of the corporate bond markets microstructure.....	32
D2 – Dealer intermediation and concentration.....	33
D3 - Corporate bond heterogeneity and standardization	34
D4 - Trading in corporate bonds	35
D5 - Growth of electronic trading.....	36
D6 - Increased transparency	39
Annex 1 – Discussion questions	41
Annex 2 – References	43
Abbreviations used in this report	45

Executive Summary

Corporate bond markets are an important part of the global capital markets and play a key role in financing the real economy. As part of IOSCO's objectives, there is keen interest in ensuring the fair, efficient and transparent functioning of these markets and in reducing systemic risk. The COVID-19 induced market stresses in March 2020 highlighted the potential systemic importance of liquidity dysfunction in corporate bond markets. This episode also offers regulators the opportunity to observe and develop insights into how corporate bond markets operate under stressed conditions.

As part of its 2021-22 work plan, IOSCO established a Corporate Bond Market Liquidity (CBML) working group through its Financial Stability Engagement Group (FSEG). The CBML was tasked with analyzing the corporate bond market microstructure, resilience and liquidity provision during the COVID-19 induced market stresses of March 2020 and subsequent months.¹ Parts of the CBML's work have also contributed to IOSCO's wider input to the Financial Stability Board (FSB) Non-Bank Financial Intermediation (NBF) workplan.

The work was conducted over two phases. Phase 1 provided a data-driven diagnostic review of the corporate bond markets liquidity during the COVID-19 induced market stresses. Phase 2 expanded on the Phase 1 work, firstly, by analyzing in greater depth the market participant behavior during the COVID-19 induced market stresses and the drivers of the behavior, and secondly, by analyzing possible vulnerabilities in the corporate bond market structure.

The analysis relies on data from key jurisdictions for the US Dollar, Euro, British Pound, Canadian Dollar, Japanese Yen and Brazilian Real corporate bond markets and is supplemented by a literature review as well as by extensive external stakeholder engagement.^{2, 3}

Purpose of discussion paper.

This report summarizes the results of IOSCO's analysis and solicits views from stakeholders on the key outcomes described below. Specifically, IOSCO is interested in stakeholders' feedback on possible ways to help improve market functioning and liquidity provision, such as assessing

¹ IOSCO has previously undertaken work to better understand how corporate bond markets function, including during periods of stress. For example, in 2017 IOSCO published a report by its Committee 2 on Secondary Markets (C2) examining liquidity in corporate bond (<https://www.iosco.org/library/pubdocs/pdf/IOSCOPD558.pdf>) markets and in 2018 published recommendations by C2 to improve regulatory reporting and transparency: (<https://www.iosco.org/library/pubdocs/pdf/IOSCOPD597.pdf>). In addition, in 2019, the IOSCO published a report by its Committee on Emerging Risks (CER) that examined how liquidity in corporate bond markets might behave under conditions of market stress (<https://www.iosco.org/library/pubdocs/pdf/IOSCOPD634.pdf>).

² IOSCO conducted a series of industry round tables, follow up discussions with participants, bilateral discussions with market participants, extensive engagement with trade bodies (including with a large number of their members) and selected surveys of IOSCO and FSB jurisdictions.

³ Note that the descriptions of market trends, observations, and key outcomes identified during the analysis may not be applicable to all jurisdictions.

the feasibility, benefits and costs of mitigating shifts in liquidity demand and alleviating supply side market constraints, including the potential unintended consequences from any prospective market changes. Possible areas of further inquiry, as raised by industry and academia during the development of this report, include analyzing whether there could be greater use of “all-to-all” trading or ways to reduce the frictions currently inhibiting its wider use. This might include consideration of improving price transparency in corporate bond markets and a further exploration of the benefits, drawbacks, and practicality of reducing heterogeneity of bonds and increasing standardization.

IOSCO would also be interested in stakeholders’ perspectives on how to advance the quantity, quality, and availability of public and private data. Consistent, comparable data is a critical component for market participants, central banks, and regulators alike, allowing them to trade and monitor markets fairly, efficiently, and effectively, particularly during times of stress.

Key discussion questions are included under each section of the report and are collated in [Annex 1 – Discussion questions](#)

Who will be interested in this discussion paper?

This report will interest a broad audience, including direct and indirect market participants, credit rating agencies, and academia.

The report is organized around four sections.

Section A provides background information and a brief description of the main features of the corporate bond markets.

Section B includes a summary of the Phase 1 outcomes with respect to the *state of liquidity* during the March stress. Liquidity is measured along three dimensions: (1) primary issuances levels, (2) secondary market trading volumes; and (3) the prices or implied costs of executing secondary market transactions in corporate bonds.

Section C analyses the *supply of and demand for liquidity*. This includes analyzing how market participants, namely long-term investors such as insurance companies and pension funds, as well as asset managers and hedge funds, drove the demand for liquidity during the COVID-19 market stress. On the supply side, this section looks at the behavior of dealers,⁴ the drivers for their behavior, and their role in supplying liquidity to the market. Section D also touches on the role of central banks and other large official sector participants.

The report concludes with **Section D**, an analysis of *corporate bond market structure*. This section investigates how the evolution of corporate bond markets, including its structural features, have impacted the provision of liquidity. The section first looks at the recent evolution of the corporate bond market microstructure, focusing on the key features of the traditional dealer-based model that uses bilateral over-the-phone “voice” model to connect investors and

⁴ This includes broker-dealers.

dealers (versus multilateral Request-for-Quote (RFQ) platforms). The report then looks closer at specific elements of market structure, such as bond heterogeneity, standardization, electronification, trading characteristics, and transparency.

The key outcomes of this report are summarized below.

Corporate bond markets have grown significantly since the Global Financial Crisis (GFC). IOSCO's analysis attributes this to several factors, including benign economic conditions underpinned by accommodative monetary policies, banking sector deleveraging, supportive tax treatment of debt over equity, and the increased role of central banks in certain corporate bond markets. This is in conjunction with post-GFC reforms, which, in part by design, have shifted credit intermediation to the capital markets.

Although market dynamics are evolving with new entrants such as ETFs and increased electronification, corporate bond markets maintain a large institutional and buy-and-hold component and remain mostly reliant on a limited number of dealers for intermediation. The continued reliance on bilateral OTC dealer-intermediated trading also comes at a time when the liquidity supply by dealers is more constrained and less responsive to sudden increases in demand than before the GFC. Dealers are also committing less of their balance sheets to market-making activities. No single factor can explain dealer behavior in March 2020, but a few factors do stand out, including large one-sided flows; internal risk appetite and management of balance sheet limits; and the extreme uncertainty that made risk management difficult.

There are currently limited alternative sources of liquidity, as well as challenges to improving market-making. These factors, taken together mean that corporate bond markets may be unable to absorb significant and sudden increases in selling pressure, such as those experienced under market stress.

During the COVID-19 induced market stresses of March 2020, the corporate bond markets experienced reduced liquidity. It is difficult to assess whether corporate bond market liquidity declined primarily because of reduced liquidity supply by dealers, increased liquidity demand by investors, or a combination of both – and what the greater relative contributor to the stresses was.

Summary key outcomes:

1. Corporate bond markets have grown significantly, including on a cross-border basis, over the past decade, with new issuance volume almost tripling in certain jurisdictions.

The size of the corporate bond markets has grown significantly over the past decade reflecting growth in corporate leverage. In the US, the amount outstanding for corporate bonds increased from 2008 to Q1 2020 by approximately 80%, to almost US\$10 trillion. Corporate bonds outstanding in the euro area rose by one-third over the same period, to US\$4 trillion.

Various factors have contributed to the growth of the corporate bond markets, including benign economic conditions driven by accommodative monetary policies, banking sector deleveraging,

supportive tax treatment of debt over equity, and the increased role of some central banks in corporate bond markets.⁵

2. Corporate bond markets are less liquid than some other traded markets and the number of individual corporate debt securities that trade regularly is small.

Secondary trading in corporate bonds differs from trading in other asset classes, such as equities. Bonds are heterogeneous securities compared to equities, with an interest rate component across different maturities, structures, and risk profiles. Generally, only the largest bonds trade regularly. Even those bonds that are largest in outstanding size and most traded do not match the liquidity and relatively narrow bid-ask spreads of agency Mortgage-backed Securities, Treasuries or, as an alternative point of comparison, large corporate equity listings.

While large-cap equities trade thousands of times a day (or more), bonds – even the ones considered liquid – may not trade every day. Larger institutional trades have historically dominated these markets. However, corporate bond turnover ratios (value traded over amount outstanding) are not much lower than the turnover ratios for stocks. This is because when corporate bonds do trade, the amounts are large.

3. Primary markets are important to the overall market liquidity

Active primary corporate bond markets signal positive sentiment for the asset class, provide an important component in price discovery and assessing credit spreads, and provide the buy-side with essential depth on the offer side of the market. Newly issued (“on-the-run”) bonds are generally more heavily traded. Trading in secondary markets is closely connected to conditions in primary markets. At the same time, primary issuance normally only occurs in a stable secondary market environment.

Primary markets constitute a monetary policy transmission channel for some central banks. As a result, the market dysfunction and resulting yield increases triggered rapid central bank interventions to restore market liquidity.

4. Overall, the broader corporate bond market showed reduced liquidity during the turmoil.

The March 2020 episode was a sharp and short-lived market liquidity crisis triggered by a shock originating from outside the financial system. Therefore, it differed significantly from the GFC, which was a large-scale credit crisis endogenous to the financial system that unfolded over several months. Following the announcement of coordinated central bank intervention in March 2020, market confidence and functioning were restored and, as a result, the most severe market disruption lasted only a few weeks.

Nonetheless, during those few weeks, the effects of the pandemic and the public health measures taken by governments to contain them led to widespread uncertainty and investor

⁵ The importance of each factor varies by jurisdiction. For example, prior to March 2020, the US Federal Reserve did not participate in corporate bond markets, whereas central banks played an active role in other jurisdictions.

demand for cash liquidity. Liquidity challenges affected some parts of the corporate bond market more severely than others. Trading was particularly challenging for block trades. In most jurisdictions, reflecting investor liquidity needs, initially only shorter dated and high-quality bonds were traded, although even the market in those thinned out and the credit curve flattened or even inverted. Liquidity was more robust in larger bond issues, particularly in the US.

The markets swiftly recovered following central bank intervention, with issuance levels reaching record volumes in investment grade bonds (albeit at a higher risk premium compared to before the crisis).

5. It is difficult to assess whether corporate bond market liquidity primarily dried-up because of reduced liquidity supply by dealers, increased liquidity demand by investors, or a combination of both – and what was the greater relative contributor to the stresses.

Market participant behavior played a significant role during the weeks before central bank intervention, either in exacerbating or failing to stabilize market liquidity. Given the central role of bank-dealers in the corporate bond markets, the reduced elasticity of their balance sheets was one factor that likely limited their ability to absorb significant marginal selling pressures (i.e., the increased demand for liquidity). These dealer balance sheet constraints may be one of the causes for the liquidity dry-up. This must be weighed against that impact of the sharp increase in liquidity demand that resulted from the flight-to-safety and subsequent dash-for-cash.

6. On the demand side, evidence on the influence of long-term investors in corporate bond markets during the COVID-19 stress is mixed, in part because their behavior varies considerably by jurisdiction, in part due to the nature of their investment strategies, and in part due to the extraordinary speed of the crisis and subsequent recovery.

The volume of corporate bonds bought or sold by long-term investors varied across credit types and maturities and was dependent on the structure of the investor base and jurisdiction. Limitations in available data on long-term investor activity in corporate bonds means it is difficult to concretely determine long-term investors' relative influence on the COVID-19 induced market stresses of March 2020. For the UK and EU markets, anecdotal evidence, as well as available transaction data, shows that trading activity during the peak of the March stress was largely unchanged and could suggest that long-term investors were not the main drivers of liquidity demand. This data, however, may not be entirely representative of the long-term investor base as it does not capture trading activity from long-term investors that have delegated their portfolio management to asset managers.

In principle, due to their long-dated liabilities and corresponding investment horizons, long-term investors face less pressure than other investors to liquidate tradable assets, such as corporate bonds, during periods of stress. These characteristics of long-dated liabilities also imply that long-term investors may be able to buy assets being sold by other investors facing redemption or deleveraging pressures, which can help to limit the magnitude of asset price falls.

However, in practice and in particular events, long-term investors may not always invest countercyclically for a variety of reasons. For example, long-term investors may have limited ability to rebalance their asset holdings at short notice. This can mean that to invest countercyclically during a period of acute stress, long-term investors may have to hold higher cash balances on average (which could lower return relative to their benchmarks) or use leverage (which some investment mandates do not permit).

7. Liquidity in open-ended funds (OEFs) during the COVID-19 induced market stresses of March 2020 showed that some OEFs contributed to selling pressure in some jurisdictions, driven by investor redemptions mostly related to the flight-to-quality and the dash-for cash.

In March 2020, many OEFs faced liquidity pressures, dealing with large outflows and deterioration in market liquidity. While data is not available on the global proportion of corporate bonds held by OEFs, IOSCO and FSB member jurisdiction estimates for the share of corporate bonds held by OEFs ranged from 13 to 25%.

In the US, investors withdrew more than \$200 billion from US taxable bond OEFs in March 2020. In Europe, corporate high yield (HY) bonds faced cumulative redemptions of 5% of total net asset value (NAV) within a month. From an ESMA sample, net outflows in Undertakings for the Collective Investment in Transferable Securities (UCITS)⁶ represented 5.9% of NAV, while alternative investment funds (AIFs) in the sample recorded small inflows from 17 February to 31 March. In UK authorized corporate bond funds, there were net outflows of 2.6% of NAV in March. In Hong Kong, net outflows from fixed income and/or mixed allocation OEFs ranged from 4% of investment grade bond OEFs' assets under management (AUM) to approximately 13% of the HY bond OEFs' AUM.

8. The distressed asset community played an important role, particularly in longer duration IG bonds (which is not their typical investment strategy) and other traditionally safe sectors.

The March turmoil offered opportunities for debt funds which typically focus on “mispriced” debt (i.e., debt that has dropped in price for “non-economic reasons” as investors feel pressure to sell due to liquidity concerns when markets are dislocated).

On the other hand, market participants noted that given the brevity of the dislocation in March due to the rapid central bank intervention, hedge funds struggled to raise capital in time to take advantage of the pricing changes. It was reported that there was a scramble to launch new distressed debt and special situations funds. As with long-term investors, distressed buyers accelerated their bond purchases after the central banks' interventions and the re-opening of the primary market.

9. On the supply side, dealers did not contribute to selling pressure in the way they did during the GFC. However, their behavior had little dampening effect to the extent

⁶ UCITS - Undertakings for the Collective Investment in Transferable Securities. This refers to funds that are under the UCIT regulatory framework of the European Commission which creates a harmonized regime throughout Europe for the management and sale of mutual funds.

that dealers did not expand their market-making activities to meet increased liquidity demands during the peak phase of the turmoil and were inclined to reduce pre-trade transparency to the market.

No single factor can explain dealer behavior in March 2020, but a few factors stand out. The most important factors cited are large one-sided flows; internal risk appetite and management of balance sheet limits; and extreme uncertainty that made risk management particularly difficult. Market structure, prudential requirements, the difficulties in hedging positions and operational risk considerations are seen as somewhat important in explaining the behavior of dealers during the COVID-19 induced market stresses of March 2020.

Whilst the main request for quote (RFQ) trading protocol has not changed, the last ten years has seen a greater shift by dealers in some jurisdictions towards riskless principal client facilitation model where bonds are bought from clients contingent on an exit strategy involving a “matched sale”.

Higher capital and liquidity requirements ensured that bank dealers were resilient and could absorb the shock rather than amplify it through deleveraging, as was the case in the GFC. Nonetheless, the large increase in the size of corporate bond markets coupled with a decrease in aggregate (i.e., market-wide) dealer balance sheet capacity post-GFC has affected supply-side market intermediation under stress. Other factors have also impacted liquidity supply under stress. In particular, the risk-adjusted return of intermediating corporate bonds is not large in normal conditions, and it can be quickly wiped out by the additional risk in stressed market conditions.

Overall, academic research found that dealers did not step up to meet the additional demand and buy corporate bonds as prices were dropping, and instead some initially reduced their exposure.

10. The structure of the corporate bond markets also contributed to the constraints in meeting demand for liquidity during the COVID-19 induced market stresses of March 2020.

Trading in corporate bond markets remains essentially institutional with little direct retail participation. Although corporate bond ETF market participation and growth is altering these dynamics, there remains a large buy-and-hold component to investment in these markets, with minimal trading in specific bonds beyond the first six months after issuance. For example, the turnover ratio (measured by trading volume divided by outstanding debt) has declined over the last decade and remains low.

In contrast to the markets for equities and centrally cleared derivatives, corporate bond markets have seen little standardization. In addition, the number of distinct ISINs has grown significantly, with some corporates having hundreds of distinct bonds outstanding. Despite some increased electronification, corporate bond trading remains mostly an OTC dealer-intermediated market, where intermediation is concentrated in a small number of dealers. All-to-all trading and portfolio trading have grown but remain a small proportion of total trading and trading is mostly through RFQ.

Discussion questions

1. What are your views on the key outcomes drawn from IOSCO's analysis of the corporate bond markets? Are there any aspects of the diagnostic analysis and the key outcomes with which you disagree or that would benefit from more nuance? Are there additional regional or jurisdictional specific considerations? Please be specific to each observation and indicate why.
2. Does the report capture and accurately describe the main features of the corporate bond markets? Is there a particular aspect (or aspects) that may be missing?
3. Are there ways to improve the market functioning and liquidity provision in corporate bond markets, notably under stressed market conditions? If so, please explain how and the extent to which this could be addressed at an international level?
4. What further work, if any, should IOSCO consider in the context of corporate bond markets?⁷

⁷ See previous IOSCO work on corporate bond markets: (1) IOSCO Committee 2 on Secondary Markets (C2) (2017). "Examining liquidity in corporate bond markets", (2) IOSCO Committee 2 on Secondary Markets (C2) (2018) "Regulatory Reporting and Public Transparency in the Secondary Corporate Bond Markets", and (3) IOSCO Committee on Emerging Risks (CER) (2019). "Liquidity in corporate bond markets might behave under conditions of market stress"

Part A - Background of corporate bond markets globally

This section provides an overview of the state of the corporate bond markets pre-pandemic and how they have evolved since the GFC. It gives a brief description of the growth of the market, the relationship between primary and secondary markets, the types of instruments and the way they are traded.

Overall, the report finds that the corporate bond markets have grown significantly, including on a cross-border basis over the past decade, with new issuance volumes almost tripling in certain jurisdictions. Although new participants, such as Principal Trading Firms (PTF), have entered the market and grown in importance, the corporate bond markets remain dealer intermediated. At the same time, the relationship between the buy-side and sell-side has evolved with market participants now placing greater emphasis on competitive pricing.

Primary and secondary corporate bond markets are closely interlinked with trading in secondary markets closely connected to conditions in primary markets. At the same time, primary issuance normally only occurs in a stable secondary market environment.

A1 - Corporate bonds are essentially buy and hold instruments

Secondary trading in corporate bonds differs from trading in other asset classes, such as equities. This is in part driven by the features of the underlying instruments. Bonds are heterogeneous securities compared to equities, with an interest rate component across different maturities, structures, and risk profiles. They are also often issued in large numbers of separate non-fungible bonds by an individual company. The diversity of issuers also impacts the relative illiquidity of the corporate bonds markets; some bond lines, issuers and sub-sectors are more liquid than others.

Corporate bonds tend to be traded less frequently than large cap equities or core sovereign bonds. The turnover ratio, which measures the volume of trading each day compared to the outstanding amount of corporate bonds is lower than publicly traded equities (between 0.5% and 1% in the US and less than 0.5% in the UK and Canada).

The largest group of investors in corporate bonds remain long-term investors (i.e., such as insurers and pension funds) who are predominantly buy and hold investors because of their long-term liability and liability-matching investment strategies. As a result, volatility and trading in corporate bond markets is comparatively low which has not attracted short-term arbitrage-driven or quantitative strategy investors (in contrast to the government bond or equity markets). Nonetheless, the growth of fixed income ETFs impacted this landscape and there are some high frequency traders that have entered the markets in some jurisdictions.

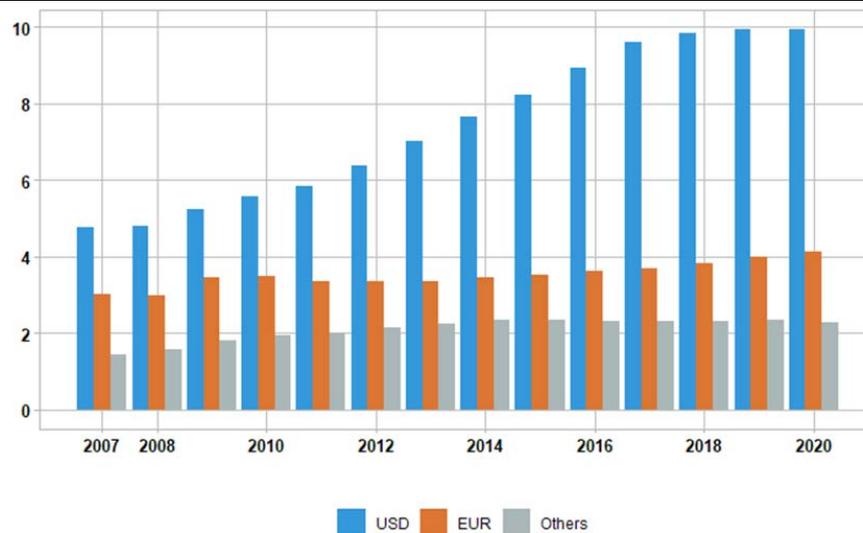
A2 - Issuance and market growth over the past decade

The size of the corporate bond markets has grown significantly over the last decade, reflecting growth in corporate leverage. Various factors have contributed to such growth, including

relatively benign economic conditions driven by accommodative monetary policies, banking sector deleveraging, and the increased role of central banks in corporate bond markets in certain jurisdictions. In the US, the amount of outstanding corporate bonds increased by approximately 80% between 2008 and Q1 2020, to almost US\$10 trillion.^{8,9} Corporate bonds outstanding in the euro area rose by one-third over the same period, to US\$4 trillion. In the UK, outstanding GBP Investment Grade (IG) credit has doubled since 2008, from around GBP 300 billion to over GBP 600 billion, and the GBP High Yield (HY) bond market has increased from a very low level prior to 2012 to around GBP 50 billion in 2020. In Brazil, an acceleration of issuance is observed in BRL of HY credit, almost tripling over the last 5 years up to 2019 but seeing a 1/3 decline in 2020 due to COVID-19.

Commensurate with the growth in outstanding volumes, the number of issuers and individual bonds also has expanded considerably.

Figure 1 – Total outstanding corporate bonds
In trillion \$



Source: Dealogic, IOSCO calculations

The growth in IG bonds over the past decade is concentrated in BBB-rated bonds, which has reduced the average credit quality of IG bonds. For example, in the US, in 2000, fewer than 30% of IG bonds were BBB-rated, compared to 2020, when BBB-rated issuances constituted nearly 45% of IG bonds. Similarly, the share of bonds rated BBB- (the lowest IG rating) increased from 8% to 12% over the same period.¹⁰ This may be due to investors reaching for yield which is consistent with expectations of a long low interest rate environment. In Europe, this may also have been driven by central banks purchases with a minimum rating at BBB. By contrast,

⁸ See [SIFMA Chart on Fixed Income Outstanding](#)

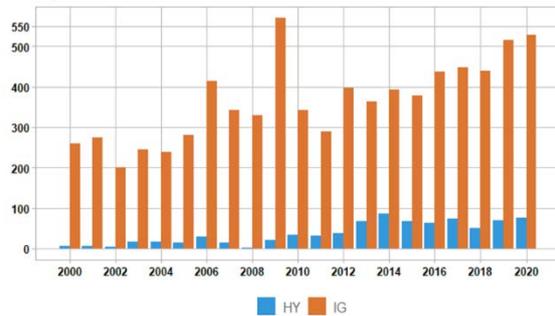
⁹ US and foreign corporate bond US capital market see SEC's Staff Report, Division of Economic and Risk Analysis, *US Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock*, available at, https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf

¹⁰ US and foreign corporate bond US capital market see SEC's Staff Report, Division of Economic and Risk Analysis, *US Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock*, available at, https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf

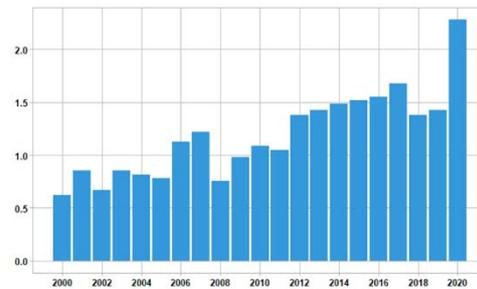
average credit quality in sub-investment grades barely changed over the past decade, partly because low rated issuers shifted to raising an increasing proportion of their debt in the leveraged loan market.¹¹

Figure 2 – Issuances of corporate bonds

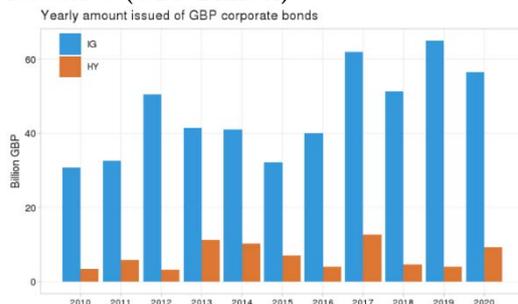
European Issuance (EUR Billion)



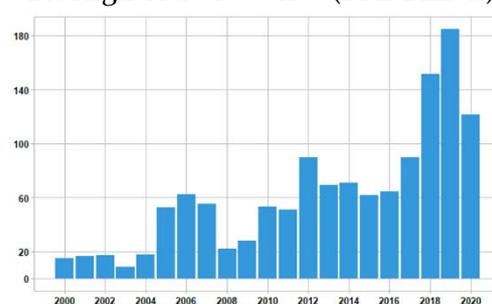
US Issuance (USD Trillion)



UK Issuance (GBP Billion)



BR High Yield Issuance (BRL Billion)



Source: Dealogic, IOSCO calculations

A3 - The role of primary markets

Primary markets are more important to the overall market liquidity in bonds than is the case in equity markets. Equities are perpetual instruments that represent the riskiest end of the capital structure. By contrast, bonds are usually dated instruments with security or seniority against default risk. For these reasons, primary bond markets see more frequent issuance and regular refinancing.

Primary bond markets are a barometer for a healthy market. When active, prime bond markets signal positive sentiment for the asset class, provide an important component in price discovery and assessing credit spreads, and provide the buy-side with depth on the offer side of the market. Newly issued (“on-the-run”) bonds are generally more heavily traded. Trading in secondary markets is closely connected to conditions in primary markets, particularly when accommodating investors switch into new

¹¹ See FSB report: [FSB report assesses vulnerabilities of leveraged loans and CLOs – Financial Stability Board](#)

issues, rather than purchasing outright. At the same time, primary issuance normally only occurs in a stable secondary market environment.¹²

Discussion questions:

5. Are the features and key characteristics of the corporate bond markets accurately captured and described? Is there a particular aspect (or aspects) that may be missing?

Part B - Liquidity during the COVID-19 induced stress

In contrast to the 2008 crisis, the COVID-19 induced stress originated outside the financial system. The March 2020 shock was unprecedented, affecting all aspects of the economy and across all jurisdictions. It triggered a rapid response by authorities¹³ focused on easing monetary and fiscal policy to support demand and cover lost incomes associated with lockdowns to contain the spread of COVID-19. Following the announcement of large-scale and coordinated intervention by authorities and central banks, market confidence and functioning was restored and, as a result, the most severe market disruption lasted only a few weeks. Consequently, there remains considerable uncertainty around the potential impact on market liquidity – and ultimately the real economy – had policy intervention not occurred. Nonetheless, during those critical few weeks, the effects of the pandemic and the public health measures taken by governments to contain them¹⁴ led to a widespread need for liquidity and a severe disruption of the corporate bond markets.

The report focusses on three measures of liquidity which, taken together, give a picture of the liquidity disruption in the corporate bond markets during the event of March 2020: 1) the level of bond issuance in the primary markets, 2) the level of secondary trading activity and 3) the cost/credit spread levels at which bonds were trading. Overall, nearly all jurisdictions experienced a severe drop in primary issuances, and a spike in credit spreads and bid-ask spreads. Trading activity was more idiosyncratic, but most jurisdictions witnessed an increased or sustained level of trading activity.

B1 – Measure of liquidity – level of primary markets issuance

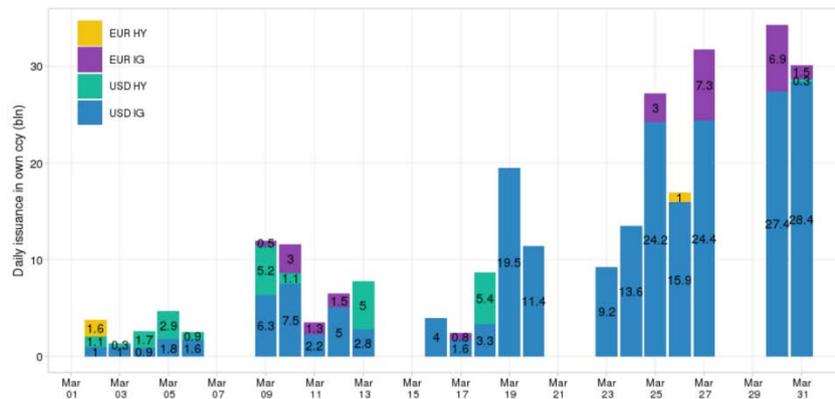
Corporate bond primary market activity was significantly curtailed from February to mid-March 2020, with most markets effectively closed for two weeks in early March. Some corporates were able to postpone planned issuances to wait for the markets to settle; some corporates drew on their bank credit facilities to bridge their short-term liquidity needs. There is, however, insufficient data to assess how many corporates attempted to issue bonds during this period but were unable to do so given prevailing market conditions.

¹² Goldstein et al. (2019) documents the impact of expected secondary market liquidity on the yield spread of primary market. Goldstein and Hotchkiss (2012) and Brugler et al. (2018) examine the link between underpricing and post-trade transparency under TRACE.

¹³ See FSB report: [COVID-19 Pandemic: Financial Stability Implications and Policy Measures Taken](#)

¹⁴ Including lockdown measures.

Figure 3 – Daily issuance of corporate bonds
In USD billion



Source: Dealogic, IOSCO calculation

Primary corporate bond markets play a significant role in the financing of the economy and, as such, constitute a major monetary policy transmission channel. Their dysfunction triggered rapid central bank intervention to restore liquidity. As a result, the worst of the crisis was short-lived, and the functioning of corporate primary and secondary markets was quickly restored (albeit at a higher risk premium compared to before the crisis). Due to the speed of the intervention and the short nature of the stress, it is difficult to determine whether the primary market affected the secondary market or the other way around.

Central bank interventions were key to the levels of primary activity. In the weeks following central bank intervention, issuance levels for IG bonds reached unprecedented volumes. In the second quarter of 2020, IG bond issuance in the US totaled a record \$693 billion. In its report on the Impact of COVID-19 on European Capital Markets,¹⁵ AFME noted that “the second quarter of 2020 was, by far, the highest quarterly value of investment grade bond issuance in Europe reaching a total of EUR 225 billion”. A similar trend could be observed in the GBP market.

B2 – Measure of liquidity - level of activity

B2.1 - The level of activity varied across jurisdictions

Increased levels of activity: Secondary trading increased during the middle two weeks of March (prior to 23rd March Federal Reserve Board (Fed) intervention) in the US and liquidity remained healthier than in other core markets (e.g., the short-term funding markets) although bid-ask

¹⁵ <https://www.afme.eu/Publications/Reports/Details/Impact-of-COVID-19-on-European-Capital-Markets-Market-Update>

spreads increased as well. Similarly, in Brazil, the activity increased considerably in March and April, particularly for shorter maturity bonds.

Unchanged levels of activity: Data shows that trading activity in Euro denominated bonds was mostly unchanged, although the overall liquidity in terms of market price impact dropped substantially.¹⁶ Similarly, the volume, frequency, or scope (days traded) of corporate bond trading in Canada were impacted little by the March 2020 turmoil. The corporate bond market in Japan, which consists mostly of IG bonds, observed a relatively small impact on liquidity during the March turmoil.

Lower level of activity: Market participants however reported that liquidity was particularly difficult to source in some other markets such as GBP. Finally, even though liquidity for HY bonds was lower across nearly all jurisdictions, the drop in HY liquidity was most pronounced outside the US.

B2.2 - The level of activity varied across types of bonds

Liquidity challenges affected some parts of the corporate bond markets more severely than others. Trading was particularly challenging for large trades and block trades and the normal relationship between transaction costs and trade size reversed, as trading large parcels became more costly than trading smaller parcels.¹⁷ Consistent with the “dash for cash” market participants reported that in most jurisdictions, initially, only short-term and high-quality bonds could trade. However, some market participants reported that even the market for shorter-dated bonds thinned out as the crisis deepened and investors tried to sell bonds with the least price impact. As a result, the credit curve flattened and even inverted, as spreads on shorter-term bonds increased relative to longer term bonds. With the worsening sell-off, it became easier to trade longer duration bonds because dealers tended to concentrate scarce capital further down the maturity curve into bonds where trading might be more profitable.

B2.3 - The level of activity was impacted by the central bank interventions

After the intervention of central banks, markets saw increased frequency, volume, trade size and breadth of corporate bond trading. US data indicates trading increased, especially for IG issues larger than USD 250 million, consistent with eligibility for the Fed facilities. Estimates of transaction costs decreased, with bid-ask spreads dropping immediately for IG. Liquidity in HY bonds recovered more slowly, reflecting the later added fallen angel provision in the Fed’s intervention and the potential spill-over from the support for IG markets. The inverted trade-size pricing of estimated bid-ask spreads also reversed.¹⁸ Similar immediate impacts were

¹⁶ See liquidity metrics on: [The-European-investment-grade-corporate-bond-secondary-market-and-the-COVID-19-crisis-280520v2.pdf](#) (icmagroup.org) and [Market data and commentary on COVID-19 Information Hub](#) (icmagroup.org)

¹⁷ At the height of the crisis, transaction costs on large block trades exceeded those of smaller trades, reversing the normal trend where market participants can negotiate better prices on block orders.

¹⁸ It reverted to the normal trend where it is easier to negotiate better pricing on large block trades than on smaller one.

observed in other jurisdictions, reflecting both local central bank interventions and the ripple effect being felt from the US market.

Academic research and market participants noted that the impact on liquidity was felt immediately after the Fed announcement and before any purchases under the Secondary Market Corporate Credit Facility (SMCCF).^{19, 20} The improvement in liquidity following the announcement of the SMCCF has been attributed to a mix of factors, including reduced selling pressures, increased capacity and willingness of dealers to supply liquidity and a reduction in expected credit losses (for example, Haddad, Moreira, and Muir, 2020; Nozawa and Qiu, 2021; and D'Amico et al, 2020). These outcomes reflect the importance of the Fed signaling its intention to provide a liquidity backstop to the corporate bond market.

B3 - Measure of liquidity - price/transactions costs

During the two weeks leading to the announcement of Fed interventions on 17 and 23 March 2020, transaction costs soared as measured by bid-ask spreads. The cost of trading short maturity HY bonds increased substantially, as did the cost of trading longer dated IG bonds. There was a smaller increase in absolute terms in the cost of trading shorter IG bonds, however in yield terms (i.e., relative to the price of a short-dated bond), this increase was material given the lower convexity of this sector.

In addition, the relationship between estimated trade-size pricing and bid-ask spread inverted. Spreads of large blocks (>=25M) became higher than for smaller trades of 1-5M and 5-25M. Feldhutter's measure²¹ of spread may not be well suited for block trades as it requires buy and sell of matching size, a significant limit for large trades. Yet O'Hara et al (2020) observes the same evidence using an alternative measure.

Evidence from research shows that the dislocation in IG bonds across all maturities was worse overall than in HY bonds.²² The CDS-bond basis spread for IG bonds widened more than for HY bonds during the period (Ma, Xiao, Zeng, 2020) and the increase in credit spreads was significantly greater than the increase in CDS for the same IG corporate (Haddad, Moreira and

¹⁹ Sharpe, Steven A., and Alex X. Zhou (2020). "The Corporate Bond Market Crises and the Government Response," FEDS Notes. Washington: Board of Governors of the Federal Reserve System, October 07, 2020, <https://doi.org/10.17016/2380-7172.2769>

²⁰ <https://www.federalreserve.gov/monetarypolicy/smccf.htm>

²¹ We use Feldhutter's (2012)²¹ method to compute roundtrip transaction costs based on trade prices (transaction level data). Since bonds are often traded with multiple trades taking place in a short time frame with identical trade volumes, it is reasonable to assume that dealers are undertaking what he calls imputed roundtrip trades (IRT) to coordinate buys and sells of investors. We aggregate all trades per bond with the same volumes that occur within a time window to an IRT. We then compute the absolute effective spread estimator as the doubled difference between the lowest and highest trade prices for each IRT. To get a relative spread proxy, we divide the roundtrip transaction costs by the mean of the maximum and minimum prices.

²² A probable explanation pattern is that as bond investors sold the most liquid bonds first, putting large downward pressure on prices and driving up yields.

Muir,2020). As noted above, the dislocation in core government bond markets, swap rates and cross-currency markets all played a significant role in the volatility of corporate bond prices.

Discussion questions:

6. Does the report accurately describe the state of liquidity in corporate bond markets during the COVID-19 induced market stress across the three stated measures employed in the report?

Part C - The drivers of liquidity - supply, demand, and market participant behaviors.

Market participants' behavior played a significant role during the weeks before central bank intervention, either in exacerbating or failing to stabilize market liquidity. However, it is difficult to assess whether corporate bond market liquidity primarily dried-up because of reduced liquidity supply by dealers, increased liquidity demand by investors, or a combination of both – and what was the greater relative contributor to the stresses. Limitation in dealers' ability to absorb the significant marginal selling pressures (i.e., the increased demand for liquidity) due to risk management limits and balance sheet constraints may be one of the causes for the liquidity dry up, particularly given the central role of bank-dealers in the corporate bond markets. However, this must be weighed against the impact of the sharp increase in liquidity demand that resulted from the dash-for-cash. Research shows that the COVID-19 liquidity dry-up in corporate bond markets can be attributed equally to both the supply and the demand functions, although the research also points to changes in supply that had a much bigger impact on risk premiums than changes in demand.²³

C1 - The demand for liquidity

While bond investments through open-ended mutual funds and ETFs have grown, a large proportion of fixed income assets are held by other types of long-term investors such as pension fund managers and insurers. For example, in the US, it is estimated that insurance companies, registered investment companies (e.g., open ended funds (OEFs) and exchange traded funds (ETFs)) and pension funds owned 31%, 19%, and 9% of outstanding bonds, respectively.²⁴

This section analyses the behavior of the long-term investors, asset managers, and distressed funds.

C1.1 - The role of long-term investors

The main types of long-term investors considered in this chapter are insurance companies and pension funds. In conducting its research, the working group noted that it was challenging to

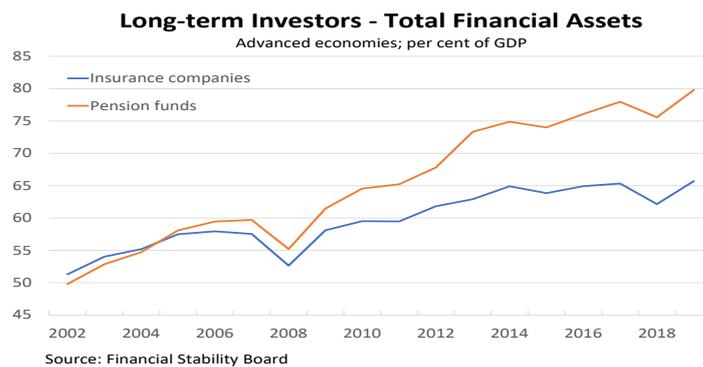
²³ Chikis, C., & Goldberg, J. (2021). "Dealer Inventory Constraints in the Corporate Bond Market during the COVID Crisis (FEDS Notes). Board of Governors of the Federal Reserve System".

²⁴ US and foreign corporate bond US capital market see SEC's Staff Report, Division of Economic and Risk Analysis, *US Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock*, available at, https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf

obtain granular data on the trading activity of long-term investors across jurisdictions. Publicly available reporting data is scarce. In addition, insurers and pensions funds delegate vast amount of their investments to asset managers making it difficult for market regulators to build a comprehensive picture of the behavior of some types of market participants in the corporate bond market.

Long-term investors have grown considerably in recent decades and are large investors in many asset classes, including corporate bonds. Assets of insurance companies worldwide exceeded USD 36 trillion at the end of 2019,²⁵ whilst retirement savings in pension funds, pension insurance contracts and in other vehicles exceeded USD 50 trillion worldwide (USD 49.2 trillion in the OECD). In advanced economies, long-term investors' total financial assets have grown more quickly than GDP since the early 2000s, owing to a mix of factors including rising wealth, increasing asset valuations in the low interest rate environment, and the accumulation of wealth by ageing populations (Figure 4).

Figure 4 – Long-term investors total financial assets
As % of GDP



Long-term investors allocate on average a third of their balance sheet to corporate bonds, making it the largest asset class they invest in aside from government bonds. For example, government and corporate bonds make up around two-thirds of European Economic Area (EEA) insurance companies' total investment portfolio ahead of equities (listed and unlisted). The investment allocation of EEA Institutions for Occupational Retirement Provisions (IORPs), in the end of 2019, consisted of equity for 33% and for bonds for 50%.^{26, 27}

Long-term investors have liabilities that are often medium or long-term in nature. This means that, while individual investor portfolios differ significantly, the asset allocation of a typical

²⁵ Source: Statista for insurance companies and OECD report Pension markets in focus 2020

²⁶ Investment allocation is highly divergent amongst Member states with some IORP allocating up to nearly 60% of equity while others have up to 70% in bonds.

²⁷ Source: EIOPA Financial Stability report July 2020.

long-term investor is heavily weighted towards high quality fixed-income securities with longer maturities to match their assets with future liabilities and projected pay-outs.²⁸

Partly due to tax reasons, insurance companies tend to be buy-and-hold investors and would not be expected to make significant portfolio sales of corporate bonds in response to rapidly changing market conditions.²⁹

However, insurance companies are sensitive to credit rating changes and, particularly to fallen angels. This is because their capital requirement increases non-linearly depending on the rating change. For example, research shows that under the EU solvency II rules, the downgrade of a five-year duration security from AA to A increases the solvency capital requirement by an extra 1.5%, whilst it jumps by 10% in the case of a downgrade from BBB to BB.³⁰ In the US, risk-based capital standards set by the National Association of Insurance Commissioners (NAIC) feature similar non-linearity, though the actual requirements vary by type of insurance. For example, for life insurance companies, NAIC standards call for a 0.40% asset valuation reserve (AVR) for bonds in the A/AA/AAA range, 1.30% for bonds in the BBB range, and 4.60% for bonds in the BB range. For property and casualty and health insurance, the capital requirements are 0.30%, 1.00%, and 2.00%.³¹

In principle due to their long-dated liabilities and corresponding investment horizons, long-term investors face less pressure than other investors to liquidate liquid assets, such as corporate bonds, during periods of stress. These characteristics of long-dated liabilities also imply that long-term investors may be able to buy assets being sold by other investors facing redemption or deleveraging pressures, which can help to limit the magnitude of asset price falls. Periodic portfolio rebalancing to benchmark weights can also contribute to long-term investors investing countercyclically.

However, in practice and in particular events, long-term investors may not always invest countercyclically for a variety of reasons. For example, long-term investors may have limited ability to rebalance their asset holdings at short notice. This can mean that to invest countercyclically during a period of acute stress, long-term investors may have to hold higher

²⁸ For example, in the EU, in the pre-CovidCOVID-19 period, insurers tended to buy mostly A and BBB rated bonds (respectively 28 and 23% of the total purchases) almost half of the bonds have a maturity longer than 7 years.

²⁹ As an example, analysis in the EU by EIPOA shows that “in normal times, in each quarter, approximately 4% of the corporate bonds held by European insurers are sold, meaning that EEA insurers’ bond portfolio do turn over in approximately 6 years”.

³⁰ Vulnerabilities and resilience in insurance investing: studying the COVID-19 pandemic by Patrick M Liedke

³¹ For NAIC risk-based capital requirements, see https://www.naic.org/documents/committees_e_capad_investment_rbc_wg_related_irbc_factors.pdf.

For a mapping of the NAIC credit rating scale to credit rating agency scales, see <https://content.naic.org/sites/default/files/inline-files/Master%20NAIC%20Designation%20and%20Category%20grid%20-%202020.pdf>. <https://content.naic.org/sites/default/files/inline-files/Master%20NAIC%20Designation%20and%20Category%20grid%20-%202020.pdf>.

cash balances on average (which could impact their benchmarking) or use leverage (which some investment mandates do not permit).

Accounting rules, and binding regulations or internal risk limits, can also incentivize long-term investors to invest procyclically. For example, marking-to-market assets and valuing liabilities using prevailing interest rates can incentivize long-term investors to sell riskier assets (such as corporate bonds) and long-dated sovereign bonds to contain duration mismatches between assets and liabilities. Further, long-term investors' buying of long-dated sovereign bonds can extend declines in interest rates, which can in turn lower solvency ratios if the present value of long-dated liabilities increases more quickly than the present value of long-term investors' long-dated assets ([Domanski and Shin, 2017](#)). Long-term investors operating close to their regulatory capital requirements or internal risk limits can also be more inclined to sell downgraded assets to de-risk their portfolios ([Merrill et al, 2012](#); [Chodorow-Reich, Ghent, and Haddad, 2021](#)).

Insurers also use derivatives to hedge risks from investment portfolios and underwriting. According to European Insurance and Occupational Pensions Authority (EIOPA), interest rate swaps (IRS) are the largest derivative type held by EEA insurers and make up 50% of the notional of derivatives (as of 2019 Q4). In a period of increased volatility in interest rates, insurers could face liquidity shortfalls due to margin calls on their IRS derivatives portfolios ([Hall, 2021](#)). The need to extend the duration of assets in periods of low yields and negative duration may explain the increase in use of IRS by insurers. However, as a result, EEA insurers are more exposed to interest rates going up.³²

Long-term investors behavior in corporate bond markets during and since the March 2020 turmoil

Long-term investors were particularly exposed to the March turmoil in terms of solvency risk, profitability risk and reinvestment risk. On the one hand, insurers and pension funds are affected by the decrease in the value of their investments because of the sudden increase in risk premia, and the increase of default risk which could trigger large-scale rating downgrades affecting capital requirements. On the other hand, the risk of low interest rates and the weakening macro economy could challenge the profitability of new business³³.

Available evidence on the influence of long-term investors in corporate bond markets during the COVID-19 induced markets stress is mixed, in part because their behavior varies considerably by jurisdiction, in part due to the nature of their investment strategies and to the extraordinary speed and short duration of the crisis. The volume of corporate bonds bought or sold by long-term investors varied across credit types, maturities, and was dependent on the structure of the investor base and its jurisdiction. Limitations in available data means it is

³² EIOPA Financial Stability Report 2021 - https://www.eiopa.europa.eu/document-library/financial-stability-report/financial-stability-report-july-2021_en

³³ Quote the IOPA report

difficult to concretely determine long-term investors' relative influence on the COVID-19 induced market stresses of March 2020.

For UK long-term investors, available data indicates that trading activity during the March stress was largely unchanged. In the EU, daily transaction data on identified UK pension and insurance firms trading in the EU, as well identified EU firms trading on UK venues, also indicates limited changes in overall trading activity. This may indicate that long-term investors in the EU and UK markets were not the main drivers of liquidity demand. The data, however, is not entirely representative of long-term investor base as it does not capture trading activity from long-term investors that delegate the management of their portfolios to asset managers. Delegation is common, albeit the overall proportion is unknown.

Some anecdotal evidence points to some long-term investors buying corporate bonds before the central banks' intervention to take advantage of relative value. Some long-term investors commented during the CBML's stakeholder outreach that it would have been a good strategy to buy during the March stress, but also reported that, in practice, it was a hard period to trade, with the prevailing uncertainty making them cautious and sometimes preferring a strategy of "wait and see". Research³⁴ shows that even well-capitalized insurers stayed away from the market because of concerns over potential downgrades.

Data from the EIOPA shows that insurers trading behavior did not materially change during the first quarter of 2020. Long-term investors purchased Euro 146 billion of corporate bonds in Q1 2020 versus an average per quarter of EUR 149 billion over the previous 5 years average. Similarly, they sold EUR 82 billion of corporate bonds during Q1 of 2020 versus EUR 80 billion in the previous quarters.³⁵ However, the data is reported quarterly. As a result, it is smoothed out over the observed reporting period and not granular enough to draw observations on relevant daily trading patterns during the peak of the crisis in March 2020.

Some long-term investors faced varying degrees of pressure to raise cash. There is some evidence that they resorted to raising cash through repo ([BCBS, CMPI and IOSCO, 2021](#)) or through selling sovereign bonds, rather than selling less liquid corporate bonds.³⁶

At the same time, some long-term investors anticipated that cash needs could increase which constrained their buying behavior while some selectively sold assets to raise cash during the peak of the stress in early to mid-March.

³⁴ Vulnerabilities and resilience in insurance investing: studying the COVID-19 pandemic by Patrick M Liedke.

³⁵ UK data, although less complete than the EU-wide data as it only includes insurance companies directly managing directly their assets (i.e., not taking into account delegated mandates), exhibits a similar trend, i.e., UK insurers were consistent net buyers of better-rated longer and shorter-dated GBP. It also unsurprising how high volumes in longer dated credit in May/June 2020, when credit was rallying and yields were falling and high sales of EUR denominated shorter higher rated bonds immediately after the announcements, perhaps consistent with portfolio rebalancing to take advantage of the buoyant primary market.

³⁶ This was suggested by some market participants and is supported by the GBP data analysis. There is also some evidence of this reported in the BCBS, CMPI, IOSCO Review of margining practices (<https://www.iosco.org/library/pubdocs/pdf/IOSCOPD686.pdf>).

When these sales of assets occurred, they were reportedly concentrated in shorter-dated and higher-rated corporate bonds that were relatively more liquid.³⁷ These bonds had better price transparency and they could be converted into cash without booking a large loss. Selling shorter-term bonds may have also been preferred to mitigate any increase in asset-liability mismatches by long term investors with typically longer fixed liabilities (particularly as long-term interest rates declined; [Domanski and Shin, 2017](#)).

Long-term investors also sold lower rated or downgraded bonds, or at the minimum slowed down their purchase of lower rated corporate bonds. Normally, insurers sell vulnerable credits in order to reduce their exposure to credit risk in anticipation of potential downgrades. They also typically sell downgraded bonds, because of capital requirements considerations or other reasons such as investment mandates. This pattern was also true during the COVID-19 induced market stresses. For example, according to the EIOPA analysis,³⁸ EU insurers significantly reduced the purchase of BBB bonds (from EUR 6.5 billion before the COVID-19 outbreak to approximately EUR 2.0 billion) in Q1 and Q2 2020, probably in consideration [of the fact] that the risk of rating downgrades was high. During the March/April turmoil, the percentage of fallen angels were at much more elevated levels than the previous decade's averages. This resulted in a higher percentage of downgrades in insurers' portfolio and a reduction of the number of upgrades. An analysis by EIOPA in Europe shows that both in the pre-pandemic period and during the first two quarters of 2020, "insurers tended to net-sell proportionally more downgraded bonds, compared to bonds without a change in rating". They also observed that fallen angels were sold more than other downgraded bonds.

Some long-term investors also sold some corporate bonds to reduce certain risk exposures, such as in sectors most impacted by the COVID-19 shock.

In some jurisdictions, some long-term investors faced selling pressure due to FX exposures associated with overseas investments. Larger and more sophisticated long-term investors have global strategic allocations and invest in bonds issued offshore denominated in foreign currencies, with the currency risk sometimes hedged back into the local currency using derivatives. For funds with fixed or defined asset allocations, currency volatility in March 2020 resulted in increased margin payments on currency derivatives. These funds partly met these increased margin requirements by selling some of their underlying foreign currency bonds. Some of these factors were more prevalent in some jurisdictions than in others.³⁹

Some long-term investors would also have sought to capitalize on re-balancing opportunities during the stress, such as in the US market: some market participants noted that US funds may have sought to shift out of bonds to capture the discounts in equity prices. In contrast, market

³⁷ For example, in the EU, insurers net sold high rated (AAA) and (AA) bonds in Q1 2020 and continued to do so in Q2 2020.

³⁸ Source: EIOPA Financial Stability report July 2020

³⁹ For example, in Australia margin payments on currency derivatives increased materially. The sharp fall in the Australian dollar in March 2020 resulted in Australian pension funds paying around US\$17 billion of margin to their counterparties. See: [RBA's April 2021 FSR Box](#)

participants noted that in the UK, pension funds did less rebalancing because of their different investment strategies (e.g., lifestyling approach); this is also supported by the working group's data analysis of the GBP market.

Long-term investors after the peak of the stress

In general, long-term investors resumed their buying of corporate bonds soon after central banks announced interventions – particularly the US Fed's corporate bond buying programs announcement on 23 March 2020. This coincided with an easing in liquidity pressures and greater transparency in pricing as dealers resumed their market-making activities. Buying activity by long-term investors was initially focused on investment grade bonds and in sectors less exposed to COVID-19. However, buying activity broadened out over subsequent weeks, especially following the announcement of the extension of the US Fed's bond purchase program to high-yield ETFs on 9 April 2020. Asset purchases by long-term investors also accelerated once the primary markets re-opened. This is because post intervention primary issues were priced with significant new issue premium (i.e., with yields well above similar bonds trading in the secondary markets).

C1.2 - The role of open-ended funds

The COVID-19 induced market stresses of March 2020 showed that some OEFs contributed to selling pressure in some jurisdictions, driven by investor redemptions mostly related to the flight-to-quality and dash-for cash.

In March 2020, many OEFs faced liquidity pressures, dealing with large outflows and a deterioration in market liquidity. Selected jurisdictional estimates for the share of corporate bonds held by OEFs ranged from 13 to 25%. In the US, investors withdrew more than \$200 billion from US taxable bond OEFs in March 2020. In Europe corporate HY bond OEFs faced cumulative redemptions of 5% of total net asset value (NAV) within a month. From an ESMA sample, net outflows in UCITS represented 5.9% of NAV, while alternative investment funds (AIF) in the sample overall recorded small inflows from 17 February to 31 March. In UK authorized corporate bond funds, there were net outflows of 2.6% of NAV in March. In Hong Kong, net outflows from fixed income and/or mixed allocation OEFs ranged from 4% of investment grade bond OEFs' assets under management (AUM) to approximately 13% of the HY bond OEFs' AUM.

Overall, there were only modest levels of fund suspensions, restricted mainly to those OEFs invested in real estate. During the turmoil, bond funds managers actively managed their liquidity risk by using available cash, selling underlying assets and deploying other liquidity management tools (LMTs) at their disposal. While the dash-for-cash and flight-to-safety were the main drivers of OEF redemptions, managers were also selling assets for other reasons such as asset re-allocations or opportunistic trading. By selling bonds, OEFs may have added to the overall corporate bond selling pressure.

To the extent that OEFs were not able to meet redemptions through new inflows or free cash flow, there is evidence that some funds deployed a horizontal slicing approach – using cash and selling the most liquid assets first. For those that used horizontal slicing, this may have been a strategic approach to rebalance their portfolio or take advantage of short-term opportunities. Other OEFs, as demonstrated in ESMA’s analysis of European funds and IOSCO survey, deployed a vertical slicing approach – selling a pro-rata representative slice of assets to maintain the shape of the portfolio. Depending on individual circumstances, managing the market impact of these orders may have proved more challenging for some funds than for others during market stress.

Those funds that sold liquid assets to increase their cash positions ahead of or during the market turmoil may have contributed to cash demand. Such behavior may have been individually rational on the part of fund managers, and in keeping with good liquidity management. It may also reflect that funds were re-allocating across asset classes for a range of reasons, including an attempt to de-risk their portfolios and to prepare for future outflows.

Other analysis suggests OEFs stabilized the corporate bond market by buying assets that other investors sold,⁴⁰ mitigating bond market fragility in times of stress.

C1.3 – The role of the official sector

“Official institutions” (i.e., public sector) includes mainly Government investments, FX reserves, sovereign wealth funds and supranational treasury operations. They are significant investors in corporate bonds (outside of the US). This is particularly the case in the EU, where they are the largest owners of euro area corporate bonds. Corporate bond holdings by official institutions are primarily in highly rated bonds issued by financial corporations and agencies. They tend to purchase bonds in the primary market and buy and hold thereafter.

In Europe, the extension of the ECB’s Asset Purchases Programme (APP) to include investment-grade EUR-denominated bonds began in 2016 and has influenced both the primary and the secondary markets given the scale of the activity and the buy and hold nature of these products.

In response to the COVID-19 induced market stresses, the ECB’s APP increased its corporate bond holdings from EUR 200 billion (pre-COVID-19), to EUR 350 billion as of November 2021. While these additional interventions took place initially in the primary market (62% of the Pandemic Emergency Purchase Program (PEPP) volume between March and May 2020), current purchases are mainly in the secondary market, also accounting for 62% of the amounts bought.⁴¹

⁴⁰ Anand, Amber, Chotibhak Jotikasthira, and Kumar Venkataraman. Mutual Fund Trading Style and Bond Market Fragility. *The Review of Financial Studies* (2020).

⁴¹ ECB announced that purchase under the PEPP would be lessened until its end in March 2022. The principal payments from maturing securities purchased under the PEPP will continue to be reinvested until at least the end of 2024. In the meantime, ECB will temporarily increase the volumes of the APP bonds purchase program, but then reduce them back to their previous levels in October 2022.

There is limited data on the trading behavior of the official sector during the crisis. Based on the UK experience, it is observed that official institutions were net buyers of AAA credit throughout H1 2020, with a prominent peak in purchases over March. It is likely that this was opportunistic buying during the sharp sell-off in underlying Government bonds and the March peak in Treasury yields. This is significant given that official institutions tend to source liquidity in the primary markets, with large anchor orders that motivate opportunistic borrowers.⁴² There is no evidence that GBP AAA bonds were sold to raise cash over March 2020. Any evidence of outright selling is subdued and appears post intervention (in a recovering and lower yielding backdrop). This mild selling would have been amid a strongly recovered primary market and could have been to accommodate new issuances.

There are similar outcomes in non-AAA high-grade GBP credit, with limited evidence of selling over March 2020. Any selling pressure appears in early summer 2020 when markets recovered (note the early June trough in VIX) and primary markets were hitting record levels of issuance. Not all official institutions stray out of AAA/AA rated products, but those that do – most usually the sovereign wealth funds – are material investors in corporate bonds for peripheral markets such as GBP.

C1.4 – The role of distressed buyers

Given the potential for high returns, the distressed asset community played an important role, particularly in longer duration IG bonds (which is not their typical investment strategy) and other traditionally safe sectors. Opportunistic credit funds look to invest in corporate debt where they perceive that the price at which the debt is trading does not reflect the fundamental credit situation of a company. Such opportunistic buyers typically consist of hedge funds which are generally not affected by outflows and are able to exercise flexibility in deploying their capital in the market. Hedge funds do not generally get allocated bonds in IG primary issues, therefore they are more reliant on the secondary market and have a tendency to be opportunistic and react to special situations.

The March turmoil offered opportunities for the debt funds which typically focused on “mispriced” debt (i.e., debt that has dropped in price for technical reasons as investors feel pressure to sell due to liquidity concerns when markets are dislocated).

Although data is sparse, the working group’s UK data confirms that distressed buyers were net buyers of longer credit over Q4 2019/Q1 2020, turning sellers after March 2020 (or in June 2020 in the case of BBB/BBB- bonds when the initial intervention-induced recovery peaked). Hedge funds were also net buyers of shorter credit over most of H1 2020 but turned sellers towards May when intervention was having the maximum effect. This seems to support the notion that more opportunistic credit specialists tend to buy into weakness and sell into strength.

⁴² A new GBP deal or increase for a frequent issuer can be transacted intraday, often with the whole process - from mandate to execution - taking a matter of hours. Contrast this to other fixed income such as securitisations, which often takes 3-6 months to originate.

Market participants noted that given the brevity of the dislocation in March due to the rapid central bank intervention, hedge funds struggled to raise capital in time to take advantage of the pricing changes. It was reported that there was a scramble to launch new distressed debt and special situations funds.

Like long-term investors, distressed buyers accelerated their bond purchases after the central bank interventions and the re-opening of the primary market.

Some market participants also noted that given the post-GFC regulatory reforms, hedge funds can no longer rent balance sheet from banks on demand, thereby limiting the funds' ability to bid in a dislocated market.⁴³

Discussion questions:

7. Do you agree with the overarching analysis of the drivers of buy-side investor behavior set out in this section?
8. Are the main demand side drivers of liquidity by investor-category accurately described and reflective of events in your experience of the COVID-19 induced market stresses?
9. Who in your view were the main drivers of liquidity demand during the COVID-19 induced market stresses and why?
10. Given mixed evidence, how significant was the behavior of long-term investors in driving or mitigating liquidity demand during the COVID-19 induced stresses?

⁴³ The IOSCO CER report on "Liquidity in corporate bond markets under stress conditions" reported: "market participants noted that, because a general increase in risk aversion in the banking sector has led to a strong reduction in lending to hedge funds, both the number of hedge funds operating in corporate bond markets and their degree of leverage have decreased sharply, causing them to curtail their provision of liquidity in the corporate bond market. Due to the insufficient passage of time, it is difficult to discern whether this is a temporary (cyclical) or a permanent (long-term) phenomenon".

C2 - The supply of liquidity - the role of dealers

The COVID-19 induced market stresses of March 2020 underscored the importance of liquidity provision in corporate bond markets and the role and behaviors of dealers in intermediating these markets in times of stress.

In all jurisdictions covered by this analysis, dealer intermediation is the most common way in which trading takes place in corporate bond markets.⁴⁴ In the primary market, dealers intermediate between borrowers (corporates and financial institutions) on one side and investors (investment funds, insurance companies, pension funds etc.) on the other side. In the secondary market, they match buyers and sellers (electronically, via voice, or in a hybrid manner). In most cases, dealers are active both in the primary as well as in the secondary market. In all jurisdictions, dealer-intermediated trades represent most trades by both value and number. Dealers usually make markets in the bonds they underwrite. They service a wide range of borrowers, many of whom also have ongoing relationships in other parts of their business. There is typically no regulatory obligation for them to make markets in their issuers' bonds, but a reasonably high expectation from their clients.

In almost all jurisdictions, corporate bond dealers are solely or predominantly banks or affiliated with banks.⁴⁵

Dealers are also major participants in electronic platforms. Electronic platforms can be particularly important for the intermediation of small trades, while direct dealer intermediation is still the norm for larger trades. For small trades most of the interaction is purely electronic, while for larger or more complex transactions these platforms are often an extension of voice protocols, and market participants may use them to report and settle trades that they negotiated over the phone. This contrasts with other asset classes like equities or futures where the quoting activities of market participants determines the prevailing trading price without the need for intermediation or negotiation at the point of trade. In corporate bonds, dealers and other participants often stream indicative prices and respond to RFQs⁴⁶ from clients, rather than submitting executable orders.

The way in which dealers intermediate has changed in recent years, with riskless principal trades more common than in the past in some jurisdictions. Most jurisdictions report that the intermediation activity of dealers changed after the GFC and subsequent regulatory reforms. Rather than relying on large proprietary inventories, dealers now attempt to match buyers and sellers before going ahead with the trades. US authorities indicate that since the introduction of the Volcker rule, bank-affiliated dealers faced additional limits on bond inventories and are

⁴⁴ Intermediation would include acting as principal.

⁴⁵ Under US law, a non-bank dealer engaged in the activities described in this section would typically register as a broker-dealer.

⁴⁶ Although RFQ is the dominant protocol, there are other protocols available.

prohibited from proprietary trading in corporate bonds. PTFs provide intermediation services, but typically only trade in small sizes. Similar behavior is observed across most jurisdictions. For instance, one jurisdiction notes that dealers do not run proprietary books but do warehouse bonds for their clients. Where possible, they seek to match buyers and sellers before trading, making a return based on the bid-ask spread. The jurisdiction also reports that dealers are more willing to have larger inventories in low volatility periods. In another jurisdiction, authorities indicate that dealers need to have some inventory to anticipate client demand but there is no proprietary trading at market making desks.

C2.1 - Dealer behavior during and since the March 2020 turmoil

In contrast to the GFC, banks entered the COVID-19 induced market stresses with lower inventories and stronger capital and liquidity positions because of the post-GFC reforms and did not face the same funding pressures on their liquidity positions as compared to going into the GFC. As such, banks did not contribute to selling pressure in the way they did during the GFC. However, to the extent that dealers did not expand their market-making activities to meet increased liquidity demands during the peak phase of the turmoil and were inclined to reduce pre-trade transparency to the market, their behavior had little dampening effect.

Generally, large dealers chose to refocus market-making activities on their core client relationships, whilst risk managing their positions more closely due to the prevailing uncertainty and market volatility. Evidence suggests that smaller/regional dealers, as well as local operations of foreign dealers, were less able to offer liquidity and more inclined to step out of the market altogether, probably because of reduced market visibility. This resulted in higher concentration of bond trading activities among larger dealers during the stress period. In a few cases, there was a more severe decrease in market-making activity by dealers during the March turmoil.

The cost of liquidity provision by dealers was severely impacted, as evidenced by bid-ask spreads three times higher on average than in the previous month. In most jurisdictions, corporate bond bid-ask spreads widened significantly, with some dealers explaining that the only way to maintain market making was to bid low, at a price where they could expect to sell the bonds more easily to opportunistic buyers. In doing so, they provided liquidity but at a much higher cost for clients. Although trading flows were initially one-sided, dealers confirmed that they eventually found willing buyers, albeit taking up to a week longer than it would have otherwise taken. Such buyers included, pension funds, insurance companies and distressed-asset funds, who saw attractive opportunities in a falling market, especially after central bank announcements removed a considerable amount of uncertainty from the market.

Most dealers shifted further towards a riskless principal client facilitation model where bonds were bought from clients contingent on an exit strategy which would mostly take the form of a matched sale. As a result of this shift, it took more time on average to execute a trade, further reducing the depth of available market liquidity.

The willingness of dealers to make markets varied across the types, size and credit ratings of bonds. Dealers did not make markets evenly across sectors and market segments. Some market participants noted that some dealers shied away from those most affected by the pandemic (e.g., airline, leisure, and hospitality). This suggests that dealers became more selective in the type of business they were willing to make. Dealers' willingness to trade in large sizes also diminished (e.g., from a USD 5 million to a USD 2-3 million average ticket in the US), with market participants noting a reluctance by some dealers (mostly non-bank affiliated or smaller dealers) to make markets in high-yield or lower-rated corporate bonds. However, dealers generally appeared more willing to make markets in bonds where they could more readily sell them on, i.e., shorter maturity, more recent and larger issuances, higher credit quality bonds or central bank eligible collateral.

It is not easy to disentangle the relative contribution of demand for, versus supply of, liquidity. A couple of studies, such as Chikis and Goldberg (2021) and Kargar et al (2021), attribute roughly 25% of the decline in the value of corporate bonds during March 2020 to the reduction in the supply of liquidity. Accordingly, the larger percentage spread increase observed in investment grade bonds may reflect the difference in demand for liquidity rather than dealer behavior per se.

Dealers were more reluctant to offer indicative quotes on bonds during the period of stress. One way of measuring dealers' willingness to make markets is to look at the number of runs (indicative quotes or axes) that dealers send to clients. Academic studies such as Hendershott et al. (2021)⁴⁷ as well as market participants' responses show that the willingness of certain dealers to show runs substantially decreased. This can be partly explained by the reluctance of dealers to show where their prices were, but it is also an indication that the appetite of some dealers to make markets had decreased. Further, most dealers turned off their algorithmic trading partly because of a lack of available reference prices (often swap spreads or government bonds) and the one-sided demand. During the peak of the turmoil, providing pricing across electronic platforms became too risky for dealers, who also became less motivated to disseminate information that might quickly become stale in fast-moving markets. As a result, participants noted that most trading temporarily switched over to phone trading, which reduced transparency in the market and further hampered liquidity.

C2.2 - Dealer inventory and central bank intervention:

During the March stress, the behavior of dealers varied across jurisdictions, as well as by size and type of dealers. Overall, academic research found that dealers did not step up to meet the additional demand and buy corporate bonds as prices were dropping, and instead some initially reduced their exposure.⁴⁸ Large dealers generally continued to make markets to maintain key

⁴⁷ Note, this research focuses on a subset of the TRACE data

⁴⁸ the same time, primary issuance normally only occurs in a stable secondary market environment.

client relationships, becoming more selective in their approach and shifting further toward riskless principal trading. Their cumulative inventories stayed relatively stable from mid-February before they began to drop when the crisis worsened in early March. In contrast, smaller or non-primary dealers shifted from buying bonds to selling bonds, resulting in, for example, the US dealers' cumulative inventory (defined as the difference between their cumulative purchases and cumulative sales of corporate bonds) declining by \$8 billion.⁴⁹

The decline in inventory positions might have exacerbated market illiquidity because bonds that were sold more aggressively by dealers experienced a greater increase in bid-ask spreads.⁵⁰ In a few cases, there was a more severe decrease in market-making activity by certain dealers during the March turmoil. Some dealers reported thin USD trading in Asian time zones when US markets were closed. In Europe, the picture is mixed, with some dealers stepping out of the market or reducing their capacity during the second half of March 2020 despite being relatively active earlier in the crisis.

Generally, the announcement of central bank interventions along with fiscal support in late March 2020 had an instant effect on market sentiment. It led to the re-opening of the primary markets, and the restoration of market confidence by substantially reducing selling pressures from institutional investors and other market participants – thereby helping to quickly unwind the liquidity supply/demand imbalance. From the dealers' perspective, the interventions helped by providing liquidity to the market and by restoring risk appetite, thereby allowing dealers to offload some of the positions accumulated during the turmoil. However, it is difficult to disentangle the role and the relative impact of the different policy measures because many of them occurred in a narrow window. Market participants noted that announcements in late March 2020 of the measures had an instant effect on sentiment even if the operationalization of some measures took time to complete. Domestic asset purchases by central banks in their own jurisdiction, coupled with the SMCCF and its USD liquidity swap lines with other central banks, are typically highlighted as the most important announcement/interventions for the resumption of trading activity. Other regulatory interventions, such as prudential actions to facilitate the use of capital resources for market-making, are generally seen as comparatively less impactful.

In addition, the normalization of conditions in core markets, such as those resulting from large-scale intervention in the government bond markets, likely had a consequential beneficial impact on corporate bond market functioning given the government bond yield curve's use as a key reference benchmark for pricing longer-dated corporate debt.

⁴⁸ Haddad, V., Moreira, A., Muir, T., & Goldstein, I. (2021). "When Selling Becomes Viral: Disruptions in Debt Markets in the COVID-19 Crisis and the Fed's Response." *The Review of Financial Studies*.

⁴⁹ Maureen O'Hara and Zing (Alex) Zhou (2021). "Anatomy of a Liquidity Crisis: Corporate Bonds in the COVID-19 Crisis"

⁵⁰ Maureen O'Hara and Zing (Alex) Zhou (2021). "Anatomy of a Liquidity Crisis: Corporate Bonds in the COVID-19 Crisis"

Since March 2020, market-making activity by dealers has mostly resumed to pre-pandemic levels (of pricing and activity), though the longer-term impact of central bank interventions remains unclear. In the second quarter of 2020, the situation rapidly returned to normal, even though corporate bond markets in some certain jurisdictions have not totally reverted to pre-pandemic conditions. Recovery was unequal across assets, depending on whether corporates were in a sector less affected by the pandemic, or assets were eligible as collateral. Some reported that dealers did not materially change their involvement in the bond market since the COVID-19 stress, though some dealers have adopted more cautious risk management practices and simplified their books. This may be largely attributable to a general change in risk-taking where positions are more systematically hedged or where an exit strategy is prearranged. In addition, the longer-term consequences of the interventions remain unclear. For example, several dealers report that the central bank intervention, although necessary to deal with the turmoil, may create moral hazard in that it may have changed dealer behavior in the long term. The impact on corporate bond markets and dealer intermediation once government support measures are wound down, across jurisdictions, remains to be seen.

C2.3 - Drivers of dealer behavior

No single factor can explain dealer behavior in March 2020, but a few factors stand out. The most important factors cited are large one-sided flows; internal risk appetite and management of balance sheet limits; and extreme uncertainty that made risk management particularly difficult:

- Dealers were reluctant to intermediate very large flows for which they could not find a counterparty quickly enough, given that most market participants were looking to sell their corporate bond holdings during the “dash for cash”. The increased use of riskless principal trading in recent years, combined with these one-way flows, may have limited dealer intermediation.
- The spike in volatility led to mechanical increases in value-at-risk (VaR), which impacted internal risk limits. Members indicate that such limits were “elastic” to reflect the mechanical increase but that dealers focused on the size of their positions, riskiness of individual exposures (e.g., sector, credit rating, duration) and, for a number of them, a reduced set of clients with whom they had important relationships when deciding where to provide liquidity. Foreign bank branches might have been affected by their headquarter strategy, given that risk limits are often set at a firm-wide level, depending on organizational structure and internal risk approval processes.
- The high uncertainty on future developments with the pandemic, coupled with the lack of clarity on whether central banks would intervene, is suggested to have been a very important factor in limiting the risk appetite of dealers. This changed once it became clear that central banks would intervene, allowing dealers to expand intermediation activities.

Market structure, prudential requirements, the difficulties in hedging positions and operational risk considerations are seen as somewhat important in explaining the behavior of dealers:

- The size of the corporate bond market has increased substantially while dealer inventories and trading activities have shrunk in recent years, including in light of post-GFC reforms, resulting in limited ability of dealers to provide the necessary liquidity in stress. In the US and EU, it is a much larger market compared to a few years ago and the lack of venues where price discovery could work easily is a factor making it more difficult for trades to take place. It was also reported that amid the extreme uncertainty, dealers were unwilling to show their prices to the market and switched to voice trading, highlighting the need to protect their quotes from being disseminated. Some dealers also reduced their automated quoting algorithms, which resulted in trading moving away from electronic venues and onto voice.
- Prudential requirements, while not the dominant factor, may have influenced behavior in several ways. In the few cases in which dealers mentioned prudential rules as being important, they mainly referred to the risk-weighted asset requirements (in particular credit and market risk) rather than the leverage ratio.
- Some dealers highlighted the increased costs of hedges as a constraint on their market-making. These stem from higher margin and lower liquidity in derivative markets (e.g., credit default swaps), limitations to pledging corporate bonds as collateral in the repo market, and large price dislocations in ETFs (as measured by NAV discounts), which in normal times are all used to hedge risk.
- In terms of operational risks, the move to a home-working environment may have influenced dealers in some markets, at least in the initial stages of the pandemic.

It was also noted that other regulations (e.g., relating to conduct and transparency/disclosure) and higher funding costs were not important, and these factors are not seen as constraining the behavior of dealers in the jurisdictions covered by the analysis.

The significance of these drivers should be considered in the context of longer-term structural and regulatory developments in corporate bond markets. In most jurisdictions, the size of corporate bond markets has grown considerably over the last decade, while dealers' capacity to intermediate in these markets has lagged. Higher capital and liquidity requirements since the GFC ensured that banks could absorb a shock rather than amplify it through deleveraging. At the same time, members note that prudential requirements affect how dealers manage their balance sheets and may make them less willing to use them, including in stress periods. They suggest that this may have reduced dealers' willingness to make markets, keep large inventories and therefore absorb risk in times of stress. Dealers and members alike note that these constraints were not unexpected and that the behavior of dealers in March 2020, when they did not expand their market-making activities sufficiently to meet large one-sided flows, should be seen in that context.

It is also noted that the elasticity of supply of liquidity by dealers is now more limited than in the past. In part, this is due to the increase in the size of corporate bond markets, coupled with reduced aggregate balance sheet capacity of bank dealers in recent years. However, there are also underlying economic issues at play. In particular, the risk-adjusted return of intermediating

corporate bonds is not large in normal conditions, and it can be quickly wiped out by the additional risk in stressed market conditions. This is exemplified by the fact that even non-bank dealers (which are not subject to any bank regulations, or any associated balance sheet constraints) reduce their intermediation of these markets in stress periods. Similarly, it is possible that the increasing volatility that impacts dealers' risk-bearing capacity and their willingness to take risks for markets like corporate bonds, where market makers are less able to promptly mitigate their inventory risk through hedges. The elasticity of the supply of liquidity in the market also depends on various market participants, with cash-rich investors stepping in to provide liquidity when prices are more attractive.

Discussion questions:

11. Do you agree with the overarching analysis of the drivers of liquidity supply and, specifically, how dealer behaviors are set out in this section? Please be specific and explain why.
12. What are your views on the relative impact of the drivers of the supply-side in driving the state of liquidity during the COVID-19 induced market stresses?
13. Considering the drivers of dealer behavior, how could the supply of liquidity be improved?

Part D - Corporate bond markets' structure and implications on liquidity provision

Structural features of the corporate bond market also contributed to the constraints in meeting demand for liquidity during the COVID-19 induced market stresses of March 2020.

Corporate bond markets have grown significantly since the GFC. This can be attributed to several factors, including benign economic conditions underpinned by accommodative monetary policies, banking sector deleveraging, supportive tax treatment of debt over equity, and the increased role of central banks in certain corporate bond markets, in conjunction with post-GFC reforms, which, in part by design, have shifted credit intermediation to the capital markets. Although market dynamics are evolving with new entrants such as ETFs and increased electronification, corporate bond markets maintain a large institutional and buy-and-hold component and remain mostly reliant on a limited number of dealers for intermediation. The continued reliance on bilateral OTC dealer-intermediated trading also comes at a time when the supply of liquidity by dealers is more constrained than before the GFC and when dealers commit less balance sheet to market-making activities.

Considering that there are currently limited alternative sources of liquidity, as well as challenges in improving market-making, these factors taken together, mean that corporate bond markets may be unable to absorb significant and sudden increases in selling pressure, such as those experienced under market stress.

D1 – General features of the corporate bond markets microstructure

The trading model and underlying structural features remain largely similar in nearly all jurisdictions.

- Trading in these markets remains essentially institutional with little direct retail participation. Investors are essentially “buy-and-hold,” with minimal trading in specific bonds beyond the first six months after issuance. For example, the turnover ratio is low in most jurisdictions (between 0.5% and 1% in the US and less than 0.5% in the UK and Canada).
- In contrast to the markets for equities and centrally cleared derivatives, corporate bond markets have seen little standardization. In addition, the number of distinct ISINs has grown significantly, with some corporates having hundreds of distinct bonds outstanding.
- Despite some increased electrification, particularly in the US, corporate bond trading remains mostly an OTC dealer-intermediated market, where intermediation is concentrated in a small number of dealers. All-to-all trading and portfolio trading have grown but remain a small proportion of total trading and trading is mostly through request for quote (RFQ) protocols.

Discussion questions:

14. Do you agree these are the core features of the corporate bond market? Please be specific and explain why.

D2 – Dealer intermediation and concentration

As noted above, dealers are key market makers and providers of liquidity in corporate bond markets. These markets are characterized as concentrated markets, where a small number of dealers execute most of the trades. In examining interdealer trade concentration, the analysis finds that the daily top ten dealers by par value traded account for 50-66% of daily dollar trading volume, and top twenty account for 70%-82% (the percentages are lower in terms of the number of trades thereby confirming that dealers are more active in larger trades). Data for the UK and Canada show similar levels of concentration.

Few dealers are active on the secondary market only. This is because the economics for dealers is heavily reliant on the provision of related services and on fees generated by new issue origination. Market-making is a key element in the winning of new issue mandates as it informs bankers where to price the new issue. Participants also noted that dealers are expected to provide liquidity in the corporate bonds that they brought to market. This has been viewed as a barrier to entry for non-dealers to intermediate in the secondary market.

Similarly, some market participants have noted that the development of passive investment has increased competition and reduced buy-side firms’ margins and has led to consolidation among asset managers. Growing buy-side concentration has negative consequences for dealers: it reduces the number of clients they face which can make trading limits more binding, increases bargaining power of clients and challenges risk management assumptions. Market participants further noted that this could have contributed to an environment with greater replication of positions and interests. Thus, as diversity of participants has reduced and concentration of AUM has increased, the market’s ability to withstand shocks on its own is deemed to have diminished.

Some market participants noted that the reduction in the number of relative value participants such as bank proprietary desks, market-making desks and hedge funds may have impacted the market's ability to take counter-cyclical actions. As explained above, the speed and size of the central bank intervention made it difficult to test fully the behavior of potential countercyclical market participants.

Discussion questions:

15. What are your views on the level of dealer concentration?
16. What could help the market diversify sources of liquidity supply and/or become less reliant on dealer intermediation, particularly in times of stress? Consider both market-led as well as potential regulatory-led solutions.

D3 - Corporate bond heterogeneity and standardization

Corporate bond markets allow borrowers to customize their bond issuance to suit their needs in terms of maturity, structures, collateral, and optionality. As a result, corporate issuers can have a large number of distinct bonds outstanding, each with different features making them non-fungible, with only a small portion of them traded on a regular basis. According to ICMA, listed fixed income ISINs in the EU outnumber equity ISINs by 33:1.⁵¹ In addition, the US noted a proliferation of individual bonds, with 2,500 different non-financial corporations having close to 10,000 bonds outstanding.⁵² The World Federation of Exchanges estimates that there are globally about 48,000 stocks. CUSIP Global Services estimates that there are over 515,000 corporate bonds in the US alone.

As part of the industry engagement, participants expressed mixed views on the potential impact of a reduction in the number of bonds and the standardization of bond issuances. Some participants saw these changes as necessary to increase trading on all-to-all platforms and to reduce the reliance on dealer intermediation. This is because the heterogeneity and the non-fungible aspect of bonds make it difficult for buyers and sellers to find a counterparty and therefore require a dealer to intermediate. As a result, market participants have noted that liquidity may be positively impacted, and all-to-all trading may be facilitated, if larger issuers were to offer more benchmark issuances effectively reducing the level of heterogeneity in the market.

Other participants, however, stated that allowing for a great diversity of bond issuance structures provides flexibility for corporate borrowers to tailor their bond issuances to their business and financial needs. Some also argue that this may lead to a bifurcation of the market with standardized corporate bonds issued by regular/large borrowers such as banks and multinationals, while issues from the rest of the corporate sector would be more akin to private

⁵¹ <https://www.icmagroup.org/assets/documents/Regulatory/MiFID-Review/EU-Consolidated-Tape-for-Bond-Markets-Final-report-for-the-European-Commission-290420v2.pdf>

⁵² SEC Staff Report, Division of Economic and Risk Analysis, U.S. Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock (Oct. 2020), at 32 available at https://www.sec.gov/files/US-Credit-Markets_COVID-19_Report.pdf.

placement. Relatedly, some participants mentioned that greater standardization of the bond market may help facilitate electronic trading. This could include measures to make bonds more fungible, with a minimum notional size, pay interest semi-annually or mature on one of four fixed quarterly dates. For instance, standardization was implemented successfully through regulation in CDS markets, including through mandatory clearing and execution on trading venues (SEF in the US and regulated markets, multilateral trading facilities and organized trading facilities in Europe). However, the CDS market is different from the corporate bond markets - e.g., the CDS market is smaller in terms of issuers and counterparties.

Discussion questions:

17. What are your views on standardization in corporate bond markets? What do you think are the pros and cons of increasing standardization and its feasibility?

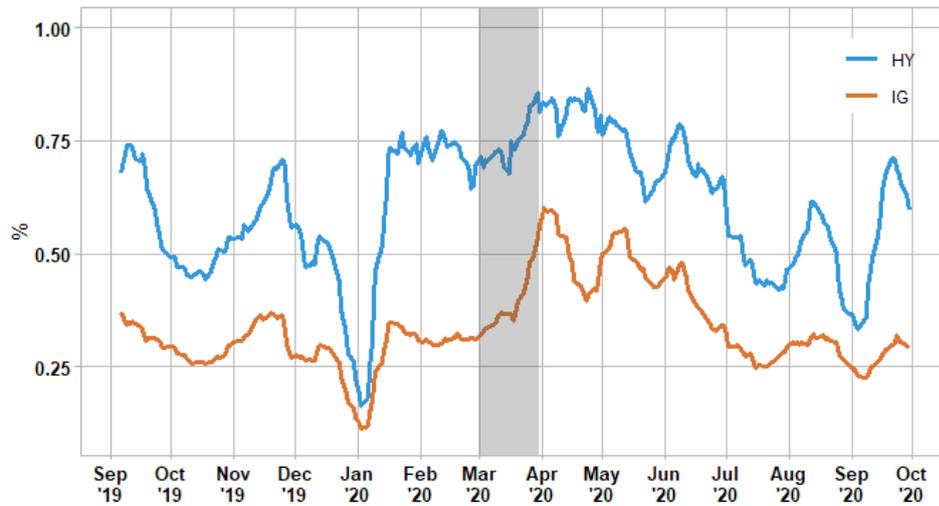
D4 - Trading in corporate bonds

Secondary trading in corporate bonds differs from trading in other asset classes, such as equities. Despite the high number of individual bonds outstanding, corporate bonds are traded infrequently in most jurisdictions compared to large cap equities or core sovereign bonds. Generally, only the largest bonds trade regularly, and even those bonds that are largest in outstanding size and most traded do not match the liquidity and relatively narrow bid-ask spreads of agency mortgage-backed securities, Treasuries or large corporate equity listings.

Corporate bond markets are characterized by different trading dynamics for newer and larger issues versus older and smaller ones. While large-cap equities trade thousands of times a day (or more), bonds – even ones considered liquid – may not trade every day. Larger institutional trades have historically dominated these markets. However, corporate bond turnover ratios (value traded over amount outstanding) are not much lower than the turnover ratios for stocks, because when corporate bonds do trade, the amounts are large.⁵³ Corporate bonds typically trade in sizes of between USD 1 and -5 million or even larger-sized blocks, especially in the US. In contrast, stocks generally trade in smaller sizes suitable for retail trading. Similarly to what was observed in the equity market, electronification and the use of algorithmic trading has led to a decrease in trade sizes in the corporate bond market.

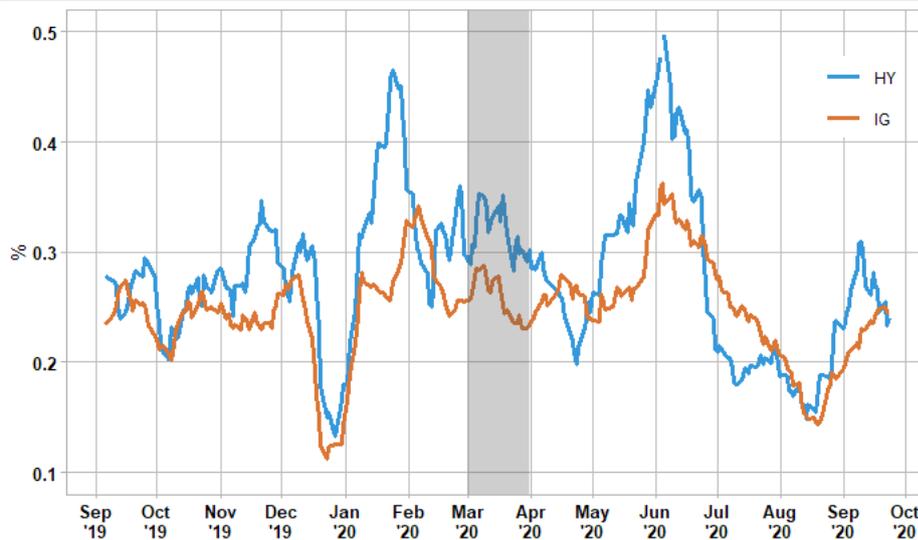
⁵³ This is because the turnover ratio is calculated using the notional amount traded. The picture would be different on a measure that used the number of distinct stock/bonds.

Figure 10 – USD turnover ratio
In % of amount outstanding, 10-day moving average



Source: TRACE/Refinitiv/Bloomberg, FINRA calculations

Figure 11 – GBP turnover ratio
In % of amount outstanding, 10-day moving average



Source: MiFID/Bloomberg, FCA calculations

D5 - Growth of electronic trading

Given the growth in electronic trading in the period between the GFC and the time of this review, there is an important question of how market participants used electronic platforms during the COVID-19 induced market stresses. This discussion is caveated by a significant data limitation; not all trades facilitated through electronic platforms are identified as such in the

regulatory audit trail because some protocols, particularly RFQ-type platforms, may be outside the regulatory perimeter of some authorities.

In recent years, electronic trading has increased in an attempt to aggregate liquidity and improve transparency. In the US, for example, the proportion of trade reports attributable to electronic platforms increased from under 8% to over 24%⁵⁴ in the last decade, although these tend to be smaller sized trades and concentrated in more liquid bonds. Beyond dealers providing electronic order books and matching engines, there has been significant growth of corporate bond trading venues which may not be registered or supervised as dealers. Instead, these systems provide a platform for potential buyers and sellers to meet each other and negotiate a trade. It is also worth noting the development of automatic trading.⁵⁵ Transparency has also increased because of the implementation of TRACE in the US in 2002 and post-2008 GFC reforms.^{56, 57}

It is not clear how much the electronic marketplace has changed the liquidity environment for corporate bonds as some platforms have simply provided electronic versions of liquidity which is available via other means (e.g., single dealer RFQ platforms). Electronic platforms are still used mostly for small trades or trades with small information leakage, while other larger or more value-added trades are executed bilaterally and OTC. In the EU, OTC trading is also characterized by the increasing presence of systematic internalisers (SI) – i.e., an investment firm which is a counterparty dealing with its proprietary capital and is not a trading venue. These firms trade on risk, on an organized, frequent systematic and substantial basis when executing client orders outside a regulated market, a multilateral trading facility (MTF) or an organized trading facility (OTF).⁵⁸ This is done without operating a multilateral system which is subject to more stringent pre- and post-trade transparency compared to pure OTC trading.

Market participants have commented that the number of firm quotes in electronic platforms, including all-to-all platforms, dropped during the March 2020 episode. Market participants noted that electronic trading was generally affected by the lack of reliable pricing (prices were either indicative or stale given the speed at which events unfolded). However, there is not sufficient data to confirm this. These participants stated that trading among institutions moved almost entirely to voice and observed that the velocity of trading declined, i.e., it took more time to execute a trade. Since trades negotiated bilaterally may still be reported through electronic venues because of the benefits in clearance and settlement, this shift may not be

⁵⁴ See <https://www.finra.org/filing-reporting/trace/trace-fact-book>.

⁵⁵ Automatic trading (or “algo-trading” where prices are automatically generated through an algorithm) remains mainly confined to small trades or trades with little risk of information leakage.

⁵⁶ Electronic trading and all-to-all trading levels vary greatly between jurisdiction, where levels are highest in the US.

⁵⁷ A review of independent academic studies assessing the impact of TRACE on liquidity in U.S. fixed income markets can be found at: <https://www.finra.org/filing-reporting/trace/trace-independent-academic-studies>.

⁵⁸ A systematic internaliser (SI) is not permitted to bring together third-party buying and selling interests in functionally the same way as a Trading Venue, e.g., in contrast to a trading venue, an SI trades on own account, is a single dealer, and is considered a counterparty.

apparent from the regulatory data. Further, these observations do not allow for a determination of whether the increased time to trade was driven by the shift away from electronic venues or changing supply and demand by investors in the face of the increased market uncertainty.

Although not a direct test of the use of electronic venues, research (O'Hara, Zhou, May 2020) shows that the transaction costs in customer-to-customer trades increased significantly more than the customer-to-dealer levels, and customer-to-customer trades were much smaller than the customer-to-dealer trades. The same paper argues that obtaining liquidity from other customers therefore proved an expensive and limited alternative in the crisis period. This evidence is consistent with the anecdotal observation that trading shifted away from electronic venues.

Some market participants note that greater use of all-to-all venues, including exchanges and trading platforms could enhance liquidity by connecting directly supply and demand for liquidity. However, the resilience of such venues in periods of stress remains unknown. Some market participants noted limited use of such venues during the stress, whilst trading data from key trading venues seem to indicate increased trading activity. As explained above, the non-fungibility of issuances and diversity of bonds may still make all-to-all trading difficult. The possibility for market participants to use the facilities of a trading venue (e.g., in settlement arrangements) for formalizing pre-agreed bilateral trades has also become common practice (and has contributed to the development of these types of functionalities across trading venues). This may provide a positive contribution to trade transparency and consequent price-discovery process.

The number of trading protocols that are used is still limited. Although roundtable participants noted a proliferation of trading protocols being offered on electronic platforms, the RFQ is the prevalent model for execution used in most jurisdictions where electronic trading venues operate. In a RFQ, a trader from the buy-side will communicate an interest in buying or selling a particular bond to one or more broker-dealer and ask the broker-dealer(s) for a price. A buy-side trader may ask several broker-dealers for a price quote and then select a dealer with whom to conduct the transaction. This contrasts with a central limit order book (CLOB). CLOB is used in exchange traded markets and is one of the primary trading protocols used in equities.

While market participants have commented that bond trading in March 2020 was characterized by a return to voice trading, the US electronic trading market remained active. Broadly speaking, the use of electronic trading has steadily grown in the US over the last decade. This growth is likely linked in part to the growth of the corporate bond ETF market, where electronic trading offers an efficient and low-cost means for ETF market participants to arbitrage differences between the ETF price and NAV. Just prior to the COVID-19 crisis in February 2020, Greenwich Associates estimates that electronic trading accounted for 29% of investment grade volume and 17% of high yield volume, up from 22% and 12% a year prior.⁵⁹

⁵⁹ Source: Greenwich Associates, as reported by Financial Times in Rennison, Joe, "Covid-19 Forces Electronic Shift in Bond Markets." *Financial Times*, February 19, 2021, available at <https://www.ft.com/content/14660aa5-a1e7-46fc-a726-00b12b3f6beb>.

During March 2020, the electronic share of US trading volume declined to 25% for investment grade and 16% for high yield, consistent with a modest shift from electronic to voice trading described by market participants. Because the market environment was rapidly changing during March 2020, aggregated monthly data likely masked intra-month trends.⁶⁰ Nevertheless, the monthly data suggest that electronic platforms continued to provide access to liquidity during the crisis, though there is a lack of independent data to verify this. Anecdotally the understanding is that electronic trading was supported by the ETF market, which continued to function throughout the crisis. Electronic venues were important for trades linked to ETF creation and redemption activity, and market participants also commented that portfolio trades – which dealers can hedge with corporate bond ETFs – remained liquid and active on the electronic platforms.

Though there is a lack of data to verify this, the understanding from market participants is that all-to-all trading in the US increased during March 2020.⁶¹ During this period, secondary market trading volumes increased, while dealers – for reasons discussed above – were reducing inventory and generally less active. Market participants commented that all-to-all platforms provided a trading venue for market participants who were willing and able to provide liquidity, which supported market clearing at higher volumes.

Discussion questions:

18. What are your views on electronification of the corporate bond markets? Has it improved the provision of liquidity?
19. Is the electronification (and any resulting increase in liquidity) of government bond markets over the last decade illustrative of how corporate bond markets could evolve? How and why?
20. What aspects or developments could help to further support increased levels, and the resilience of electronic trading both in normal times and in stress (e.g., availability of data)?
21. Would an increase in all-to-all trading help the provision of liquidity? Is it feasible to increase its use? What are the pros and cons?

D6 - Increased transparency

Market participants have said that access to data was key to price formation, trading, and liquidity. The US market is considered as the most advanced in terms of availability and accessibility of data though the implementation of TRACE. In Europe, MiFID has implemented pre- and post-trade transparency, but access to the data remains fragmented. Australia has no regulation mandating the reporting of corporate bonds. The UK and the EU are currently

⁶⁰ The same *Financial Times* article displays higher-frequency data for two large US platforms. The graphs show electronic trading volumes declining substantially during the first two to three weeks of March, before rapidly reversing around the time of Federal Reserve intervention.

⁶¹ Consistent with this increase, Greenwich Associates estimates that all-to-all trading accounted for 12% of investment grade volume in 2020, up from 8% in 2019. See “All-to-All Trading Takes Hold in Corporate Bonds”, available at <https://www.greenwich.com/fixed-income/all-all-trading-takes-hold-corporate-bonds>. The same paper estimates that electronic trades accounted for 31% of investment-grade volume in 2020, so that all-to-all trades accounted for nearly 40% of all electronic trades.

considering changes to their regime and the appropriateness of a consolidated tape to address the fragmentation of data.

Overall, electronification has made it easier and more efficient to trade because of the improved quality and quantity of the data compared to 2008. However, market participants also noted that transparency can increase risks of information leakage, which might have adverse effects on market liquidity. This suggests that markets calibrate how much and what type of trading occurs on electronic platforms in addition to the transparency based on individual market characteristics and dynamics. This may explain the reduced used of electronic trading during the height of the crisis when price information was most valuable.

Concerning the role of algorithmic traders, at least in the EU, after being almost fully absent until mid-2019, bond trading (including all types of bonds) saw a significant increase in algorithmic trading in Q2 2019, with a peak in Q3 2019 when algorithmic trading, other than high frequency trading (HFT), accounted for around 80% of traded volume. Contrary to the other asset classes, there is only marginal HFT in bonds, which could be explained by the less liquid nature of those instruments.⁶²

Discussion questions:

22. Do you think there should be more transparency in the corporate bond market, including the level of consolidated information? In which segments of the corporate bond market do you think transparency is most needed?
23. Would you consider that pre-trade transparency and post-trade transparency are equally important?

⁶² See ESMA Final Review report on Algorithmic Trading https://www.esma.europa.eu/sites/default/files/library/esma70-156-4572_mifid_ii_final_report_on_algorithmic_trading.pdf

Annex 1 – Discussion questions

Summary of key outcomes

1. What are your views on the key outcomes drawn from IOSCO’s analysis of the corporate bond markets? Are there any aspects of the diagnostic analysis and the key outcomes with which you disagree or that would benefit from more nuance? Please be specific to each observation and indicate why.
2. Does the report capture and accurately describe the main features of the corporate bond markets? Is there a particular aspect (or aspects) that may be missing?
3. Are there ways to improve the market functioning and liquidity provision in corporate bond markets, notably under stressed market conditions? If so, please explain how and the extent to which this could be addressed at an international level?
4. What further work, if any, should IOSCO consider in the context of corporate bond markets?

Background of corporate bond markets globally

5. Are the features and key characteristics of the corporate bond markets accurately capture and described? Is there a particular aspect (or aspects) that may be missing?

Liquidity during the COVID-19 induced stress

6. Does the report accurately describe the state of liquidity in corporate bond markets during the COVID-19 market stress across the three stated measures employed in the report?

The drivers of liquidity - supply, demand, and market participant behaviors

The demand for liquidity

7. Do you agree with the overarching analysis of the drivers of buy-side investor behavior set out in this section?
8. Are the main demand side drivers of liquidity by investor-category accurately described and reflective of events in your experience of the COVID-19 induced market stress?
9. Who in your view were the main drivers of liquidity demand during the COVID-19 induced market stresses and why?
10. Given mixed evidence, how significant was the behavior of long-term investors in driving or mitigating liquidity demand during the COVID-19 stress?

The supply of liquidity - the role of dealers

11. Do you agree with the overarching analysis of the drivers of liquidity supply and, specifically, how dealer behaviors are set out in this section? Please be specific and explain why.
12. What are your views on the relative impact of the drivers of the supply-side in driving the state of liquidity during the COVID-19 induced market stresses?

13. Considering the drivers of dealer behavior, how could the supply of liquidity be improved?

Corporate bond markets' structure and implications on liquidity provision

14. Do you agree or disagree with these core features of the corporate bond market? Please be specific and explain why.

Dealer intermediation and concentration

15. What are your views on the level of dealer concentration?
16. What could help the market diversify sources of liquidity supply and/or become less reliant on dealer intermediation, particularly in times of stress? Consider both market-led as well as potential regulatory-led solutions.

Corporate bond heterogeneity and standardization

17. What are your views on standardization in corporate bond markets? What do you think are the pros and cons of increasing standardization?

Growth of electronic trading

18. What are your views on electronification of the corporate bond markets? Has it improved the provision of liquidity?
19. Is the electronification (and any resulting increase in liquidity) of government bond markets over the last decade illustrative of how corporate bond markets could evolve? How and why?
20. What aspects or developments could help to further support increased levels, and the resilience of electronic trading both in normal times and in stress (e.g., availability of data)?
21. Would an increase in all-to-all trading help the provision of liquidity? Is it feasible to increase its use? What are the pros and cons?

Increased transparency

22. Do you think there should be more transparency in the corporate bond market, including the level of consolidated information? In which segments of the corporate bond market do you think transparency is most needed?
23. Would you consider that pre-trade transparency and post-trade transparency are equally important?

Annex 2 – References

- AFME (2020). *“Impact of COVID-19 on European Capital Markets: Market Update”*
- Boyarchenko, N, A Kovner and O Shachar (2020) *“It’s what you say and what you buy - a holistic evolution of the corporate credit facilities”*, CESifo Working Paper No. 8679, November
- Chikis, Craig A., Jonathan Goldberg (2021). *“Dealer Inventory Constraints in the Corporate Bond Market during the COVID Crisis,”* FEDS Notes. Washington: Board of Governors of the Federal Reserve System, July 15, 2021.
- D’Amico, S, V Kurakula and S Lee (2020) *“Impacts of the Fed Corporate Credit Facilities through the Lenses of ETFs and CDX”*, Federal Reserve Bank of Chicago Working Paper, No. 2020-14
- EIOPA (2020) *“Financial Stability report July 2020”*
- EIOPA (2020) *“Financial Stability report December 2020”*
- ESMA (2020) *“ESMA Annual Statistical Report 2020”*
- Falato, A, Goldstein, I, Hortaçsu, A, (2021). *“Financial fragility in the COVID-19 crisis: The case of investment funds in corporate bond markets.”* Journal of Monetary Economics.
- FSB (2019) *“Vulnerabilities associated with leveraged loans and collateralised loan obligations”*
- FSB (2020) *“Holistic Review of the March Turmoil”*
- FSB (2020) *“COVID-19 Pandemic: Financial Stability Implications and Policy Measures Taken”*
- Gilchrist, S, B Wei, V Z Yue and E Zakrajšek (2020) *“The Fed Takes on Corporate Credit Risk - An Analysis of the Efficacy of the SMCCF”*, Federal Reserve Bank of Chicago Working Paper 2020-18
- Haddad, V, A Moreira, and T Muir (2020) *“When Selling Becomes Viral: Disruptions in Debt Markets in the COVID-19 Crisis and the Fed’s Response”*, NBER Working Paper No. 27168, May
- ICI (2021) *“Global Worldwide Regulated Open-End Fund Assets and Flows Fourth Quarter 2020 (March 17, 2021)”*
- ICMA (2020). *“EU Consolidated Tape for Bond Markets Final report for the European Commission”*
- ICMA (2020). *“The-European-investment-grade-corporate-bond-secondary-market-and-the-COVID-19-crisis”*
- ICMA (2020). *“ICMA’s 3rd study into the state and evolution of the European investment grade corporate bond secondary market”*
- IOSCO Committee 2 on Secondary Markets (C2) (2017). *“Examining liquidity in corporate bond markets”*
- IOSCO Committee on Emerging Risks (CER) (2019). *“Liquidity in corporate bond markets might behave under conditions of market stress”*
- Kargar, M, B Lester, D Lindsay, S Liu, P Weill and D Zúñiga (2021) *“Corporate Bond Liquidity During the COVID-19 Crisis”*, NBER Working Paper No. 27355, Mahy

Liedtke, P (2021) “*Vulnerabilities and resilience in insurance investing: studying the COVID-19 pandemic*”, *The Geneva Papers on Risk and Insurance - Issues and Practice*, March 2021

Ma, Y, K Xiao and Y Zheng (2021) “Mutual fund liquidity transformation and reverse flight to liquidity”, Working Paper, April
Nozawa, Y and Y Qiu (2021) “*Corporate Bond Market Reactions to Quantitative Easing during the Covid-19 pandemic*”, Working Paper, April

Aquilinia, M, Suntheim, F, (2016). “*Liquidity in the UK corporate bond market: evidence from trade data*” FCA occasional papers in financial regulation, March 2016

Kozora, M, Mizrach, B, Peppe, M, Shachar, O, Sokobin, J, (2020). “*Alternative trading systems in the corporate bond market*” Federal Reserve Bank of New York Staff Reports, August 2020

O'Hara, M., & Zhou, X. A. (2021). “Anatomy of a liquidity crisis: Corporate bonds in the COVID-19 crisis.” *Journal of Financial Economics*.

Liang, N (2020). “*Corporate Bond Market Dysfunction during COVID-19 and Lessons from the Fed's Response*” Hutchins Center on Fiscal and Monetary Policy, Brookings Institution

Sharpe, Steven A., and Alex X. Zhou (2020). “The Corporate Bond Market Crises and the Government Response,” FEDS Notes. Washington: Board of Governors of the Federal Reserve System, October 07, 2020.

US SEC Staff Report, Division of Economic and Risk Analysis, “U.S. Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock”, October 2020.

Abbreviations used in this report

- *CBML* Corporate Bond Market Liquidity
- *CDS* Credit Default Swap
- *ECB* European Central Bank
- *EIOPA* European Insurance and Occupational Pensions Authority
- *ETF* Exchange Traded Fund
- *Fed* Federal Reserve Board
- *FSB* Financial Stability Board
- *FSEG* Financial Stability Engagement Group
- *GFC* Global Financial Crisis
- *HFT* High Frequency Trading
- *HY* High Yield
- *IG* Investment Grade
- *IOSCO* International Organization of Securities Commissions
- *MiFID* Market in Financial Instrument Directive
- *NAIC* National Association of Insurance Commissioners
- *NAV* Net Asset Value
- *NBFI* Non-Bank Financial Intermediaries
- *PEPP* Pandemic Emergency Purchase Program
- *PTF* Principal Trading Firm
- *RFQ* Request for Quote
- *SMCCF* Secondary Market Corporate Credit Facility
- *TRACE* Trade Reporting and Compliance Engine
- *VAR* Value at Risk
- *WDB* FSB's Workstream on Dealer Behavior
- *WHO* World Health Organization