

Examination of Liquidity of the Secondary Corporate Bond Markets

Final Report



OICV-IOSCO

**The Board
OF THE
INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS**

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Foreword

On August 5, 2016, the Board of the International Organization of Securities Commissions (IOSCO) published a Consultation Report, *Examination of Liquidity of the Secondary Corporate Bond Markets*,¹ with a view to encouraging the public to comment on its analysis, data and conclusions. The Board also requested that market participants provide any data relating to liquidity in the corporate bond market that they believed would assist IOSCO in further refining its analysis. Comments were requested by September 30, 2016.

Sixteen comment letters were received and considered by IOSCO, as it prepared this final report, *Examination of Liquidity of the Secondary Corporate Bond Markets* (Final Report). The attached feedback statement (Annex 1) describes and addresses the major comments. In a number of instances, the Final Report reflects changes made to the Consultation Report in response to particular comments.

¹ <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD537.pdf>

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I. EXECUTIVE SUMMARY

The IOSCO Board mandated IOSCO Committee 2 on the Regulation of Secondary Markets (IOSCO Committee 2) to examine the liquidity of the secondary corporate bond markets in IOSCO Committee 2 member jurisdictions, including the impact of structural and regulatory developments since 2004, with a particular focus on the period just prior to the financial crisis to 2015. In response, IOSCO Committee 2 engaged in an extensive fact-finding project that collected information by survey from regulators and industry (including funds, dealers, electronic trading venues and others). IOSCO Committee 2 solicited additional information through roundtables with industry representatives and independent academics. In general, industry shared with IOSCO Committee 2 its corporate bond trading experiences, along with impressions of the liquidity in the corporate bond market.

Analysis of the data collected from IOSCO Committee 2 members regarding the corporate bond markets in their respective jurisdictions was challenging because of differences in data collection methods and scope, quality, consistency and availability. These differences made it difficult to aggregate and compare data across jurisdictions. Despite these challenges, a detailed analysis of liquidity metrics, survey results (both qualitative and quantitative) from industry and regulators, roundtables with industry, and a review of academic, government and other research articles allowed IOSCO to develop an informed picture of current secondary corporate bond market liquidity.

IOSCO's study revealed meaningful changes to the characteristics and structure of the secondary corporate bond markets, including changing dealer inventory levels, increased use of technology and electronic trading venues, and changes in the role of participants and execution models (i.e., dealers shifting from a principal model to an agency model). In addition, IOSCO reviewed several potential metrics that could be used to assess the liquidity of the secondary corporate bond markets. IOSCO recognises that no single metric can act as a reliable measure of liquidity and that an examination of many different metrics is needed to see a more complete picture of corporate bond market liquidity. While some of the relevant metrics (turnover ratio, dealer inventories, and block trade size) might indicate potential signs of lower liquidity, most metrics reviewed show mixed evidence of changes in liquidity (bifurcation of trading², average trade size, and average number of counterparties or market makers) or some evidence of improving liquidity (trading volume, bid-ask spreads, and price-impact measures).

By examining many different metrics in aggregate, IOSCO was able to see a more complete picture of market liquidity emerge. Based on the totality of information collected and analysed, IOSCO did not find substantial evidence showing that liquidity in the secondary corporate bond markets has deteriorated markedly from historic norms for non-crisis periods.

IOSCO also notes in the conclusion to this report that the level of post-trade transparency (i.e., publicly released data concerning executed trades) in the corporate bond markets may impact liquidity. Moreover, the data disclosed through transparency requirements, along with relevant non-public data reported to regulators concerning corporate bond trades, can provide regulators with valuable data that can be used to create liquidity metrics. For this reason, the

² For example, less liquid assets being traded relatively less.

IOSCO Board has mandated IOSCO Committee 2 to update its 2004 report on regulatory reporting and transparency in the corporate bond markets.

The purpose of the transparency mandate will be to examine in detail the transparency regimes and regulatory requirements in place in IOSCO Committee 2 jurisdictions that have developed since 2004, and discuss in more detail the relationship between transparency and liquidity and the decisions regulators have made to address it (volume caps, delayed dissemination, etc.). The new mandate is also expected to be an opportunity for regulators to study current data reporting requirements regarding the corporate bond markets and the goal of collecting data that is comparable and useful on a cross-border basis, including for purposes of liquidity assessment.

II. INTRODUCTION

Bond markets are an important source of financing for economic growth. In general, deep and liquid markets for long-term debt securities can provide alternative financing options for growth, leading to greater diversification of the sources of funding beyond bank financing or equity offerings.

A number of market participants have recently raised concerns about liquidity³ in the secondary corporate bond market. They expressed, in particular, concerns that changes in market structure have impacted liquidity, and that some of these market structure changes were driven by changes in regulatory requirements.

Some market participants also expressed the view that in the event of an unexpected or significant market event, such as an abrupt interest rate rise, investors could face a possible rush to a crowded exit to sell their positions. Under this scenario, where markets are increasingly illiquid, prices would be pushed further down, perhaps falling rapidly, as the market seeks a new equilibrium level for interest-rate and credit risk transfer.

The IOSCO Board asked IOSCO Committee 2 to examine developments and issues relating to the liquidity in the secondary corporate bond⁴ markets in IOSCO Committee 2 member jurisdictions and to undertake a data driven analysis of the market, including: (a) evaluating and reporting on the current state of the corporate bond markets and any changes to secondary corporate bond markets in IOSCO Committee 2 member jurisdictions, particularly with regard to their structure, operation and liquidity; and (b) considering the impact of structural and regulatory developments that have occurred over the past decade.

The purpose of this report is to provide an objective and data driven examination of the development of the secondary corporate bond markets during the last decade with a specific focus on liquidity.⁵ To this end, IOSCO Committee 2 conducted a fact-finding exercise, which

³ Liquidity is a measure of the ability to buy or sell a product in a desired quantity and at a desired price and time without materially impacting the product's price. Metrics used to measure liquidity are discussed in detail in Section IV, below.

⁴ For the purpose of this mandate, "corporate bonds" are defined as ordinary corporate bonds, which would not include, for example, securitised issuances, convertible bonds or debentures, bonds with embedded options, asset-backed or covered bonds.

⁵ Our examination, however, focuses on potential changes to liquidity and not on possible consequences of a possible crisis or stress scenario. That exercise would be challenging given the inherently

included consultation with the industry and academics through both a survey and three roundtables. IOSCO Committee 2 also conducted a survey of its members and examined relevant academic, industry and government research.⁶

Data was gathered from a variety of additional sources, either in the form of publicly available information (for example, data vendors, trading venues, exchanges and clearing houses) or transaction reporting (non-public) data submitted to regulators. This report provides, based on this fact-finding, a description of the current state of the secondary corporate bond market and examines the liquidity of those markets.

While conducting this study, IOSCO learned that many member jurisdictions do not possess or have access to comprehensive sources of data regarding their corporate bond markets although there are notable exceptions.⁷ Moreover, the information available to regulators varies widely, particularly with respect to its granularity, methodological basis, timeliness and accessibility (see **Annex 6**).⁸ Further, the state of corporate bond markets differs in IOSCO Committee 2 member jurisdictions, with some jurisdictions having very large and liquid corporate bond markets, while others having small markets. These variables make comparisons of the liquidity of the corporate bond markets in different jurisdictions particularly challenging, and underscores the risk of over generalization about liquidity conditions.

The rest of this Report is structured as follows:

- Section III broadly describes the secondary corporate bond markets, including its participants, structures and other factors that may impact liquidity.
- Section IV discusses liquidity metrics and uses them to assess the current liquidity of the secondary corporate bond markets.

speculative nature of any such examination and the lack of globally comparable data that would be needed for such an analysis.

⁶ Twenty-three regulators and seventy-three financial firms answered the IOSCO surveys.

⁷ The most comprehensive source of data currently is FINRA's Trade Reporting and Compliance Engine (TRACE) in the U.S. FINRA rules require dealers to report their secondary market corporate bond trades to TRACE as soon as practicable, but no later than within 15 minutes of trade execution. Both regulators and the public have access through TRACE to post-trade data on nearly all U.S. corporate bond market activity. As of November 2015, all fixed income trades in Canada are reported to the Investment Industry Regulatory Organization of Canada (IIROC). A subset of the corporate data reported to IIROC will be disseminated. In Brazil, post-trade information is also publicly available. Since 2014, all trades over-the-counter must be informed to trade repositories no later than 1 hour after the trade (30 minutes for register, plus 30 minutes for counterparty confirmation). Information is made public shortly afterwards (every 15 minutes). In Europe, there have been requirements since 2007 under MiFID to report to regulators the details of trades in corporate bonds. There have also been limited post-trade public transparency requirements for trades in some corporate bonds that take place on-exchange or on multilateral trading facilities (MTFs). IOSCO notes that there are a number of initiatives in different jurisdictions that will introduce or have introduced transparency to corporate bond markets. In Europe, MiFID2 and MiFIR (Markets in Financial Instruments Regulation), which are expected to be implemented in 2018, will introduce a pre- and post-trade transparency regime for bonds for trading venues (regulated markets/MTFs/organised trading facilities within the meaning of MiFID II). In Japan, members of the Japan Securities Dealers Association (JSDA) have been required, since November 2, 2015, to report post-trade data of bond transactions on every trading day.

⁸ Any examination of the corporate bond markets is complicated by the possibility that a bond may be listed and traded outside its country of incorporation or listed in one country but traded in another.

- Section V sets forth the Report’s conclusions.

III. OVERVIEW OF THE SECONDARY CORPORATE BOND MARKETS

A. Introduction

This section describes the current characteristics and structure of the secondary corporate bond market based on the fact-finding undertaken by IOSCO. The focus is on the market participants, the use of technology, and other aspects of the corporate bond market that may impact liquidity. At a high level, these responses show that the corporate bond markets have evolved substantially over the last decade. A more detailed and data-driven assessment of the liquidity of the market today is set forth in Section IV.

B. Industry’s General Perceptions of Corporate Bond Market Liquidity and Liquidity Factors

Industry perceptions of the development of bond market liquidity from 2004 - 2015 are mixed. However, the majority of both buy-side and sell-side respondents to the IOSCO survey perceive market liquidity to have decreased. These perceptions were generally based on personal experience and not supported with data or data analysis.

In their responses to the IOSCO survey, some buy-side participants reported an increase in bond liquidity, while 68% of respondents overall reported a perceived deterioration of liquidity from 2004 - 2015. They acknowledged, however, a lack of objective data to measure bond market liquidity. With respect to the sell-side participants, 80% reported a perceived decrease in liquidity. Again, the information provided was based on overall experience and not on data analysis.

Both sell and buy side respondents stated that the characteristics of a corporate bond could impact its liquidity, including credit rating (*e.g.*, investment corporate bonds have greater liquidity, compared to high yield corporate bonds), the number of underwriters/market makers, along with the size of bond offerings by an issuer, concentration of holders, bond structure, date from issuance, maturity, currency in which the bond is denominated, credit events, and index eligibility. Indeed, a key feature of secondary bond markets is that trading activity encompasses a large number of distinct securities with individual characteristics. For example, BlackRock estimated that as of April 2014, the ten largest issuers of corporate bonds in the U.S. had more than 9000 individual bonds outstanding.⁹

As a result, market participants referred to bond specific factors as playing a role in their consideration of whether to engage in a specific bond transaction in the secondary market. Some market participants also highlighted external factors, such as the low interest rate environment, as impacting liquidity.

⁹ BlackRock, Corporate Bond Market Structure: The Time for Reform is Now, BlackRock Viewpoint (Sept. 2014), available at: <https://www.blackrock.com/corporate/en-mx/literature/whitepaper/viewpoint-corporate-bond-market-structure-september-2014.pdf>).

A bondholder’s investment strategy will impact his or her perceptions of a change or decline in liquidity. For example, many respondents indicated that they take many risk factors into account when buying a bond, including the possibility that there might be insufficient liquidity in a corporate bond that they may wish to buy or sell, at least at the price that they are willing to pay and within a timeframe acceptable to them. However, the importance of such “liquidity risk” can vary greatly depending on the strategy of the investor.

Investors that tend to hold bonds until maturity are typically not very concerned with how liquid a bond is. In contrast, for those investors that actively manage their portfolios (such as hedge funds or asset managers that offer managed accounts) or for funds facing a potential sudden massive redemption request, secondary market liquidity is essential. A list of some of the factors considered by market participants in deciding whether to engage in a transaction in the secondary bond market are included in **Annex 2** of this report.



Source: Industry participant responses to IOSCO survey

C. Increase in Corporate Bond Issuance

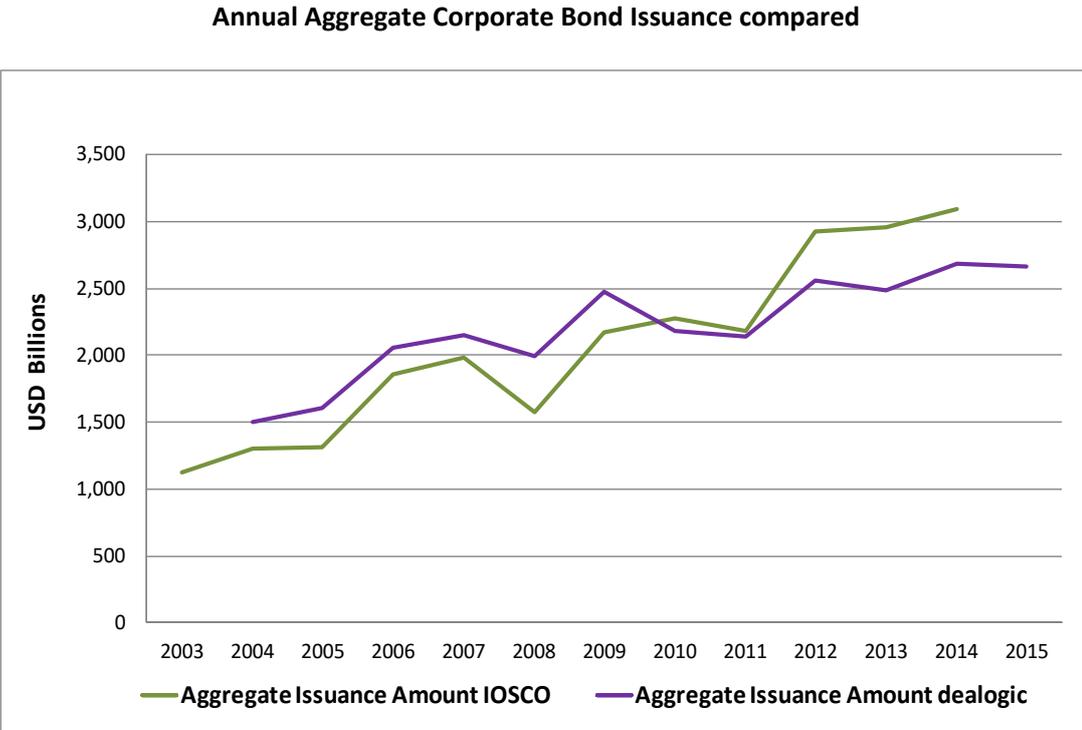
Corporate bond issuances have reached record highs in most IOSCO member jurisdictions. The growth in the primary market has increased the number of corporate bonds available for trading in the secondary bond markets and the total amount of debt outstanding.

In recent years, corporate bond issuances have reached record highs in most IOSCO member jurisdictions. See Figure 1. Moreover, according to aggregate data provided in response to the IOSCO survey to regulators and from Dealogic,¹⁰ which are broadly consistent with one another, the trend of global corporate bond issuances has been increasing since 2003. One reason for this is the low interest rate environment – which in many jurisdictions has resulted in interest rates at close to zero for nearly seven years. This environment has indirectly incentivised investors to buy assets such as corporate bonds in the hunt for yield as a result of low interest rates and other central bank policies, such as quantitative easing.

¹⁰ Dealogic is a financial markets platform offering integrated content, analytics, and technology to financial firms worldwide.

The growth in the primary market has increased significantly the number of corporate bonds available for trading in the secondary markets. At the same time, many traditional dealers say they have adjusted their business models to decrease the size of their balance sheets due to a combination of strategic, capital and regulatory factors (as discussed below). Thus, dealer corporate bond inventories are not keeping pace with the number of bonds available for trading in the secondary corporate bond markets, as shown later in this report (see Figure 28, infra). However, rather than a sign of illiquidity, this shift may partially reflect the traditional dealers’ transition away from a principal model to an agency model, which does not require them to hold large amounts of corporate bonds on their balance sheets.¹¹

Figure 1: Aggregate Annual Corporate Bond Issuance Compared (Value)¹²



Source: Regulator responses to IOSCO survey and Dealogic

Based on the data¹³ obtained by IOSCO, new corporate bond issuances in the developed markets have been growing steadily in recent years (Figure XB). After declining during the

¹¹ See, Hendrik Bessembinder, Stacey E. Jacobsen, William F. Maxwell, & Kumar Venkataraman, *Capital Commitment and Illiquidity in Corporate Bonds*, (Mar. 21, 2016), available at SSRN, <http://ssrn.com/abstract=2752610> (finding that, in the U.S., the role of dealers has changed since Dodd-Frank was implemented, as dealers are less inclined to commit capital in a market making capacity, but more inclined to facilitate riskless principal trades more akin to a brokerage capacity).

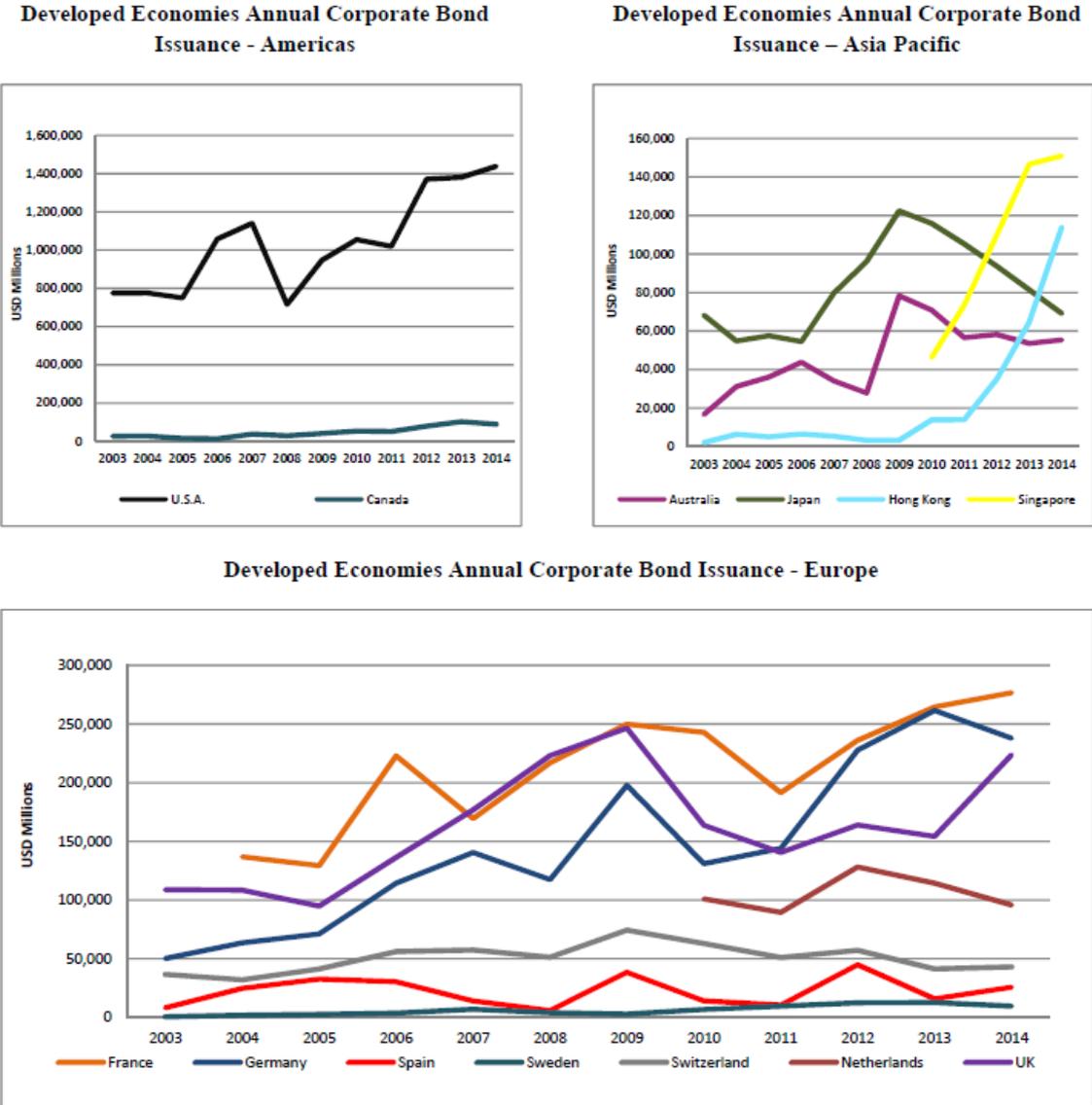
¹² IOSCO data was obtained from regulator responses to IOSCO survey, including from Australia, Brazil, Canada, France, Germany, Hong Kong, India, Japan, Korea, Malaysia, Mexico, Netherlands, Romania, Singapore, South Africa, Spain, Sweden, Russia, Switzerland, Turkey, U.K. and the U.S. (SEC and FINRA). The data included from Dealogic is comprised of the same countries.

¹³ The data is based on IOSCO survey responses from C2 member jurisdictions, and covers annual domestic bond issuance. Each jurisdiction may calculate the figures for new issuance differently. For

crisis, the number of new issuances has recovered and even exceeds pre-crisis levels in some markets. In Europe, banks traditionally funded corporates until after the 2008 crisis, when they moved towards financial markets to raise funds.

IOSCO also reviewed data from Dealogic (*see Annex 3*) with respect to issuances in both developed and emerging markets. This data was broadly consistent with the data provided in response to IOSCO survey to regulators, as set forth Figure 2.

Figure 2: Annual Corporate Bond Issuance (Value) – Developed Markets



Source: Regulator responses to IOSCO survey

As reflected in Figure 3, new corporate bond issuances have increased in many emerging markets since the crisis. Between 2009 and 2012, annual new issuances in many emerging

example, for the purposes of this report, the U.K. considered a bond as domestic if it was issued by a firm registered as a U.K. PLC. Other jurisdictions may however include a bond issued and sold to investors in their country by a company based in another country. Accordingly, the definition of a corporate bond may have different meanings in IOSCO member countries.

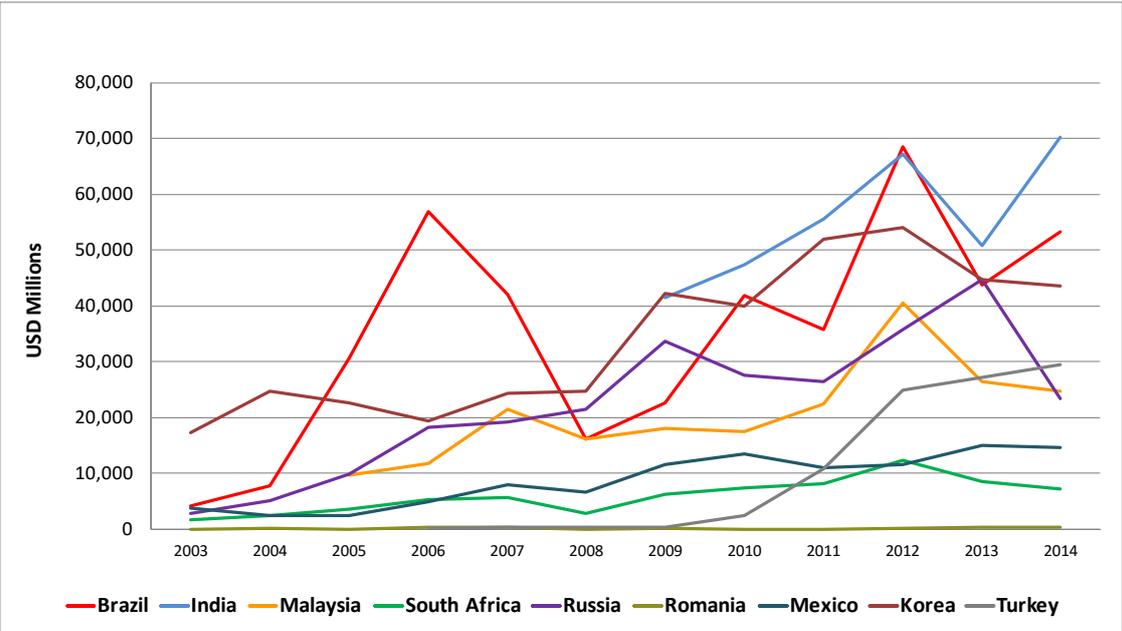
markets hit record highs. Since 2012, new issuances have fluctuated in these markets. Several factors may have contributed to this development.

Since 2012, the value of the U.S. dollar has increased relative to other major currencies, which impacted the exchange rate in many emerging markets.¹⁴ In this report, corporate bond issuance values are provided in U.S. dollars (converted from the local currency in which the bonds were issued) and this may have negatively impacted, albeit not significantly, the reported value of the issuances in the past few years.

In addition, certain emerging markets have experienced a slow-down in growth in their economies.¹⁵ This may have impacted the number of new corporate bond issuances. Nonetheless, annual corporate bond issuances in a majority of the emerging markets that responded to the IOSCO survey exceed pre-crisis levels.

Figure 3: Annual Corporate Bond Issuance (Value) – Emerging Markets

Emerging Economies Annual Corporate Bond Issuance



Source: Regulator responses to IOSCO survey

Total outstanding debt needs to be discussed in conjunction with trading volumes, since the relationship between the two, turnover ratio,¹⁶ is considered an important liquidity metric. Consistent with the increase in issuance, the total amount of outstanding corporate bond debt globally has increased steadily since 2003. In the U.S., corporate debt outstanding achieved a

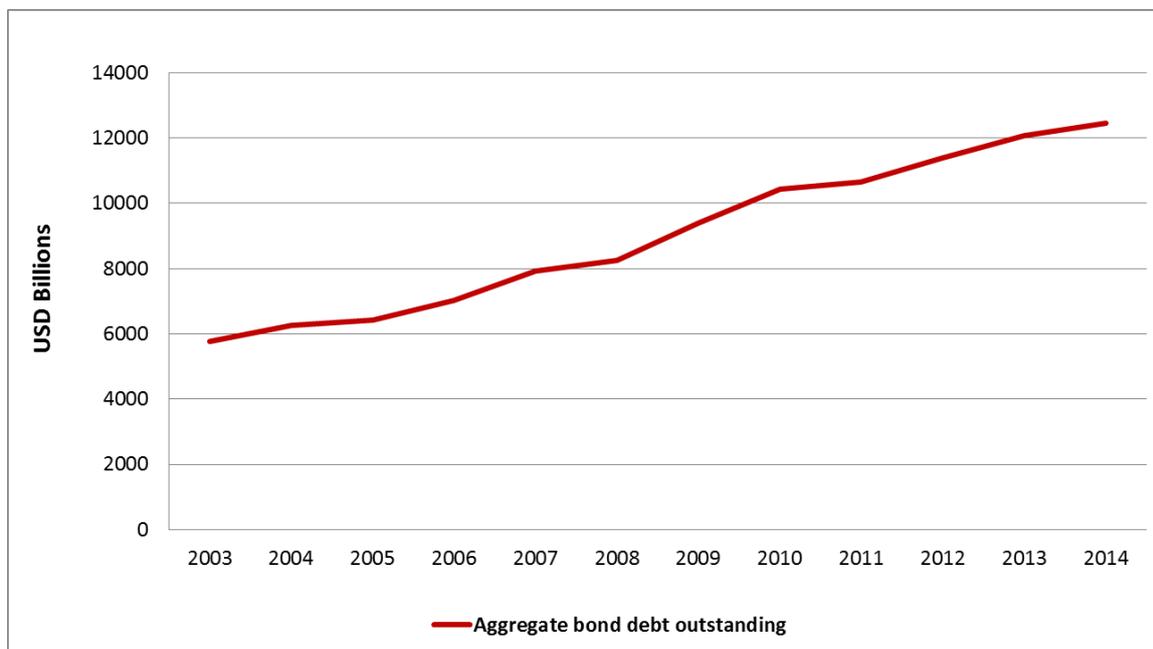
¹⁴ See *Trade Weighted U.S. Dollar Index: Major Currencies*, Federal Reserve Bank of St. Louis, at <https://research.stlouisfed.org/fred2/series/DTWEXM> (last modified June 20, 2016).

¹⁵ See, e.g., World Bank, *Global Outlook, Disappointments, Risks, and Spillovers* (Jan. 2016), available at <https://www.worldbank.org/content/dam/Worldbank/GEP/GEP2016a/Global-Economic-Prospect-January-2016-Global-Outlook.pdf>.

¹⁶ Turnover ratio is typically calculated as total trading volume per year divided by total debt outstanding.

record-high of \$7.8 trillion at the end of 2014.¹⁷ This trend continued during the global financial crisis. Based on the responses to the IOSCO survey, aggregate corporate bonds outstanding were at a record high of over \$12 trillion in 2014.

Figure 4: Aggregate Corporate Bond Debt Outstanding¹⁸



Source: Regulator responses to IOSCO survey

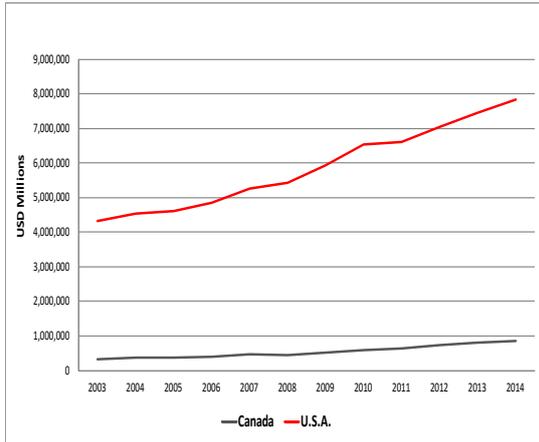
In the developed markets, the amount of outstanding corporate debt has increased most significantly in the U.S. In Europe and other developed markets, the increase has been more gradual, but the overall trend is upward.

¹⁷ Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015), available at: <http://libertystreeteconomics.newyorkfed.org/2015/10/has-us-corporate-bond-market-liquidity-deteriorated.html> .

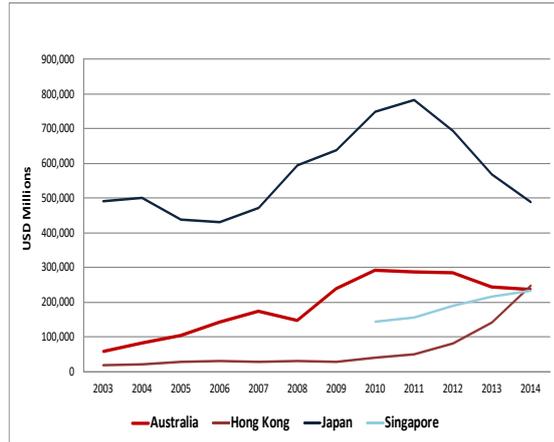
¹⁸ Data is obtained from regulator responses by Australia, Brazil, Canada, Germany, Hong Kong, Japan, Korea, Malaysia, Saudi Arabia, South Africa, Spain, Sweden, Romania, Russia, Switzerland, Turkey, U.S. to IOSCO' survey.

Figure 5: Corporate Bond Debt Outstanding-Developed Economies

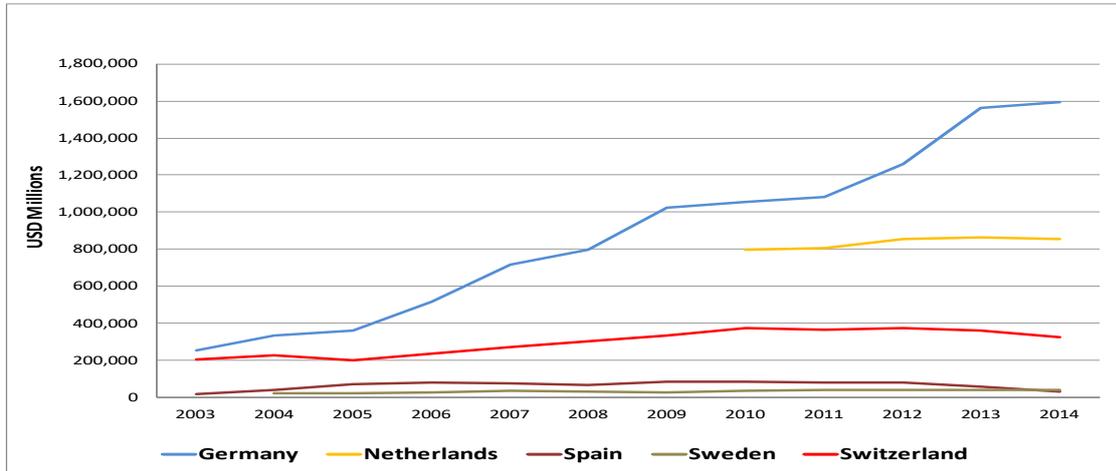
Developed Economies Outstanding - Americas



Developed Economies Outstanding – Asia Pacific



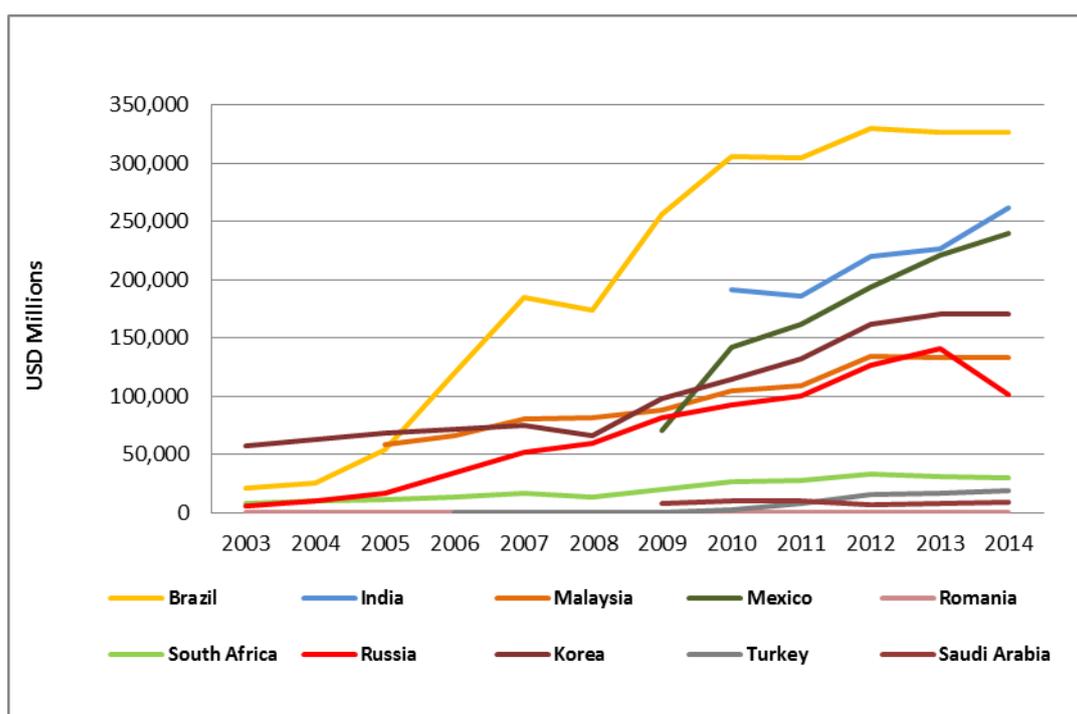
Developed Economies Outstanding – Europe



Source: Regulator responses to IOSCO survey

The amount of outstanding corporate debt in emerging markets has increased significantly since 2003, with a corresponding rise in the number of different bonds available for trading in most jurisdictions. However, since 2012, the growth in some emerging markets has slowed. As discussed above, this slowdown could be due to a number of factors, including the strength of the U.S. dollar and a general slowdown in economic growth in certain markets.

Figure 6: Corporate Bond Debt Outstanding-Emerging Economies



Source: Regulator responses to IOSCO survey

D. Participants in the Corporate Bond Market

1. Dealers and the Market Making Model

Although the markets are evolving, dealers continue to play a dominant role in the secondary corporate bond markets.

For decades, fixed income markets have functioned in most developed markets as over-the-counter (OTC), “principal” markets where the dealer owns or acquires the bonds to then trade as principal with its customer, and is compensated for market-making activity through the bid-offer spread, or the difference between purchase and sale price.¹⁹ Most trading occurs as part of bilateral transactions between a dealer and a customer or between two dealers. Much of this trading still occurs over the telephone in negotiations between dealers and their customers or through systems that allow customers to send orders or negotiate with particular dealers (for example, Bloomberg ALLQ). The volume of trading on exchanges or other organized trading venues is generally much smaller (or even negligible) in comparison with the OTC markets.²⁰

¹⁹ BlackRock, Corporate Bond Market Structure: The Time for Reform is Now, BlackRock Viewpoint, at 1, (Sept. 2014), available at: <https://www.blackrock.com/corporate/en-mx/literature/whitepaper/viewpoint-corporate-bond-market-structure-september-2014.pdf>

²⁰ There are, however, a few jurisdictions where OTC trading does not dominate. In Italy, for example, corporate bonds are traded only on regulated markets (RM), Multilateral Trading Facilities (MTFs) and systematic internalisers (SIs). RMs and MTFs are all order driven (except one MFT). Trading can be

In sum, large dealers that are active in more than one jurisdiction have been and remain the key market makers and liquidity providers, especially for large transactions.²¹

Some dealers nonetheless claim to have limited their trading presence in certain products due to a combination of strategic, capital and regulatory factors. In particular, some dealer representatives expressed the view that regulatory requirements, *e.g.*, higher capital and leverage requirements, have reduced dealer ability and willingness to allocate capital to proprietary and market making activities, hold positions (particularly large inventories) in corporate bonds over time, and actively trade corporate bonds.²² As a result, they believe that the resulting decline in the breadth of participation on the dealer-side is likely a contributor to the sense of illiquidity perceived by some buy-side market participants today. In addition, a few industry representatives opined at a roundtable that when economic conditions (particularly interest rates) change and are more favorable, dealers may be more willing than today to increase the portion of their balance sheet allocated to making markets in corporate bonds.

In addition, a number of dealer respondents perceive that, since the global financial crisis there has been a decrease in participation by dealers in the secondary corporate bond market. They say that dealers, who provided liquidity in the past, have exited market making activities altogether, which could impact market liquidity, as there is a negative correlation between the number of market makers and the liquidity risk premia.²³

For example, dealers report that there has been, to some extent, a shift from the traditional principal (dealer)-based market making to an agency (commission-based) or a “riskless principal”²⁴ model in which dealers seek to find both sides of the trade before committing capital, although survey respondents did not produce quantitative evidence backing up this

only on principal basis through SIs, while it can be both on a principal and agency basis on RMs and MTFs.

²¹ In emerging markets, the corporate bond market tends to be an agency market, except Brazil and Malaysia where the markets are dealer driven.

²² Following the financial crisis, authorities have imposed various requirements on dealer-banks through regulatory reforms (e.g., Volcker rule, Dodd-Frank and Basel III) with the aim to improve the resilience of the banking sector. Sell-side market participants often cite higher capital requirements in particular as having a substantial impact on their market making businesses and thereby affecting liquidity in secondary markets. In response to regulatory changes, some dealers say they have reduced available balance sheets allocated to market making, or are less willing to take on risk resulting from trading corporate bond trades as principal. Sell-side participants may also have become more selective with regard to the customers with whom they are prepared to do business. Some industry representatives have also argued that repo markets and certain derivatives markets have also been affected by regulatory reforms. They argue that as banks use repos to finance their trading and market making activities, a contraction or reduced ability to transact in the repo market could affect liquidity provision by dealers across a variety of asset classes including corporate bonds. IOSCO notes, however, that its analysis of liquidity metrics does not provide substantial evidence to support the suggestion that regulatory reforms in and of themselves have led to diminished liquidity in the secondary corporate bond markets.

²³ Miles Kennedy et al., *Global financial markets liquidity study*, PwC (Aug. 2015), at 152.

²⁴ For purposes of this report, “Riskless principal trades” are trades in which a dealer that takes on a long or short position in connection with execution of a client order, immediately executes an offsetting order in the market to completely unwind the position, while acting as principal in both the take-on and unwinding trades. Dealer balance sheets are still used, but the dealer does not complete the trade with the client until it can make the unwinding trade.

assertion. Industry representatives noted in particular their belief that dealers are more reluctant to take on large positions.²⁵

Buy-side market participants point to evidence that in the U.S. trades in approximately 30%-40% of investment-grade corporate bonds and as much as 70% of high-yield corporate bonds are executed following the receipt of an order.²⁶ This means that the execution and inventory risks, which have traditionally resided with the dealers, may be shifting to investors, an observation supported by the literature.²⁷ However, some are of this view that this shift will not wholly replace the role of dealers due to the buy-and-hold nature of the fixed income asset class as a whole and constraints on the ability of asset managers to access leverage.

Further, a few dealers note that they are focusing more on bond underwriting for the primary market, rather than making markets in the secondary market. Others note that some dealers who used to provide liquidity across a broader spectrum of issuers are now shifting to a more focused and specialized approach by sector or region. Survey respondents indicated, however, that smaller or regional dealers might be providing increased liquidity in the secondary corporate bond market.

2. Institutional and Retail Investors

Institutional investors in corporate bonds are becoming more diversified (e.g., asset managers and hedge funds play a more prominent role) and remain, compared to retail investors, the dominant investors in the corporate bond markets. While the direct investment of retail investors remains low, there seems to be an increase in their indirect participation through mutual funds and exchange-traded products (e.g., exchange-traded funds).

²⁵ In a similar vein, several respondents highlighted decreasing dealers' appetites for offering prices in any but the most liquid of products due to difficulty in matching buyers and sellers at the same price and size, particularly in times of market stress.

²⁶ Anthony J. Perrotta, Jr., *Platform Proliferation: Déjà vu All Over Again?*, TABB Forum (June 17, 2015), available at <http://tabbforum.com/opinions/platform-proliferation-deja-vu-all-over-again>.

²⁷ See, e.g., Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics, Federal Reserve Bank of New York (Oct. 5, 2015), available at <http://libertystreeteconomics.newyorkfed.org/2015/10/has-us-corporate-bond-market-liquidity-deteriorated.html> (noting that “[i]n the corporate bond market, dealers have reportedly shifted from the principal model toward the agency model in recent years, but the ability of dealers to switch trading models without affecting liquidity is limited by the market’s structure”); Miles Kennedy et al., *Global financial markets liquidity study*, PwC (Aug. 2015), at 67; John Tierny & Kunal Thakkar, Deutsche Bank Research Haus, *Corporate Bonds-The Hidden Depth of Liquidity*, Konzept (Jan. 19, 2015), at 29 (“In other words, the business model has shifted primarily to market making.”); Andy Hill, *The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market*, ICMA Secondary Market Practices Committee (Nov. 2014), at 12 (“Thus, banks are more likely to work orders, taking on the role of ‘broker’ rather than ‘trader.’”); Charlie Himmelberg & Bridget Bartlett, *Why Market Liquidity has Deteriorated*, Global Macro Research – Top of Mind, Goldman Sachs, (Aug. 2, 2015), at 7 (finding the narrowing of bid-ask spreads “reflects a substitution away from trades executed on an **principal** basis in favor of trades executed on an **agency** basis.”).

a. Institutional Participants

According to several industry representatives and roundtable participants, the roles of market participants are evolving, which has the potential to help mitigate a decrease in liquidity stemming from reduced traditional dealer market making activity (which still, however, remains dominant in providing liquidity to the markets). According to industry representatives, the most significant examples are large asset managers, hedge funds, and independent market makers (i.e., non-bank affiliated firms) who are entering the market as not only liquidity takers, but also liquidity makers. This change in role is facilitated by electronic trading venues enabling greater “all-to-all” trading across sell-side and buy-side market participants. They further argue that smaller or regional broker-dealers or banks increasingly provide liquidity to the secondary corporate bond markets, with some of them focusing on certain industry segments (e.g., technology, financial, energy etc.).

Other industry representatives have observed a slight change in the mix of institutional investors over the past years. Specifically, they have observed increased participation from traditional asset managers, pension funds and insurance companies.

b. Retail Investors

With respect to direct investment in corporate bonds, regulators and industry participants report that the corporate bond market is largely an institutional market, with limited retail participation. But participation or exposure to market conditions in the secondary corporate bond markets can occur in a number of ways, including by purchasing mutual funds, exchange-traded funds (ETF) or other products that invest in corporate bonds.

There are mixed trends globally regarding whether retail participation (whether defined as “retail size” or a purchase by a retail investor) has increased or decreased since the financial crisis. Some jurisdictions reported that retail participation has increased, while others reported it has decreased.

One key emerging theme across several jurisdictions is the increasing participation of retail investors in the corporate bond market *indirectly* through mutual funds and ETF products. Those investment vehicles have grown substantially over the last decade. For example, buy-side market participants have reported that, at the end of 2002, combined U.S.-listed fixed income mutual fund and ETF assets were \$1,191 billion, but by the end of 2014, that number had increased 300% to \$3,610 billion.²⁸ By purchasing these products, retail investors are able to gain exposure to the underlying corporate bonds.

²⁸ BlackRock, *Bond ETFs: Benefits, Challenges, Opportunities*, BlackRock Viewpoint n. 1 (July 2015), available at: <http://www.blackrock.com/corporate/en-pt/literature/whitepaper/viewpoint-bond-etfs-benefits-challenges-opportunities-july-2015.pdf#sthash.9Y7sFeDJ.dpuf>. See also Committee on the Global Financial System, CGFS Papers, No. 52, *Market-making and proprietary trading: industry trends, drivers and policy implications*, at 20 (“In the U.S....mutual funds have raised their corporate and foreign bond holdings by nearly \$1.2 trillion since the beginning of 2008, while ETFs have accumulated an additional \$166 billion reflecting a more than tenfold increase in their holdings...Worldwide, net assets of mutual bond funds are approximated to have risen by \$3.1 trillion since 2008 and now account for some \$7.3 trillion in total.”) (Nov. 2014), available at <http://www.bis.org/publ/cgfs52.pdf>.

The information provided to IOSCO to assess the scope of retail participation in the corporate bond markets generally was based primarily on anecdotal evidence because of a general lack of trading data that differentiates between retail and institutional investors. Some IOSCO members provided data regarding their assessment of the level of participation of institutional and retail investors in the corporate bond markets. This is shown in **Annex 4**. However, the data is not comparable because each IOSCO member jurisdiction uses a different methodology to estimate the amount of retail participation.²⁹

E. The Use of Technology to Trade Corporate Bonds

Technological advances in many jurisdictions are facilitating trading in secondary corporate bond markets by allowing dealers to communicate directly and trade with their clients or facilitating the execution of trades on electronic trading venues.

The use of technology to facilitate trading in corporate bonds is growing in many jurisdictions. This is seen particularly in the electrification of communication channels between dealers and their customers that are used to disseminate indications of interest. It is also seen with respect to trade processing, and the use of electronic trading venues.

Nonetheless, industry responses to the IOSCO survey indicate that electronic trading venues are generally used for a limited range of standardised and frequently smaller transactions. Moreover, the use of electronic platforms varies across jurisdictions. A few jurisdictions have experienced substantial growth in trading on electronic platforms,³⁰ while in others, trading volumes on electronic platforms has been low, including in emerging markets.³¹

Dealers use technology to offer single-dealer platforms to facilitate trading with their clients.³² In some jurisdictions, corporate bond trading venues have been formed. These include multilateral trading facilities (MTF) or alternative trading systems (ATS), or will be considered organised trading facilities (OTFs) in the future.³³

²⁹ Ten jurisdictions delivered statistics and concrete data, while others provided estimates of the relative participation levels. However, only a small number of jurisdictions described how they differentiate between retail and institutional corporate bond trading data within their jurisdiction.

³⁰ For example, in the U.S., it is estimated that trading through electronic platforms accounted for 16% of all trading volume in U.S. investment-grade bonds in 2014 (while it was only 8% in 2013). See Cordell Eddings, *Electronic Trading in Corporate Bonds Jump Amid Liquidity Fear*, Bloomberg (Dec. 8, 2015), available at <http://www.bloomberg.com/news/articles/2015-12-08/electronic-trading-in-corporate-bonds-jumps-amid-liquidity-fear>.

³¹ For example, in Mexico, there are seven platforms to trade corporate bonds, but the volumes on these platforms are insignificant. Even if this trend is commonly observed across many developed countries it may vary from one to another.

³² A single dealer system is where a bank or dealer operates a bilateral system that acts as the market maker by trading with its own capital.

³³ In Europe, as part of MiFID II (due to come into effect in Europe in January 2018), a new type of trading system called an organised trading facility (OTF) will be introduced. An OTF is a multilateral system, which is not a regulated market or a multilateral trading facility, as defined under MiFID, which brings together buying and selling interests in, e.g., bonds in a way that results in a contract. This concept is being introduced to capture certain OTC 'venues' within a suitable regulatory regime. A key difference between OTFs and MTFs is the ability of an OTF operator to use discretion when matching buying and selling interests, provided that this does not compromise best execution obligations to its members/clients.

Other models include: dealer-to-dealer venues (where dealers trade exclusively with one another) and dealer-to-client customer venues, for example, multi-dealer platforms, where a variety of dealers facilitate trades between dealers and non-dealers alike. There are also some all-to-all platforms (where buy-side participants can trade with each other or with dealers) that have been launched recently.

The request-for-quote model (RFQ) is the prevalent model for execution used in most jurisdictions where electronic trading venues operate. RFQ systems allow investors to request quotes from one or multiple dealers at a time. Others offer trading using a central limit order book.³⁴

IOSCO has not found evidence that the use of technology increases liquidity in the secondary corporate bond market, per se. Industry respondents noted, however, a number of advantages to the increased use of technology to trade corporate bonds, including:

- Helping to pool liquidity more effectively, with the widespread use of request-for-quote models impacting how participants interact in the market
- Increased transparency
- Broader participation in the market
- Reduced errors
- A general decrease in ticket sizes and narrower spreads, leading to a reduction in explicit transaction costs
- Better execution of smaller ticket sizes (including odd lot trades)
- Faster and more secure trade execution
- Improved dealer economies of scale through improved execution, both with respect to time and the resources needed to complete a trade

F. Transparency of Corporate Bond Trading

Some regulators and academic articles argue that transparency of trading in corporate bond markets has been shown to facilitate the price discovery process, while a number of industry representatives and others noted concerns that too much transparency can negatively impact liquidity.

1. Transparency Requirements

Transparency and liquidity of financial instruments have always been linked, including in the secondary corporate bond markets. As discussed below, transparency can encourage broader participation in the market, tightens spreads, and contributes to price discovery. However, where there is transparency, there is a need to consider the impact of transparency on the liquidity that market participants are willing and/or able to provide.

Industry respondents to the IOSCO survey expressed mixed views regarding the impact of regulatory transparency requirements on the secondary corporate bond market. Respondents from emerging markets indicated that, in their view, transparency encourages broader

³⁴ A central limit order system is where potential buyers and sellers submit orders to a central limit order book, and trade execution takes place when a new order can match against an existing order in the system.

participation in the market, tightens bid-ask spreads, and contributes to price discovery, thus leading to increased liquidity.³⁵ Industry representatives from developed economies indicated that transparency is beneficial for smaller participants, provides investors with the ability to assess dealers' markets in the context of previous trades, and may make it easier to exit a position and thus would positively impact liquidity. However, many respondents, both buy-side and sell-side, expressed the view that "too much" transparency, and in particular, real-time post-trade transparency, can negatively impact liquidity, including prices moving against a dealer when it attempts to offset positions taken, which may either lead the dealer to trade more on an agency basis (*i.e.*, not take the bonds into inventory) or reduce the dealer's willingness to make markets. Moreover, dealers would likely price this risk into the bid-ask spread (*i.e.*, offer the liquidity at a premium).

Several respondents to the IOSCO survey suggested that delayed dissemination of information, waivers with respect to illiquid markets or big orders, and/or volume caps above which actual volumes are not reported, would assist in balancing transparency with the potential impact on liquidity. Differing approaches have been or may be adopted in a few jurisdictions.³⁶

IOSCO recognises the potential impact of transparency requirements on the liquidity of the corporate bond markets. A number of jurisdictions have introduced (or are introducing) trade transparency regimes for corporate bonds. IOSCO Committee 2 expects to examine in a new project these regulatory approaches and the impact of transparency on liquidity.

G. Other Factors that May Impact Secondary Corporate Bond Market Liquidity

There are other factors that may impact secondary corporate bond market liquidity, including cyclical factors, the market for credit default swaps and the repo market.

1. Cyclical Factors

The economic environment in many jurisdictions with interest rates set close to zero for an extended period of time, and in some cases below zero, has had a significant impact on corporate bond markets. For example, primary market issuance has significantly increased in most regions, in part because corporations have relatively inexpensive access to funding.

³⁵ A view supported by some academic research *see* Hendrik Bessembinder et al, *Market transparency, liquidity externalities, and institutional trading costs in corporate bonds*, *Journal of Financial Economics* 82(2), 251-288 (2006); Amy K. Edwards et al., *Corporate bond market transaction costs and transparency*, *The Journal of Finance* 62(3), 1421-1451 (2007); Michael A. Goldstein, Edith S. Hotchkiss, & Erik R. Sirri, *Transparency and Liquidity: A Controlled Experiment on Corporate Bonds*, *Review of Financial Studies*, 20(2): 235–73 (2007); and Hendrik Bessembinder & William F. Maxwell, *Markets: Transparency and the Corporate Bond Market*, *Journal of Economic Perspectives* 22 (2), 217-234 (2008).

³⁶ The U.S. TRACE data include the time, price, and size of all corporate bond trades in the U.S., but there are caps for actual trade sizes above \$5,000,000 (for investment grade bonds) and above \$1,000,000 (for high-yield bonds) to be reported with markers ("1MM+" and "5MM+"). In Canada, trade information will be disseminated at T+2 and the volume caps are over \$2,000,000 for investment grade bonds and over \$200,000 for non-investment grade bonds. In Europe, MIFID 2 will develop several waivers to take into account the liquidity of the asset as well as the size of the trade aimed at taking into account the need for market makers to hedge their positions.

Some have expressed the concern that low interest rates have led to “herd” behaviour in purchasing corporate bonds that has resulted in a bull market, and that any significant rise in interest rates could lead to a disorderly unwinding of long positions in the corporate bond market. However, IOSCO has not, as part of its mandate, researched this presumption.

One investment strategist in the fixed income area analysed the last series of Federal Reserve rate interest hikes (2004–06) as an example of the negligible impact the Federal Reserve has on longer rates. He concludes that investor fears about the impact of Federal Reserve interest-rate hikes and the liquidity of the bond market may be misplaced.³⁷ In addition, IOSCO Committee 2 was told by one of its roundtable participants that mutual fund redemption levels in crisis periods, including as a result of interest rate hikes, revealed no significant liquidity mismatch between fund redemptions and the sell off for the underlying assets in the fund. Specifically, in cases of distressed markets, funds met redemptions with cash and sold the most liquid securities. According to the presenter, empirical data showed that funds’ cash ratios tend to remain relatively stable, especially during periods of redemptions.³⁸

³⁷ Tim Paulson, *Bonds: Busting Five Myths about the Fed, Rates, and Liquidity*, Fixed-Income Insights, Lord Abbot (Aug. 5, 2015), available at: <https://www.lordabbett.com/content/lordabbett/en/perspectives/fixedincomeinsights/bonds-busting-five-myths-about-the-fed-rates-liquidity.html>.

³⁸ At least one research article supports this view. See, e.g., Sean Collins & Chris Plantier, *The “Waterfall Theory” of Liquidity Management Doesn’t Hold Water*, Investment Company Institute, (Mar. 9, 2016), available at https://www.ici.org/viewpoints/view_16_nyfed_bond_flows_03. In this article, the authors argue that the “waterfall theory” fails for at least two reasons: first, when interest rates rise, bond prices fall and the value of a bond fund’s assets will typically decline. But the losses will be concentrated in the fund’s longer-term bonds, which are more sensitive to changes in interest rates. In contrast, the fund’s shorter-term assets, especially cash and cash equivalents, will tend to hold their value. As a result, all else being equal, a fund’s short-term asset ratio will rise when bond prices fall. This can help provide a natural buffer against fund outflows. Second, fund managers are extremely cognisant of the need to balance the interests of redeeming shareholders with those of remaining shareholders. Among other things, this means that a fund will often meet redemptions by selling a representative portion of the fund’s portfolio (sometimes called a “slice”). When a fund does this, it is helping to protect the interests of non-redeeming shareholders.

2. Credit Default Swaps (CDS)

IOSCO considered whether the CDS market provides an alternative liquidity outlet when the cash bond market is illiquid.³⁹ There is academic support for the notion that for an issuer with many bond issues that exhibit large variations in contractual terms, the CDS market referencing that issuer is more liquid than the market for the underlying bonds in terms of having larger positions and higher trading volume. The CDS market, therefore, could offer an alternative product and provide an alternative liquidity outlet (in normal market conditions).⁴⁰

IOSCO also considered whether liquidity in the CDS market (looking in particular at the CDS-bond basis⁴¹) is informative about the liquidity in the cash bond market.⁴² Our review of the economic literature suggests that CDS-bond basis seems to be more strongly related to variables other than bond liquidity that may impact or limit arbitrage opportunities.⁴³ This report, therefore, does not consider the CDS-bond basis as a metric for purposes of its liquidity analysis (see Section IV, below).

³⁹ The CDS market and the underlying cash bond are interconnected. For example, if there is a large bond issuance, investors who buy the bond may want to hedge the credit risk and thus purchase credit protection via a CDS. A credit risk shock in the market would likely increase demand for credit protection and this would move CDS prices.

⁴⁰ Martin Oehmke & Adam Zawadowski, *The anatomy of the CDS market*, available at <http://ssrn.com/abstract=2023108> (2014). The authors interpret the result as the CDS market offering an alternative outlet for standardization and liquidity to an unstandardized illiquid underlying cash bond market. Thus, from the perspective of this study, a symptom of an illiquid cash bond market is a healthier synthetic bond market (*i.e.*, CDS market). This suggests that the CDS market acts as a substitute for the cash bond market, at least when liquidity in the cash bond market is limited due to factors such as fragmented bond issues and search costs.

⁴¹ The CDS-bond basis is the difference between the CDS premium for a reference entity and the credit spread of the underlying cash bond.

⁴² The CDS market and underlying cash corporate bond market are linked because both markets offer exposure to corporate credit risk. A measure of the linkage between these two markets is the CDS-bond basis. Intuitively, this measure captures the credit risk-free return that an investor could earn by buying a corporate bond and hedging away the credit risk of the bond by purchasing credit protection via a CDS contract that references the bond issuer. If credit markets were frictionless (*e.g.*, no transaction costs, infinite supply of capital), the CDS-bond basis should always be zero, because any deviations would be instantaneously arbitrated away for a risk-free profit. However, credit markets are hardly frictionless. For instance, the transaction cost of shorting a corporate bond to arbitrage away a positive CDS-bond basis could be prohibitively large such that the positive basis may persist. This example suggests that bond transaction costs, and more generally, bond market liquidity, could affect the size of the CDS-bond basis by limiting traders' ability to eliminate this basis by trading in both the CDS and bond markets.

⁴³ A study by Amrut Nashikkar et al., *Liquidity and arbitrage in the market for credit risk*, *Journal of Financial and Quantitative Analysis* 46.03 (2011), at 627-656, finds some empirical support for the hypothesis that bond liquidity affects the CDS-bond basis over the sample period 2002-2006. However, this stylized empirical result seems to depend on the sample period, the empirical methodology, and how bond liquidity is measured. Using a different empirical approach and alternative measures of bond liquidity, a more recent study by Jennie Bai & Pierre Collin-Dufresne, *The CDS-Bond Basis*, AFA San Diego Meetings Paper (2013), shows that over the sample period 2006-2011, the explanatory power of bond liquidity for the cross-section of CDS-bond basis is strong during the crisis period (2007-2009), but weak or insignificant outside the crisis period (2006-2007 and 2009-2011). Furthermore, their study finds that counterparty risk, funding cost risk, and collateral quality affect the CDS-bond basis in both crisis and non-crisis periods. An important implication of Bai and Collin-Dufresne's study is that the CDS-bond basis may not serve as an informative proxy for bond market liquidity, especially post 2009.

Finally, IOSCO reviewed academic literature with regard to how activity in single named CDS (SN-CDS) markets can impact underlying securities markets. SN-CDS may be used in order to hedge or speculate on the credit risk of reference names. For instance, prices of both CDS and corporate bonds are sensitive to the credit risk of underlying reference securities and, therefore, trading across markets may sometimes result in a potential *positive* spillover effect between informational efficiency, pricing and liquidity in SN-CDS markets, and market quality in bond markets. At the same time, if some large institutional traders prefer to transact on their credit risk information in more liquid markets in order to minimise price impact and improve execution quality, price discovery and liquidity in the SN-CDS market may draw out these sophisticated investors and *lead to a drying up of liquidity* in the underlying bond markets.

Empirical evidence on the direction and significance of the CDS-bond market spillover is mixed. Massa and Zhang⁴⁴ considered whether the presence of CDS improves pricing and liquidity of investment grade bonds in 2001-2009. *They found a positive effect*, strongest during the financial crisis period, and document a dampened effect of shocks on bond liquidity and spreads for bonds with CDS contracts. Others⁴⁵ have considered the effects of CDS trading on the efficiency, pricing error and liquidity of corporate bond markets. They find that efficiency in corporate bond markets *has not improved* after the introduction of CDS trading and find no evidence of increases in market quality or bond liquidity. Further, Boehmer, Chava and Tookes⁴⁶ find the emergence of CDS has adversely affected equity market quality. They concluded that “[*b*]oth equity market liquidity and equity price efficiency decline when markets for single-name CDS contracts are introduced. Firms with traded CDS contracts on their debt have less liquid equity and less efficient stock prices following CDS introduction.”

The CDS market may also serve a standardisation role, which could be beneficial to the fragmented bond market. Oehmke and Zawadowski⁴⁷ address bond standardisation and how it impacts CDS – bond market spillovers. They find that CDS positions and trading volume are larger when the reference entities bonds are fragmented into many separate issues and have heterogeneous contractual terms.

⁴⁴ M. Massa & L. Zhang, CDS and the Liquidity Provision in the Bond Market (INSEAD Working Paper No. 2012/114/FIN, 2012), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2164675 (considering whether the presence of CDS improves pricing and liquidity of investment grade bonds in 2001-2009);

⁴⁵ S. Das, M. Kalimipalli & S. Nayak, Did CDS Trading Improve the Market for Corporate Bonds?, 111 J. Fin. Econ. 495 (2014) (considering the effects of CDS trading on the efficiency, pricing error and liquidity of corporate bond markets).

⁴⁶ Boehmer, S. Chava, & H. Tookes, Related Securities and Equity Market Quality: The Cases of CDS, 50(3) J. Fin. & Quant. Analysis (2015), pp 509-541 (providing evidence that firms with traded CDS contracts on their debt experience significantly lower liquidity and price efficiency in equity markets when these firms are closer to default and in times of high market volatility).

⁴⁷ M. Oehmke & A. Zawadowski, The Anatomy of the CDS Market, Rev. of Fin. Studies (forthcoming), available at https://www0.gsb.columbia.edu/faculty/moehmke/papers/OehmkeZawadowski_CDS.pdf (suggesting a standardisation and liquidity role of CDS markets and documenting cross-market arbitrage links between the CDS market and the bond market).

3. Repo markets

Repurchase agreements – or ‘repos’ as they are commonly known – play an important role in improving liquidity in capital markets, including fixed income markets.⁴⁸ Repos are of particular importance to dealers, who typically use them to (a) borrow cash to fund long positions in securities, or (b) borrow securities to cover short positions. But repos are also used by many other market participants as a means of gaining access to short-term funding, or by pension funds as a way of increasing the return on their long-term asset holdings. While the majority of collateral in most repo markets consists of domestic government bonds, alternative collateral can also be used, including types of ‘credit repo’ such as high-quality corporate bonds.

The repo market can have a significant impact on dealers’ ability to make markets in securities such as corporate bonds. In order to quote selling prices to investors on bonds that market makers do not hold in their inventory (if market-makers cannot or do not wish to purchase that bond immediately from someone else in the market), their ability to deliver the bond to the investor depends on being able to borrow the bond in the repo market. In a similar vein, dealers rely on the repo market to quote buying prices continuously to investors by taking short positions in issues with similar maturities to hedge the temporary accumulations of long positions. Alternatively, they could use a related derivative instrument to hedge their position – such as a bond future or interest rate swap – but some of these derivatives may themselves be ultimately hedged by someone else borrowing in the repo market.

It has been suggested that dealer-banks’ appetite to intermediate repo markets has changed recently, often citing increased regulatory capital requirements as the principal contributing factor behind a decline in repo market liquidity. However, none of the respondents to the IOSCO survey provided quantitative evidence supporting these assertions. Nevertheless, a deterioration of liquidity in repo markets, or an increase in costs associated with using repo markets, could conceivably have a negative knock-on effect on liquidity in secondary corporate bond markets.

4. Purchases of Corporate Bond by Central Banks

Some have expressed the view that central bank purchases may have impacted liquidity negatively. For example, the Bank for International Settlements (BIS) has said: “*central banks’ asset purchase programs may also have reduced liquidity and reinforced liquidity illusion in certain bond markets. In particular, such programs may have led to portfolio rebalancing by investors from safe government debt towards riskier bonds. This new demand can result in narrower spreads and more trading in corporate and EME bond markets making them look more liquid. However, this liquidity may be artificial and less robust in the event*

⁴⁸ A repo can be defined as an agreement in which one party sells securities or other assets to a counterparty, and simultaneously commits to repurchase the same or similar assets from the counterparty, at an agreed future date or on demand, at a repurchase price equal to the original sale price plus a return on the use of the sale proceeds during the term of the repo. Although the term ‘repo’ is applied to the whole transaction, it is market convention to specifically describe the seller’s side of the transaction as the ‘repo’ and the buyer’s side as the ‘reverse repo.’ For further background information, see Euroclear, *Understanding repos and the repo markets* (2011), or visit the International Capital Market Association’s (ICMA) website, www.icmagroup.org.

of market turbulence.”⁴⁹ Yet available objective data shows that this is not a universally held view.

In the U.S., the Federal Reserve has engaged in three successive rounds of expansionary policies-known as quantitative easing (QE)-since 2008, i.e., within the period of time covered by the Consultation Report.⁵⁰ Economic academic studies have shown that, although there is some evidence that QE may lead to increased demand for corporate bonds and hence lower their yields, the longer-term effects of QE on corporate bond markets are inconclusive.⁵¹

IOSCO also notes that the European Central Bank (ECB) began its corporate bond-buying program in June 2016, which was outside the assessment period for the Consultation Report. Thus, IOSCO has not expressed a view as to whether the ECB purchases have “reduced the eligible corporate bond portfolios available for trading,” as suggested by one commenter to the Consultation Report.⁵²

IV. METRICS BASED ASSESSMENT OF LIQUIDITY IN SECONDARY CORPORATE BOND MARKETS

A comprehensive picture of market liquidity emerges through an examination of many different metrics in aggregate. Our examination of aggregated metrics and other factors did not reveal a material decline in the liquidity of secondary corporate bond markets from a historical perspective.

A. Overview of the Use of Data and the Metrics

A careful review of reliable metrics is essential to any assessment of the liquidity of the secondary corporate bond markets, in addition to considering trading experience and perspectives of industry participants. These metrics can be particularly useful in determining the extent to which liquidity may have changed over time.

In gathering data for this report, IOSCO found that no single metric could alone serve as a reliable measure of liquidity. Rather, by examining many different metrics in aggregate, IOSCO was able to see a more complete picture of corporate bond market liquidity. IOSCO cautions, however, that due to certain limitations to data availability, there could be some aspects of liquidity (for example, immediacy) that may not be fully taken into account by the metrics closely examined in this report.

⁴⁹ <http://www.bis.org/publ/arpdf/ar2015e.pdf>, at p. 39.

⁵⁰ In QE1 (Dec. 2008), the Federal Reserve bought long-term treasuries, corporate debt of Fannie Mae and Freddie Mac, and mortgage-backed securities (MBS). In QE2 (November 2010), the Federal Reserve bought \$75 million per month of longer-termed treasuries, up to a total of \$600 billion. In QE3 (September 2012), the Federal Reserve announced an open-ended commitment to purchase up to \$85 billion per month of treasuries, MBS and corporate debt of Fannie Mae and Freddie Mac. The Federal Reserve ended QE3 and stopped expanding its balance sheet in late 2014.

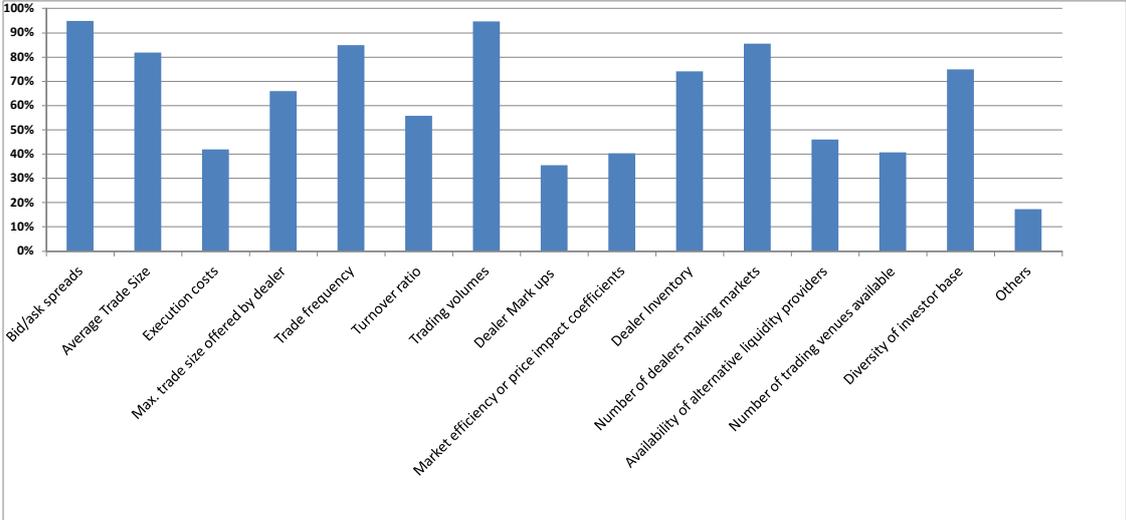
⁵¹ Yu, Edison, *Did Quantitative Easing Work?* Economic Insights, Federal Reserve Bank of Philadelphia Research Department (First Quarter 2016).

⁵² BVI Letter, at 1

In the context of its fact-finding, questions were raised about the types of metrics used to measure liquidity in corporate bonds. There was a general consensus concerning the most relevant metrics, and IOSCO therefore focused its analysis on those. These include trading volume, turnover ratio, average trade size, block trade size, price impact measures, bid-ask spreads, and statistics related to market making. Two graphs below show the type of metrics used by respondents to the IOSCO survey, along with the importance given to any one metric as compared to others.

Other information noted by industry and regulators as possible indicators or measures of liquidity, but which IOSCO did not examine further, include, among others: dealer mark-ups; immediacy measures such as time-to-enter/time-to-exit,⁵³ the spread over the benchmark; total number of transactions; analysis of quotes or pre-trade information (historic), such as order to trade ratios in OTC markets or on electronic request-for-quote platforms; and number of zero trading days. As noted in the previous section, IOSCO also considered CDS-bond basis as a possible metric, but decided against using it after a review of academic literature.

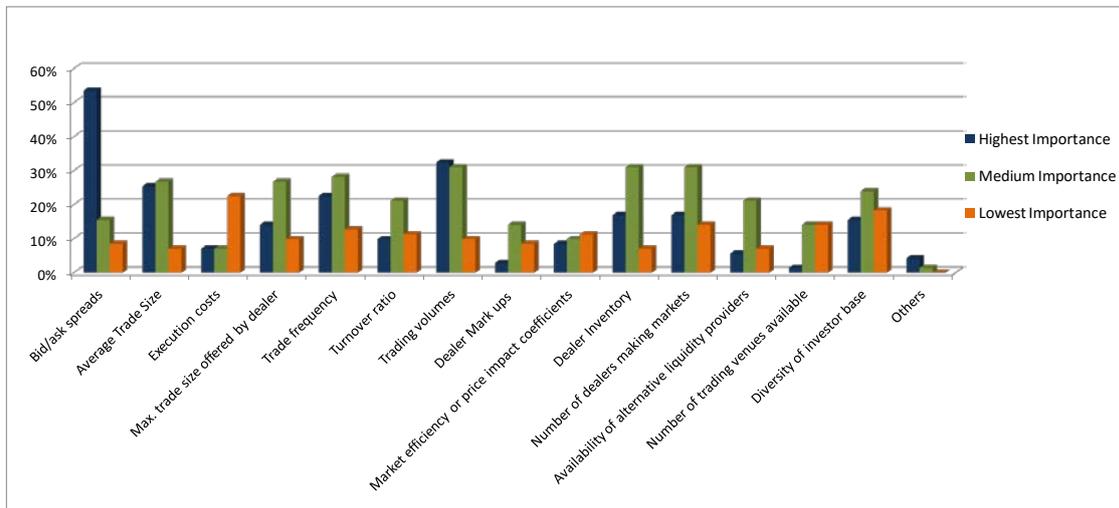
Percentage of respondents who use a particular Liquidity Metric



Source: Industry participant responses to IOSCO survey

⁵³ This refers to the time it takes to trade a bond (“immediacy”), which is an important aspect of liquidity. A common complaint heard by C2 is that it takes buy-side clients longer to buy/sell a given notional amount of bonds than previously. IOSCO found some academic evidence to support the notion that the cost of immediacy for corporate bonds may have risen since the 2008 credit crisis in certain situations. See Jens Dick-Nielsen & Marco Rossi, *The Cost of Immediacy for Corporate Bonds*, (Feb. 9, 2016), available at: <http://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/lums/accounting--finance/CorpBondImmediacy.pdf2016>.

Percentage of respondents based on importance given to a particular Liquidity metric



Source: Industry participant responses to IOSCO survey

Overall, the analysis of liquidity metrics below does not corroborate assertions of a material decline in the liquidity of secondary corporate bond markets. Rather, the metrics present a mixed picture of liquidity and suggest the nature of trading may be changing alongside shifts in participant behaviour and market structure. Of the metrics examined in this report, some show a modest decline in liquidity while others show some improvements, or little or no change. In addition to this analysis (described in more detail below), IOSCO considered the findings from academic literature and regulatory authorities concerning various academic liquidity measures. These are summarised in **Annex 5**.⁵⁴

The data available globally regarding the corporate bond markets is not easily consolidated or compared, is of varying quality, and is often not in a long enough time series to assess accurately from a historical perspective. This made the assessment and use of liquidity metrics for this project particularly challenging. The challenges raised by the data are discussed in detail in **Annex 6**.

It is also important to consider whether all metrics will continue to be good indicators of liquidity as markets change. For example, the increasing availability of electronic trading of bonds on centralised or organised platforms may make it easier to execute smaller sized trades. Participants might, therefore, choose to divide a block trade rather than risk market impact costs or wait for execution of the entire block. To the extent this increasingly occurs, it may not be accurate to conclude that smaller trade sizes necessarily indicate less liquidity. The relevance of certain metrics of liquidity should therefore be considered before conclusions are drawn.

⁵⁴ The academic measures generally show improving liquidity based on combinations of various metrics.

B. Metrics

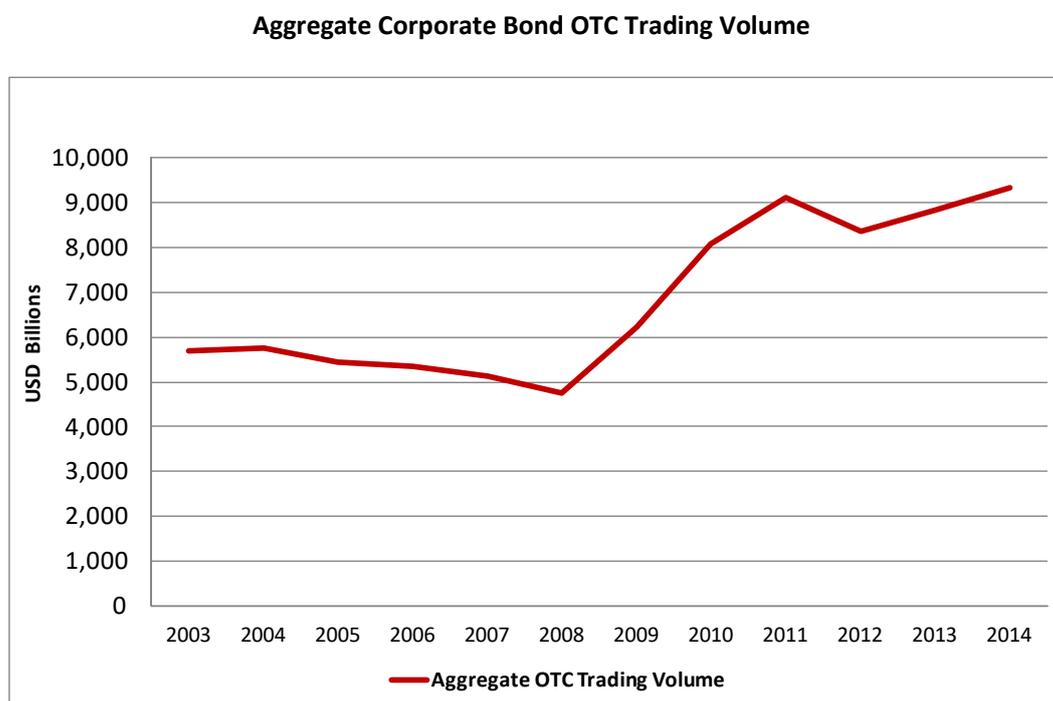
1. Trading Volume

Trading volume has increased in the majority of jurisdictions. In some jurisdictions, trading volume has not kept pace with the large increase in new issuance.

Trading volume, or notional amount traded,⁵⁵ is one of the most commonly used measurements for liquidity. However, trading volume does not take into account any growth or decline in primary market issuance—and therefore the supply of bonds in secondary markets. Nevertheless, trading volume can provide some insight into the activity on secondary corporate bond markets.

As shown below in Figure 7, trading volume in the OTC market has rebounded since the crisis and now exceeds pre-crisis levels. However, this increase in volume does not necessarily mean that liquidity has remained steady or improved since the volume traded is much smaller as a percentage of the market size.

Figure 7: Aggregate OTC Corporate Bond Trading Volume (notional)⁵⁶



Source: Regulator responses to IOSCO survey

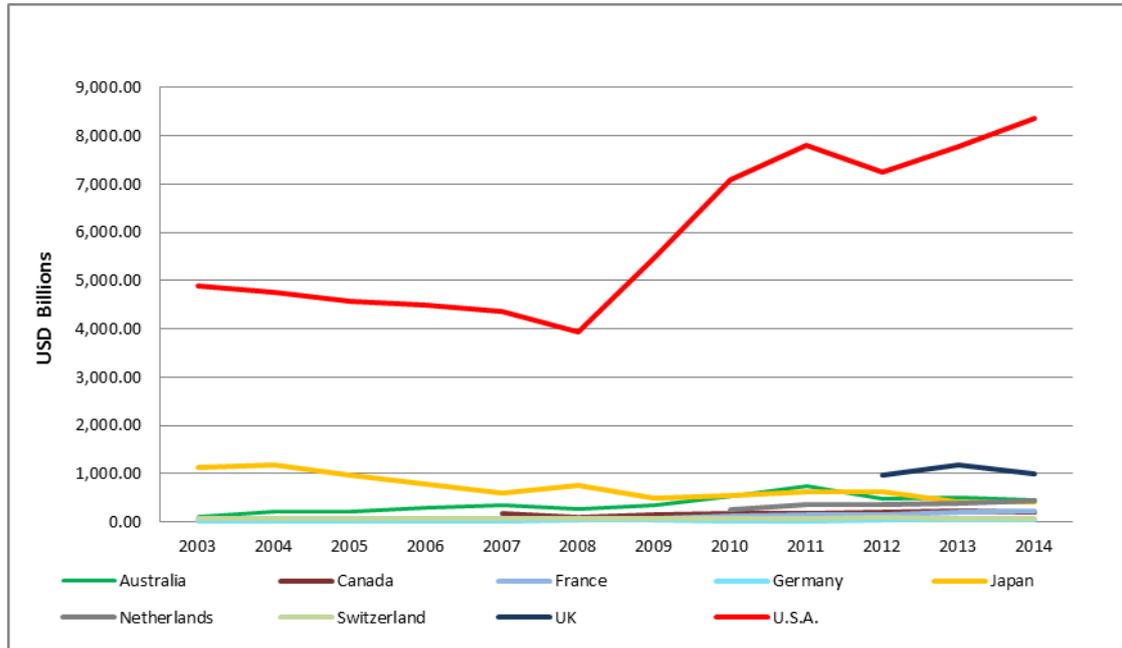
Data on trading volume in each jurisdiction is set out below, and shows trading volume has surged in the U.S. market since 2008. In Europe and Asia, trading volume has not increased at the same pace as in the U.S. Moreover, assessing trends in developed markets outside the

⁵⁵ The notional amount of a corporate bond is the nominal or face amount that is used to calculate payments.

⁵⁶ Data is obtained from regulator responses to IOSCO survey from Australia, Brazil, Canada, France, Germany, India, Japan, Korea, Malaysia, Mexico, Netherlands, Switzerland, the U.K. and U.S.

U.S. is more difficult since data across the entire time series is not available in every jurisdiction.

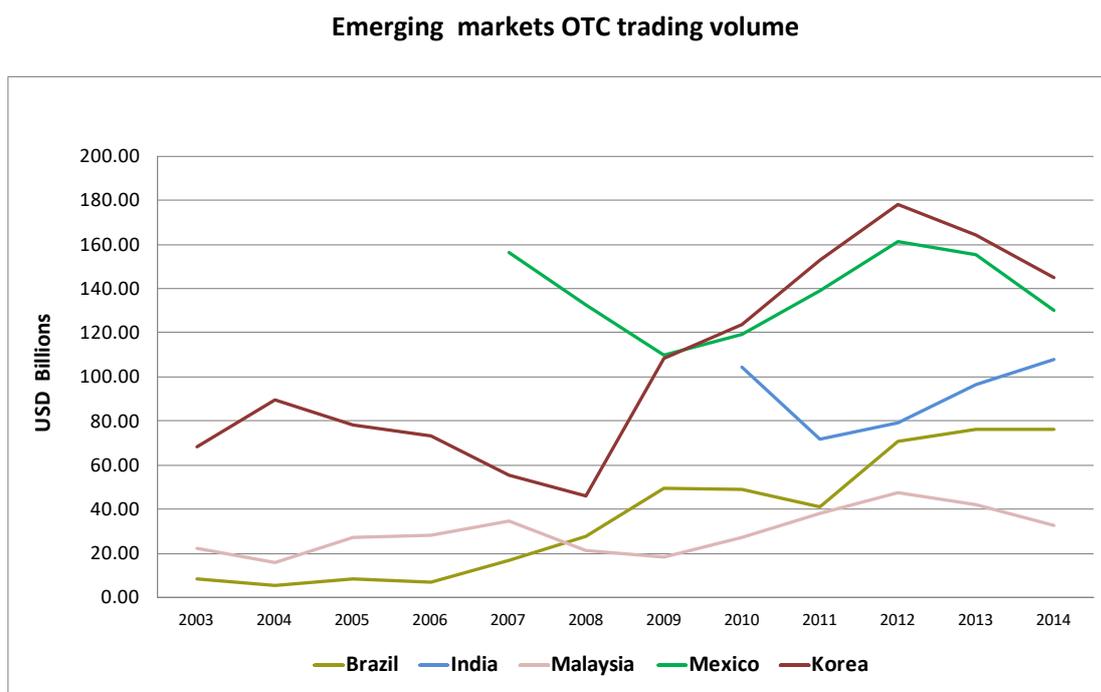
Figure 8: OTC Trading Volume in developed markets



Source: Regulator responses to IOSCO survey

The table below shows that trading volumes in emerging markets have been volatile since the crisis. However, similar to developed markets in Europe and Asia, the absence of a longer data series makes it difficult to draw conclusions about trading volume trends in the emerging markets. The table does show, however, that trading volume has either returned to pre-crisis levels or exceeds pre-crisis levels, at least for those markets with data.

Figure 9: OTC Trading Volume in emerging markets



Source: Regulator responses to IOSCO survey

Although overall trading volume has increased modestly, some industry participants, particularly those on the buy-side, have reported that a “bifurcation” is taking place in secondary markets in corporate bonds.⁵⁷ They argue that dealers continue to make markets in the most liquid corporate bonds but are less willing or unwilling to make markets in relatively illiquid high-yield bonds; instead, they are reportedly shifting toward an agency model in these bonds.

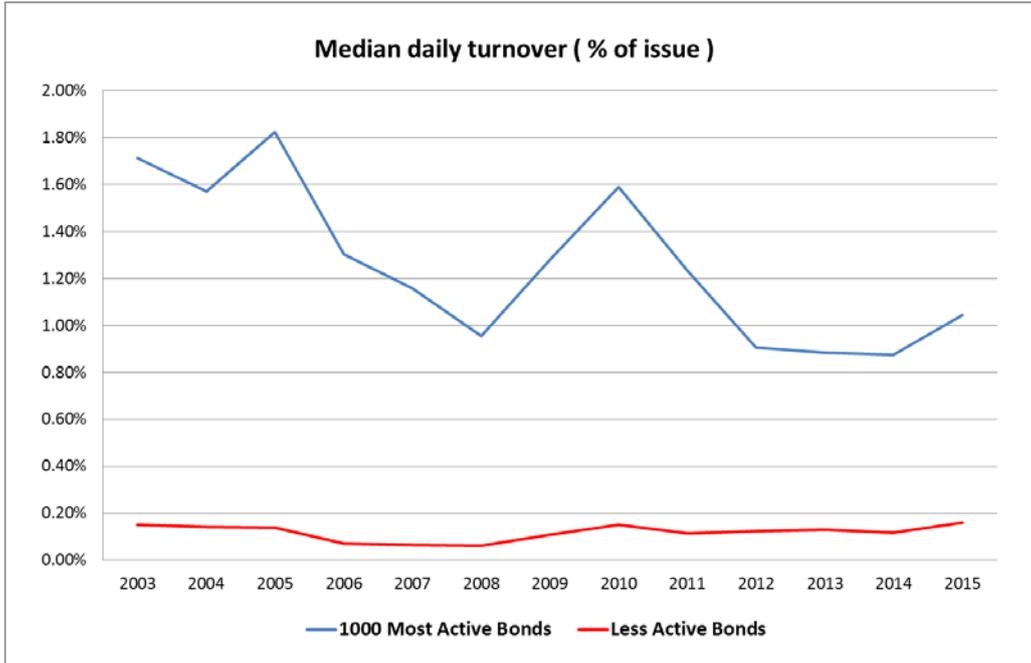
The bifurcation argument was put into doubt by a recent FINRA study that examined the differences in the market behaviours for actively traded and less actively traded bonds by looking at percentage of investment grade securities in the actively traded and less actively traded category.⁵⁸ It concluded that, to the extent that its analysis found differences in the market behaviours for actively traded and less actively traded bonds, those differences do not appear to be driven by differences in credit quality across the portfolios.⁵⁹ In particular, FINRA found that median turnover in less active securities is currently at its highest level since 2002, whereas median turnover in the most active 1,000 securities has fallen from a high of 1.8% in 2005 to just over 1% in 2015.

⁵⁷ “Liquidity bifurcation” occurs where actively traded markets with tight bid-ask spreads co-exist with more sparsely traded markets, especially in corporate bonds.

⁵⁸ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist (Dec. 2015) available at https://www.finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12.pdf.

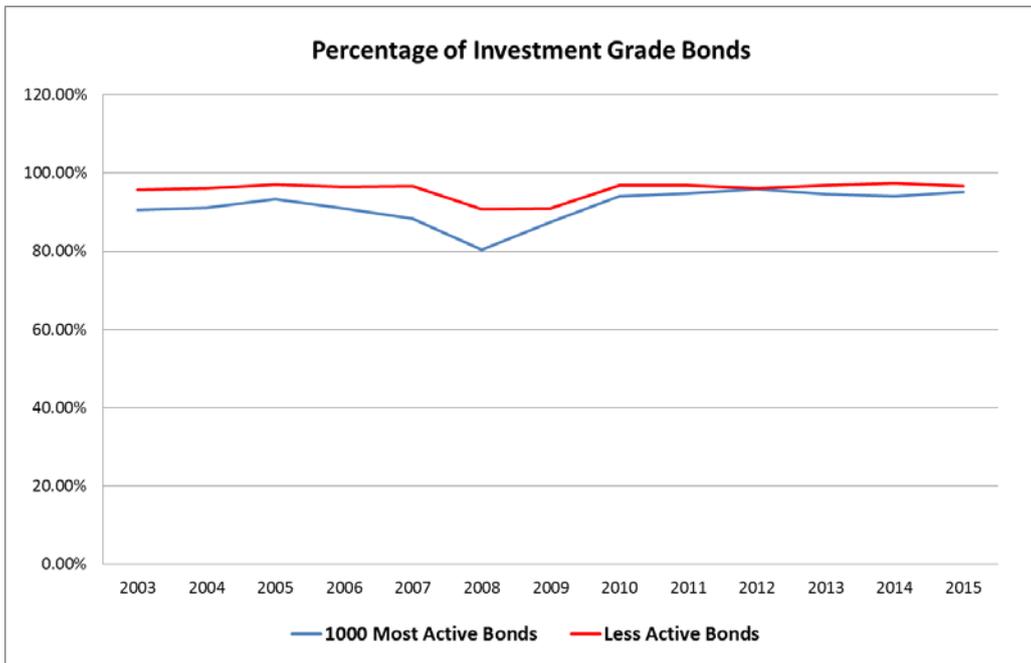
⁵⁹ *Id.* at 5.

Figure 10: Median Daily Turnover (% of Issue)



Source: FINRA

Figure 11: Percentage of Investment Grade Bonds in Each Trading Activity Group



Source: FINRA

2. Turnover ratio

In recent years, the turnover ratio seems to have decreased or been flat. This is because, as the data shows, primary market growth has outpaced secondary market trading volume.

The turnover ratio⁶⁰ of bonds may be considered by some observers to be a more accurate measure of liquidity over time than trading volume alone, as it takes into account any rise or decline in the total outstanding amount of bonds. From the data gathered in IOSCO's fact-finding, the aggregate turnover was declining prior to the crisis in 2008. From 2008 to 2011, turnover increased year-over-year. From 2011 to 2012, turnover decreased and has been flat since.

As described below, this trend seems to reflect the outsized impact on the *aggregate* turnover ratio of the large U.S. secondary bond market. In France, the Autorité Des Marchés (AMF) published a study⁶¹ of liquidity in French bond markets, which mentioned (among other metrics) turnover ratio. The study shows that the trend of estimated turnover ratios on French corporate bonds (financial and non-financial) was broadly stable from 2010 to 2015 (around 7% to 8% per month). In addition, economists at the U.K. Financial Conduct Authority also examined the turnover ratio of corporate bonds traded in the U.K. over a similar period and found it to be stable or slightly increasing.⁶²

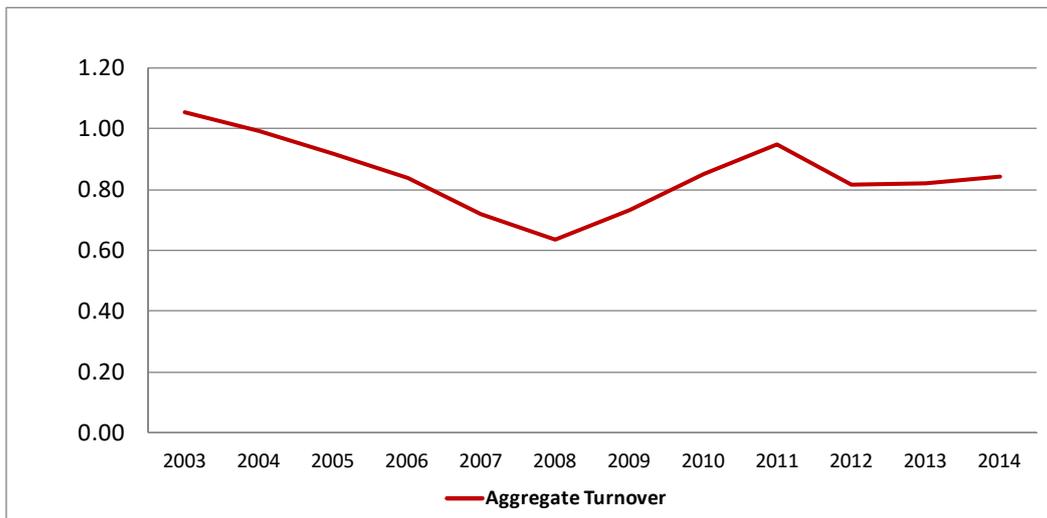
⁶⁰ Turnover ratio is typically calculated as total trading volume per year *divided by total debt outstanding*.

⁶¹ Autorité Des Marchés Financiers, *Study of liquidity in French bond markets* (Nov. 2015).

⁶² Matteo Aquilina & Felix Suntheim, *Liquidity in the UK corporate bond market: evidence from trade data*, FCA Occasional Paper 14 (Mar. 2016).

Figure 12: Aggregate Corporate Bond turnover⁶³

Aggregate Turnover



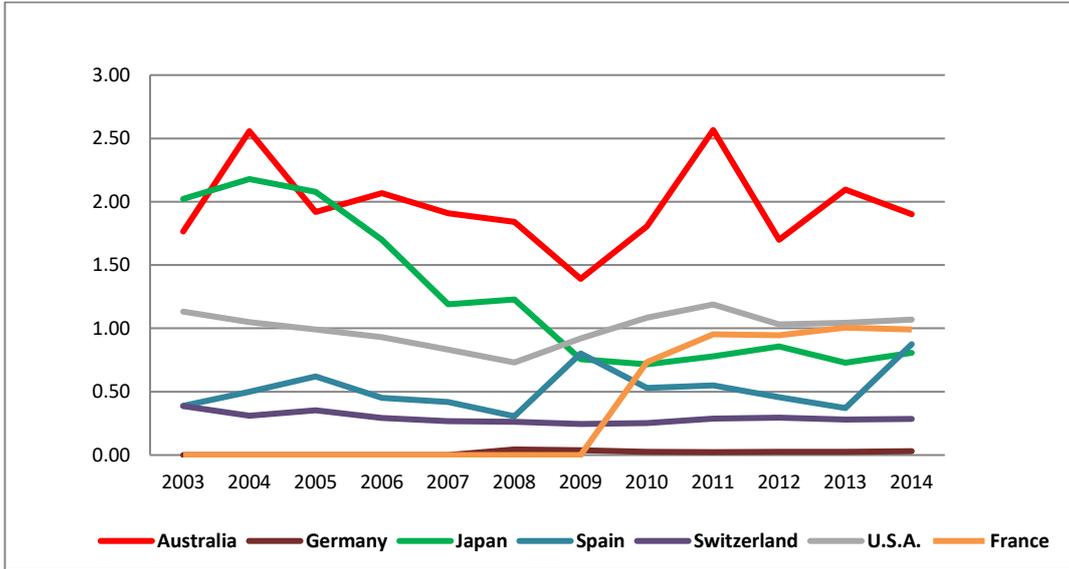
Source: Regulator responses to IOSCO survey

As shown in Figure 12, the bond turnover ratio in U.S. secondary markets declined slightly between 2011 and 2012, and has been flat since. During that same time period, U.S. trading volume increased (as shown in Figure 7), and amount outstanding increased (as shown in Figure 5). Despite the increase in U.S. trading volume over this time (as shown in Figure 7), it has not kept pace with the larger increase in outstanding bonds (face value or “notional” amount) (Figure 5). As a result, the decline in turnover ratio is not attributable to a reduction in secondary market activity, but rather is attributable to primary market growth outpacing secondary market trading volume.⁶⁴ In Europe and Asia, where generally the amount of new issuance and trading volume has not increased at the same pace as in the US, trends are inconsistent.

⁶³ Data is obtained from regulator responses to IOSCO survey received from Australia, Brazil, France, Germany, Japan, Korea, Malaysia, South Africa, Spain, Russia, Switzerland and the U.S.

⁶⁴ See discussion under Section III.C.

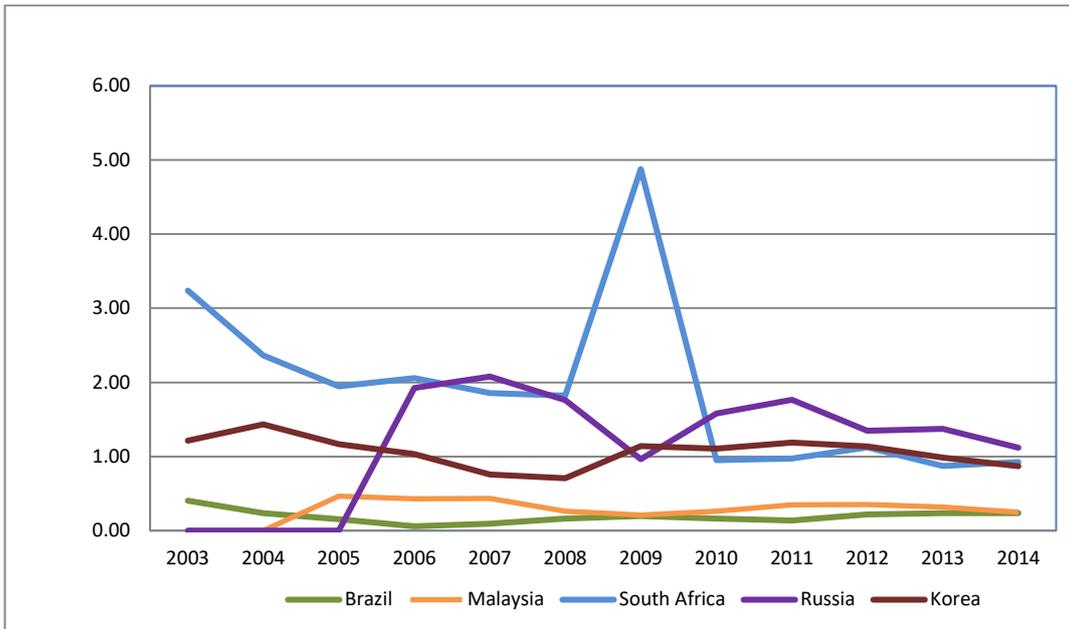
Figure 13: Corporate Bond turnover-Developed Markets



Source: Regulator responses to IOSCO survey

Based on the data below, trends in turnover ratios in emerging markets have been erratic. Certain markets have experienced relatively stable turnover ratios since 2003. In other markets, turnover ratios have fluctuated significantly since the crisis and appear to have stabilised at levels below pre-crisis turnover rates, as shown in Figure 14.

Figure 14: Corporate Bond turnover-Emerging Markets



Source: Regulator responses to IOSCO survey

3. Average Trade Size

There is mixed evidence regarding a possible decline in average trade sizes, and little evidence that indicates that any decline is due to a decline in liquidity rather than reflecting market structure changes.

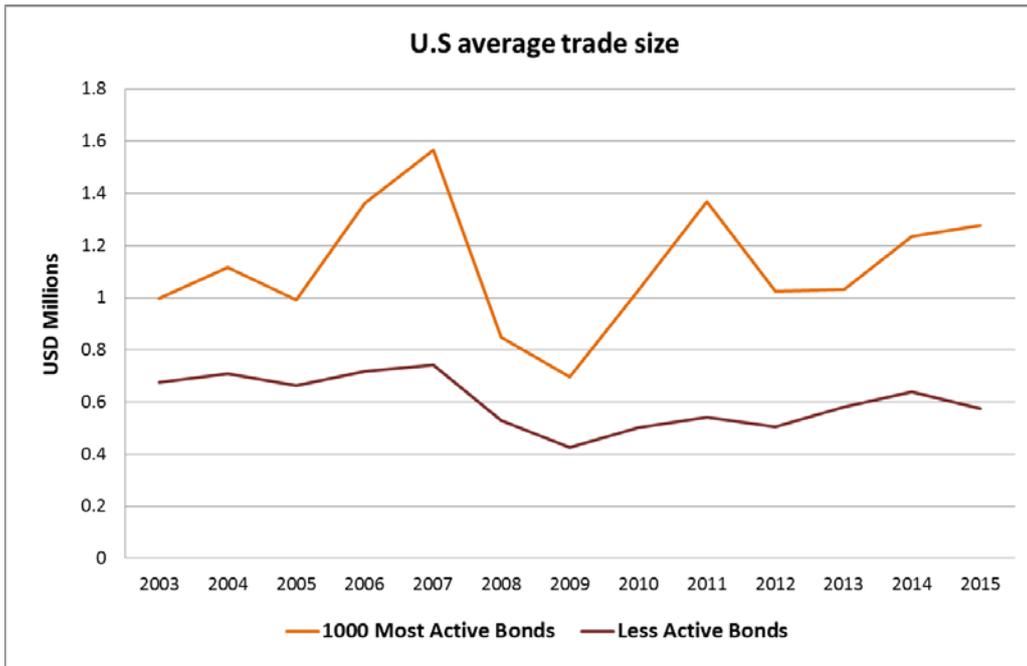
A number of buy-side market participants reported that it is becoming increasingly difficult to execute trades in larger sizes and that, as secondary markets have become less liquid, more transparent and more fragmented across a multitude of venues, market participants are increasingly forced to cut orders into smaller pieces to reduce price impact and execute trades. Some believe that this reflects market structure changes, for example, the increasing availability of electronic trading of bonds on platforms, as these make it easier to execute smaller sized trades. Based on the data detailed below, however, there has not been a major shift in trade sizes.

Data compiled by FINRA for the U.S. market (see Figure 15)⁶⁵ indicates that average trade size in the U.S. is similar to pre-crisis levels, but has declined somewhat compared with the peak period immediately prior to the financial crisis – arguably a period of unusually abundant liquidity.⁶⁶

⁶⁵ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, (Dec. 2015), at 8, available at: https://www.finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12.pdf.

⁶⁶ See, e.g., Allen N. Berger & Christa H.S. Bouwman, *Financial Crises and Bank Liquidity Creation*, (Oct. 2008), at 4, available at <http://fic.wharton.upenn.edu/fic/papers/08/0837.pdf> (“Our main results regarding the behavior of liquidity creation around financial crises are as follows. First, prior to financial crises, there seems to have been a significant build-up or drop-off of “abnormal” liquidity creation”).

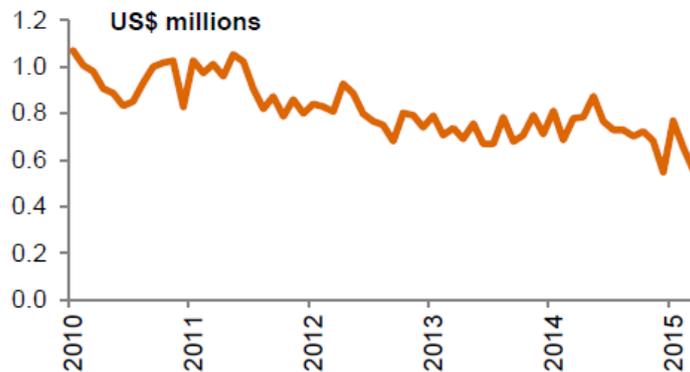
Figure 15: U.S. average trade size



Source: FINRA

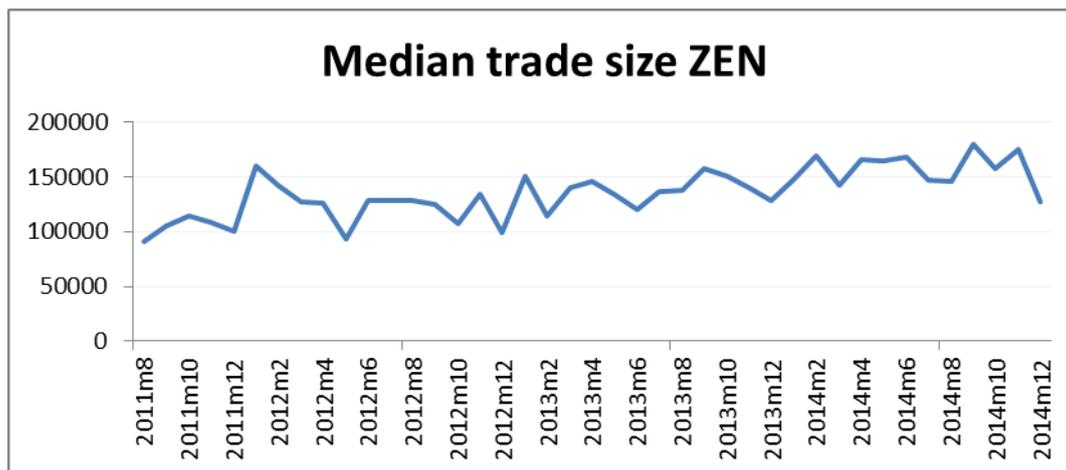
In Europe, average trade size may have decreased more significantly, as demonstrated in Figure 16. IOSCO cautions, however, that this data may be affected by exchange rate changes, given that it is converted into U.S. dollars. This trend is also not corroborated by transaction reporting data provided by the U.K. FCA showing rising median trade sizes over time in Figure 17.

Figure 16: European corporate bonds, average trade size



Source: Trax, PwC analysis

Figure 17: Median trade sizes over time in the U.K.



Source: Matteo Aquilina & Felix Suntheim, “Liquidity in the U.K. corporate bond market: evidence from trade data”, FCA Occasional Paper 14 (Mar. 2016).⁶⁷

4. Size of Block Trades

There is some evidence that the average size of block trades is declining, which may support claims that it is becoming difficult to execute large trade sizes. However, it could also indicate greater use of electronic trading venues that execute smaller trade sizes.

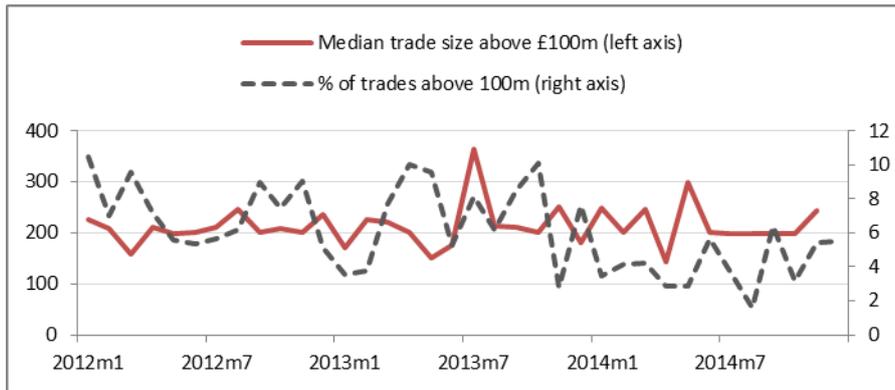
A number of buy-side market participants told IOSCO that they are finding it harder to execute block trades, or large trades above a certain size threshold, which can be subject to delayed or reduced transparency requirements. They say that the potential price impact of block trades has increased due to declining liquidity and trading volumes. They also note a decline in the willingness of dealers to make markets in large blocks and, in recent years, a decline in the amount of block trades being executed. The decrease in block orders could also be attributed to an increase in smaller trades due to greater electrification of the market, although IOSCO does not have data to confirm this supposition.

Both FINRA and the U.K. FCA examined the percentage of trades that are large (or block trades) compared with the total bond trading volume.⁶⁸ Figures 18 (U.K.) and 19 (U.S.) show a soft decline in the percentage of trading occurring in block sizes in recent years, which could potentially indicate that it has become more difficult. We have observed trading in multiple, smaller pieces (*e.g.*, between \$5m and \$10m), as demonstrated in Figure 20 (U.S.). Larger blocks (*i.e.*, greater than \$25m) are not less frequently executed today than pre-crisis.

⁶⁷ Based on ZEN, the U.K. FCA’s surveillance and monitoring program, data beginning in Aug. 2011 through Dec. 2014.

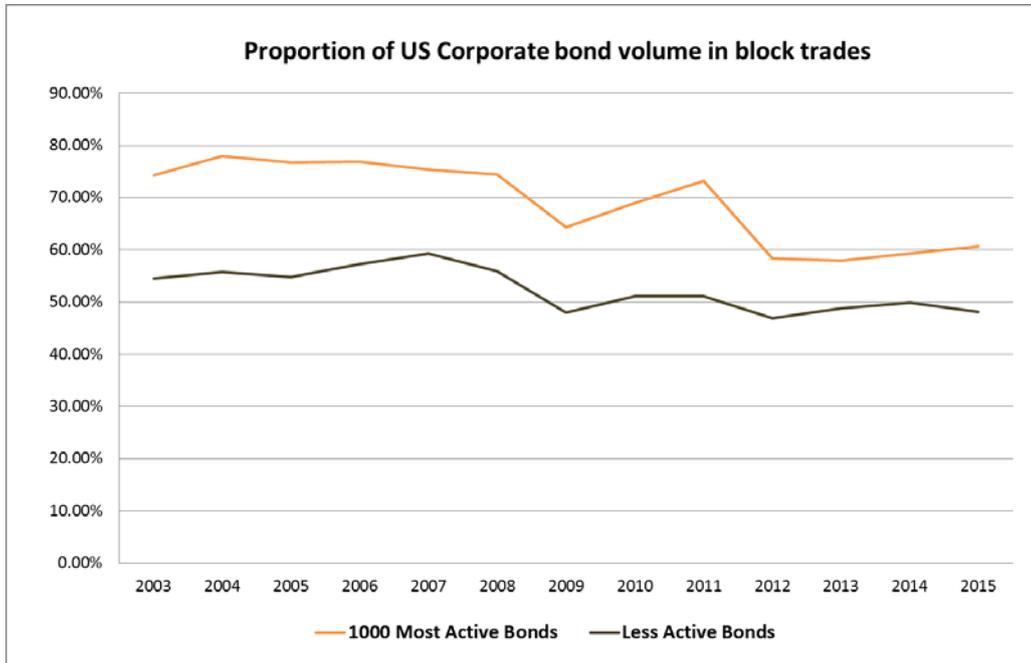
⁶⁸ This figure is more accurate than using block trade volumes alone, as block trades might be rising simply as the market is growing. The FCA used a large trade size threshold of £100m and FINRA used a block trade threshold of \$5m (in accordance with TRACE).

Figure 18: Percentage of U.K. trades that are large (above £100m) and their median trade size



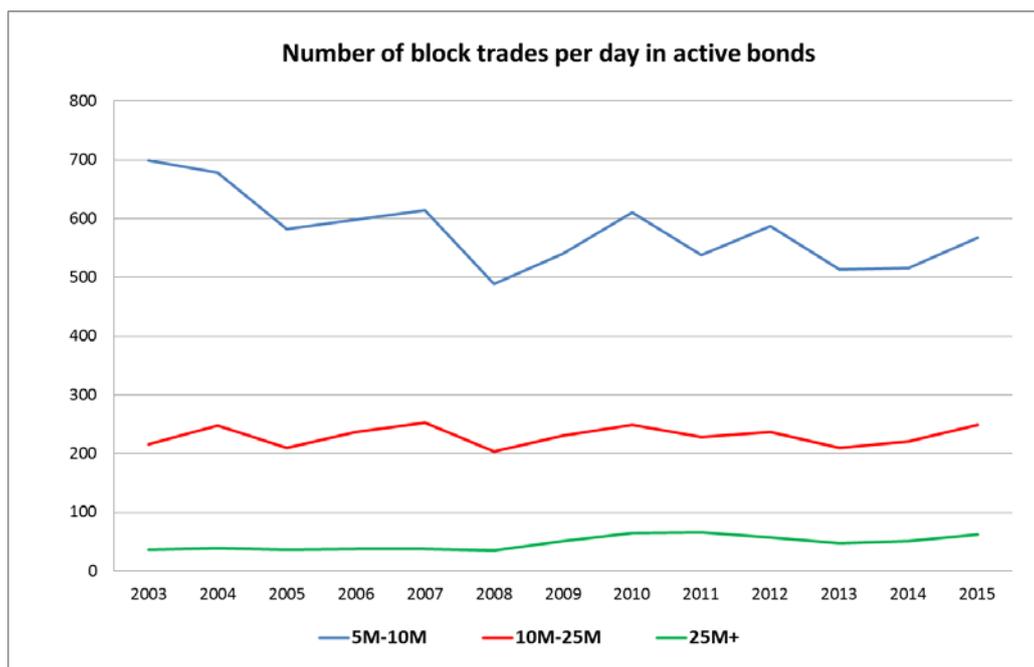
Source: Aquilina, Matteo & Suntheim, Felix, “Liquidity in the U.K. corporate bond market: evidence from trade data”, FCA Occasional Paper 14 (Mar. 2016), using transaction reporting data

Figure 19: Proportion of U.S. corporate bond volume in block trades (trade size of \$5 million and above)



Source: FINRA

Figure 20: Number of block trades per day in active bonds



Source: FINRA

5. Price-impact Measures

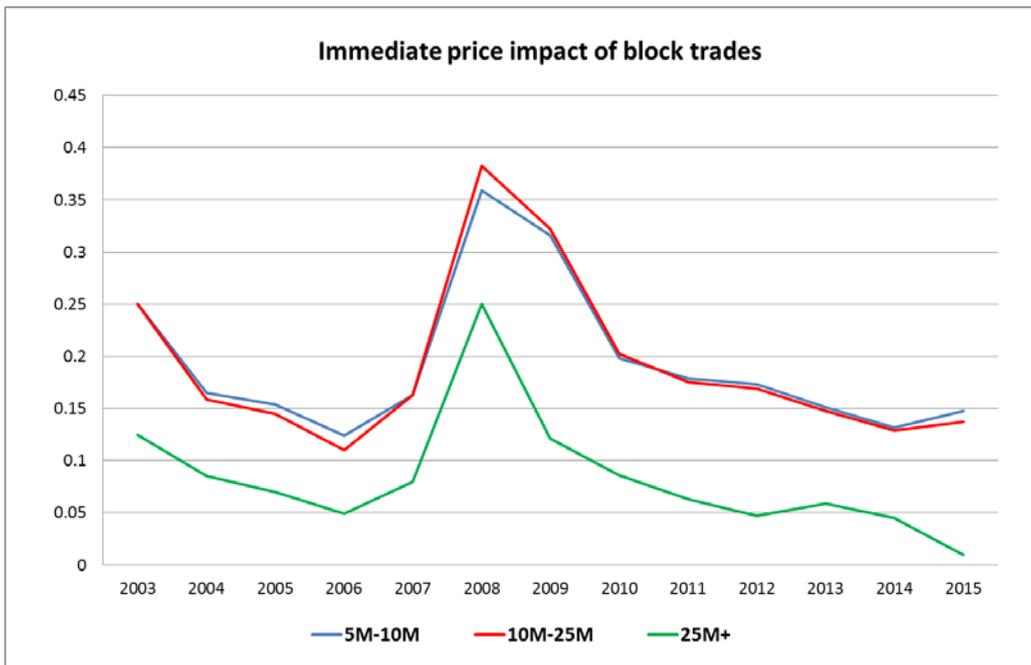
There is evidence of a steady decline post-crisis in the price impact of trades, which would indicate improving liquidity.

Price impact measures calculate the effect trading volumes have on market prices; in other words, how much a given transaction will change the prevailing price for the asset in the market. Whereas very deep markets typically accommodate large trading volumes with minimal price impact, less liquid markets are associated with larger price movements. Therefore, price impact can be used as an indirect measure of liquidity, usually by examining the impact of large block trades.

In its recent paper, FINRA examined price impact of block trades of various sizes in corporate bonds since the introduction of TRACE.⁶⁹ It found a decline in price impact post-crisis, which could indicate improving liquidity in U.S. secondary corporate bond markets.

⁶⁹ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist (Dec. 2015), available at: https://www.finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12.pdf.

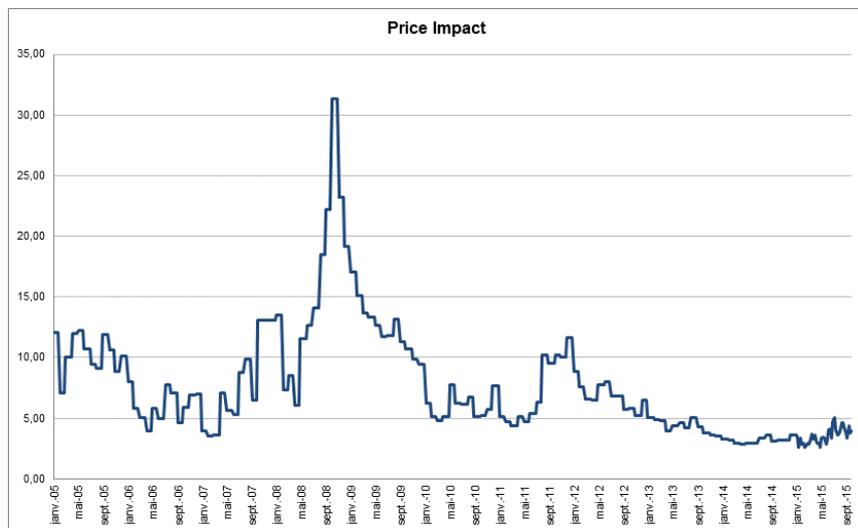
Figure 21: Immediate price impact of block trades



Source: FINRA analysis using TRACE data. The figure shows the median increase (decrease) in the price of a trade immediately following a block buy (sell) order.

In its own study of the price impact of block trades over time, the French AMF calculated the price impact as the standard deviation of intraday returns by the square root of the sum of trading volumes, and came up with a similar finding to FINRA's:

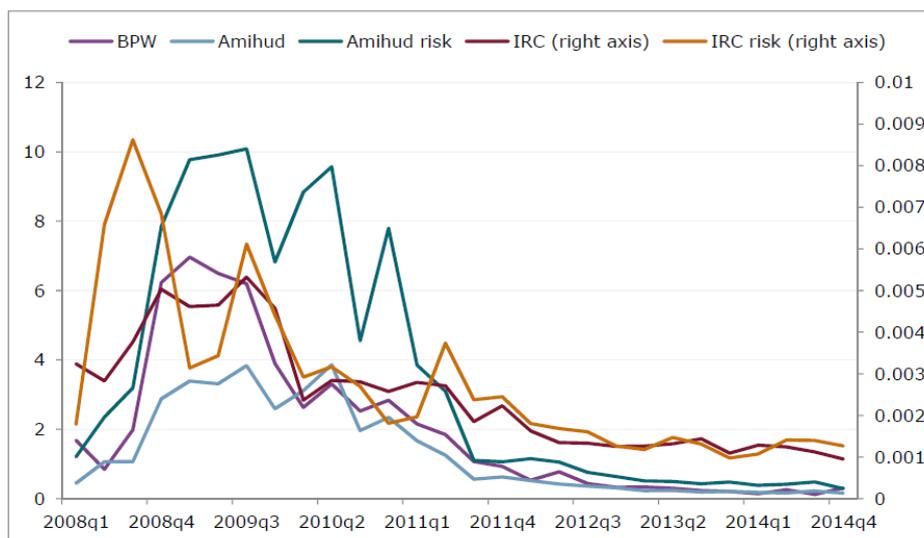
Figure 22: Price impact of block trades - AMF



Source: AMF -Bloomberg

Likewise, economists at the U.K. FCA analysed several liquidity metrics – such as the Amihud price-impact measure, the Feldhutter measure of imputed roundtrip costs, and the Bao, Pan Wang price-reversal measure – which all showed a large improvement in liquidity in recent years, as shown in Figure 23 below.⁷⁰

Figure 23: Measures of liquidity and liquidity risk – U.K. FCA



Source: Chief Economist’s Department U.K. Financial Conduct Authority, showing the Amihud, Imputed Roundtrip Costs and Bao Pan Wang measures of illiquidity (as well as the standard deviation of the former two).

6. Bid-ask Spreads

Most measures of bid-ask spreads show a substantial decrease in spreads.

The bid-ask spread is the difference between the price at which dealers are willing to buy (bid) and the price at which dealers are willing to sell (ask). This spread compensates market makers for the risk of holding a bond over a period of time. It can be a useful measure of liquidity, but like other proxies, it does not fully take into account other aspects of liquidity such as market depth. Given that corporate bonds generally trade over-the-counter and without central limit order books, the calculation of bid-ask spread is also based on indicative prices rather than firm orders and so may not fully reflect liquidity condition, which may limit the reliability and usefulness of such data.

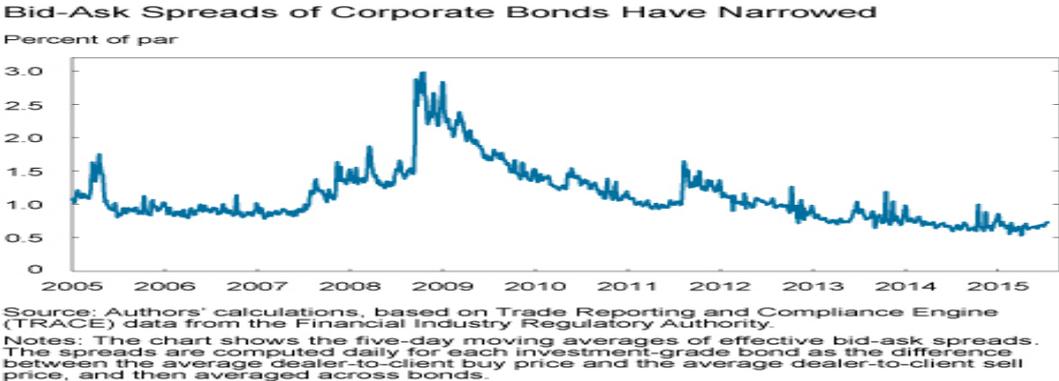
Figures 24 and 26 show that corporate bond bid-ask spreads have narrowed in the U.S. and Europe since the financial crisis.⁷¹ In fact, in the U.S., the current level of bid-ask spreads is

⁷⁰ Matteo Aquilina & Felix Suntheim, “Liquidity in the U.K. corporate bond market: evidence from trade data”, FCA Occasional Paper 14 (Mar. 2016).

⁷¹ One roundtable participant noted the difference between inter-dealer bid-ask spreads and dealer-to-client bid-ask spreads, and suggested that retail customers are now better off (e.g., there is a lower

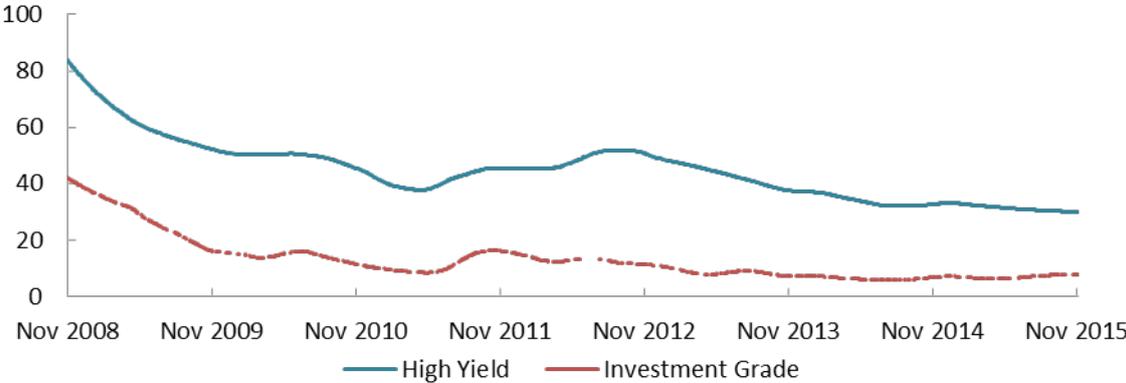
even lower than pre-crisis levels (see Figure 24). The trend is the same for both investment-grade and high-yield corporate bonds.⁷²

Figure 24: U.S. corporate bond bid-ask spreads



Source: Federal Reserve Bank of New York

Figure 25: Bid Ask Spreads⁷³



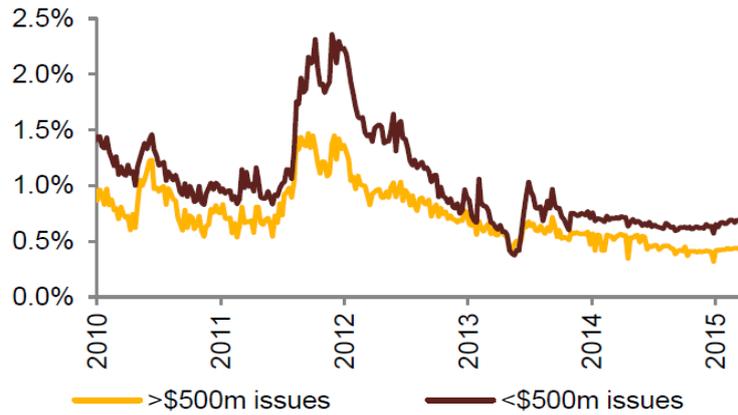
Source: Data from MarketAxess; Chart from the investment Company Institute

overall spread as they can trade more bonds ‘on their own’) than they were when dealers played a larger market-making role.

⁷² IOSCO Research Department, *IOSCO Securities Markets Risk Outlook 2016*, at 34, available at: <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD527.pdf>.

⁷³ *Id.*

Figure 26: Bid-ask spreads on a sample of European corporate bonds, by issuance size

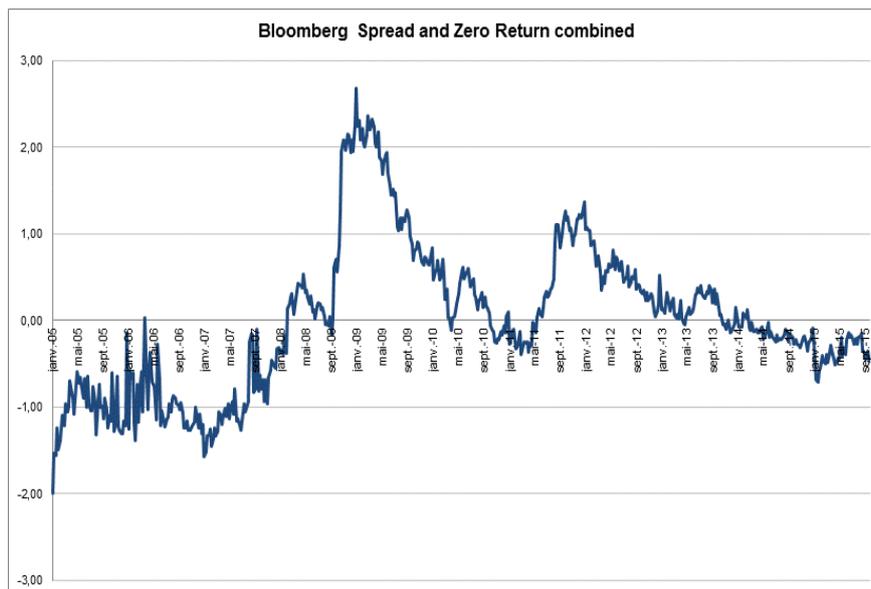


Source: Thomson Reuters, Trax, PwC analysis

The French AMF uses bid-ask spreads from Bloomberg as an ex-ante component of its Illiquidity Index. To provide a comparable basis for all instruments with different maturities, bid-ask spreads, which were originally expressed in price terms, were divided by the estimated residual maturity of the bonds. Moreover, Bloomberg spreads are enhanced by the use of Zero Return.⁷⁴ The combination of the two components shows that liquidity improved steadily in French bond markets since beginning of 2012, albeit without recovering to its pre- subprime crisis level (2005-2007), as demonstrated in Figure 27.

⁷⁴ “Zero Return” refers to the number of bonds for which the price is absent or constant relative to the previous period. This measure captures the notion that illiquid bonds are less likely to trade and have price changes. A tradable security would have a zero return over a certain period of time (e.g., day) if the price of the security at the end of the period equals the price of the security at the beginning of the period without taking into account the payout of the security (e.g., coupon) to its holder during this period. As stated in the AMF report, “[t]he loss of quality of the Bloomberg bid-ask spread during periods of major stress (2008) is due to a decline in the number of contributions and ultimately to an absence or scarcity of trades.” The Zero Return can be used to address these imperfections and helpfully supplement the Bloomberg bid-ask indicator when analysing bonds.

Figure 27: Bloomberg Spread and Zero Return combined – French corporate bonds



Source: AMF – Bloomberg

7. Measuring Market Making

As noted above in Section III.D.1, dealers continue to play a dominant role in the secondary corporate bond market. Fewer dealers could make it more difficult to execute orders, reduce immediacy (the time it takes to complete a transaction), and possibly result in less competitive pricing. The average number of dealers making markets in corporate bonds can therefore be seen as another measure of liquidity provided in secondary markets.⁷⁵

A number of buy-side and sell-side participants report that progressively fewer dealers are willing to make markets or quote prices in secondary corporate bond markets, especially in the relatively illiquid or high-yield segments because of their concern that it may be difficult to find a willing buyer or seller, particularly in times of market stress. Furthermore, they note that some traditional market makers have exited the business entirely, due to a combination of strategic factors, tougher capital restrictions and various regulatory reforms.⁷⁶

FINRA also presents evidence of a consolidation of dealer activity amongst the largest dealers. The top 10 dealers accounted for approximately 55.18% of trading volume in 2007, and 58 to 61% of the trading volume over the last three years. It is unclear whether the exit by some dealers (possibly smaller players) has led to the rising market share of the largest top 10 dealers. According to FINRA, however, the total number of dealers has indeed declined.

⁷⁵ See also, Hendrik Bessembinder et al., Capital Commitment and Illiquidity in Corporate Bonds (Mar. 21, 2016), available at SSRN, <http://ssrn.com/abstract=2752610> (noting that, in the U.S., the fifteen most active dealers generally execute more than 60% of overall volume).

⁷⁶ For example, Dodd-Frank reforms, including the so-called Volcker rule, along with Basel III capital requirements and leverage ratios.

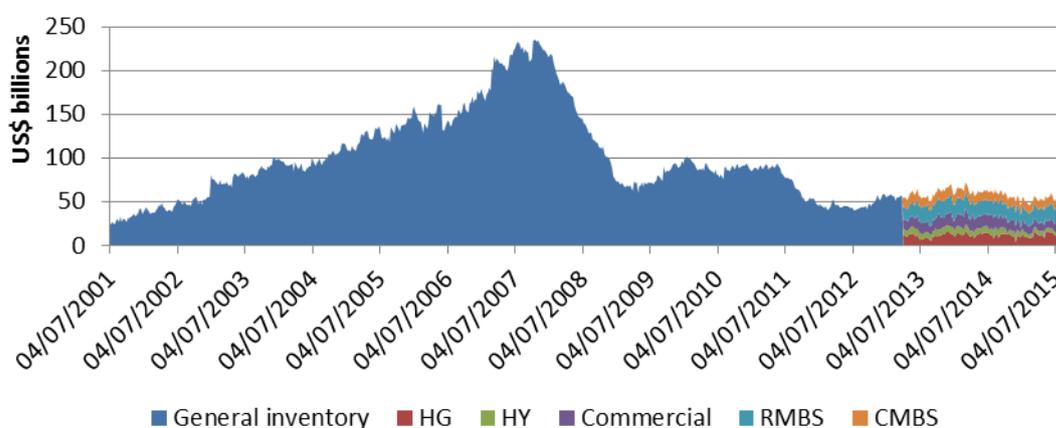
a. Dealer Inventories

On average, there has been a small to significant decrease in dealers inventories allocated to market making activities (although it can vary considerably from firm to firm). Following the financial crisis dealer inventories seem to have recovered but remain below pre-crisis levels.

One way of measuring dealer activity in secondary corporate bond markets is to look at dealer inventories.⁷⁷ Since corporate bond markets are predominantly dealer-intermediated, fluctuations in the levels of corporate bond inventories held by dealers for market making purposes could affect their ability to provide liquidity in secondary markets.

A number of dealers told IOSCO through the survey and at roundtable discussions that dealer inventories of corporate bonds have significantly declined.⁷⁸ To support their views, a number of dealers who responded to the IOSCO survey referenced a chart from the New York Federal Reserve showing a steep decline in U.S. primary dealer net positions in corporate credit instruments (*see* Figure 28). In their view, this apparent decline in the breadth and depth of participation on the dealer-side is likely a contributor to the sense of illiquidity felt by the buy-side market participants today.

Figure 28: U.S. dealer credit net positions



Source: Federal Reserve Bank of New York

However, the Federal Reserve data includes types of corporate credit *other than bonds*, such as asset-backed and mortgage-backed securities, with a breakdown of components only beginning in 2013. Issuance of asset- and mortgage-backed securities rose rapidly in the years before the financial crisis, followed by a sharp fall post-crisis.⁷⁹ The inclusion of these securities in inventory statistics therefore very likely exaggerates the decline in corporate bond inventories.

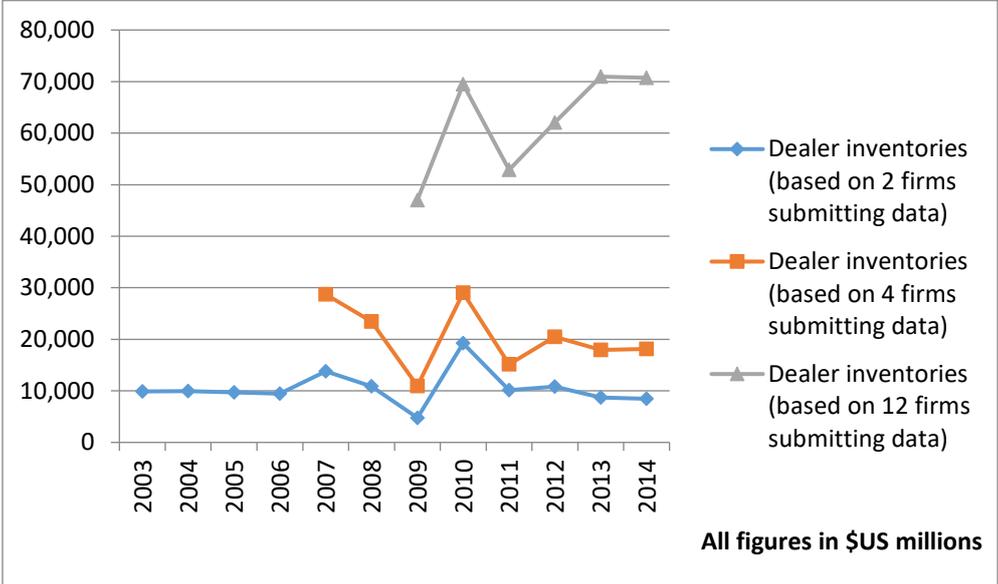
⁷⁷ For the purposes of this report, when IOSCO uses the term “dealer inventories”, it is referring to inventories of corporate bonds held by dealers *for market-making purposes*.

⁷⁸ However, it was also noted by market roundtable participants that this might be due to the fact that some dealers are moving to an agency model.

⁷⁹ Data on inventories is also aggregated across all parts of the dealers; therefore market-making desks within a dealer may have strong positive inventories but these could be offset by short positions at other desks within the bank.

IOSCO attempted to find alternative, global evidence to examine the assertion that dealer inventories of corporate bonds had significantly declined, in particular by asking for quantitative information from dealers on their inventories of corporate bonds held for market-making purposes. Seventeen dealers from Asia, Europe and the U.S. provided some data. This data has been aggregated and anonymized and is exhibited in Figure 29. It is important to note that many of the respondents did not provide information on inventories held in the earlier years of the requested period (2003-2014).

Figure 29: Net dealer inventories of corporate bonds held for market-making purposes



Source: Dealer responses to IOSCO Survey. Note many respondents did not provide data for the earlier years in the sample period.

Data was insufficient to firmly establish that dealer inventories of corporate bonds⁸⁰ rose significantly from the middle 2000s until shortly before the 2008 financial crisis, as has been widely noted by market participants. However, the data does indicate a material and sharp reduction in dealer inventories immediately prior to and following the 2008 financial crisis. Dealer inventories partly recovered by 2010, but some firms reduced inventories again in 2011, when markets were riled by downside macroeconomic concerns stemming from the sovereign debt crisis in the Eurozone, an uncertain economic recovery in the U.S., and new financial regulations taking effect, among other events. Since 2012, dealers appear to have generally increased their inventories or kept them around the same level, albeit in many cases without recovering to pre-crisis (2005-2007) levels. There also appear to be some minor regional differences.

Based upon responses to the IOSCO survey,⁸¹ it appears that (1) within Asia, dealers have generally increased their corporate bond inventory levels at a greater pace than their

⁸⁰ The vast majority of dealers that responded to the IOSCO survey noted that their inventories of corporate bonds were entirely used for market making purposes.

⁸¹ IOSCO cautions, however, that only a limited number of survey respondents provided data on inventory levels.

counterparts in Europe and the U.S. since the 2008 financial crisis; (2) in Europe, inventories generally reached their lowest points in 2008 and then 2011 – a significant time of economic uncertainty in the Eurozone – but have recovered since then; and (3) in the U.S., dealer inventories remain subdued below their pre-crisis peak – arguably an abnormally high period⁸² – but also appear to have stabilized. Naturally, there are also significant variations from firm to firm within the same region, as each firm adapts their business model uniquely in response to changes in market structure, regulations and other factors.

Dealers also provided in their responses to the IOSCO survey data on their total inventories of financial products (*e.g.*, including products other than corporate bonds). In general, total inventories displayed similar trends to the corporate bond inventories; namely, they rose significantly from 2003-2007, fell following the financial crisis, and have since recovered but remain below pre-crisis levels.

To the extent that data was available, the average percentage of total inventories made up of corporate bonds appears to have increased slightly from 2003-2014. Based on submissions from 4 dealers, in 2007, the average percentage was 24%, rising to 28% in 2010 (based on figures from 12 submitters) and 34% in 2014 (based on 15 submitters). From this, it could be inferred that dealers are now devoting an increasing proportion of their total market making capacity to corporate bonds – suggesting dealers are cutting back their market making capacity in financial products other than corporate bonds at a faster rate than cutting capacity in corporate bond market making.

Lastly, the corporate bond inventories of most dealers who responded to the IOSCO survey consist primarily of investment-grade corporate bonds. In 2014, based on data from 16 submitters, roughly three-quarters, or 76%, of corporate bond inventories comprised investment-grade corporate bonds, with the remainder comprising high-yield bonds. However, the percentage varied widely from firm to firm. To the extent that data was available, this percentage does not appear to have changed significantly across the time period 2003-2014. There are also interesting regional differences apparent in the data. Investment grade corporate bonds made up a lower proportion of total corporate bonds for dealers in the U.S. (generally around 55-75%) compared with dealers in Asia and Europe (generally around 95%). One explanatory factor behind this could be the large and deep high-yield corporate bond market established in the U.S.

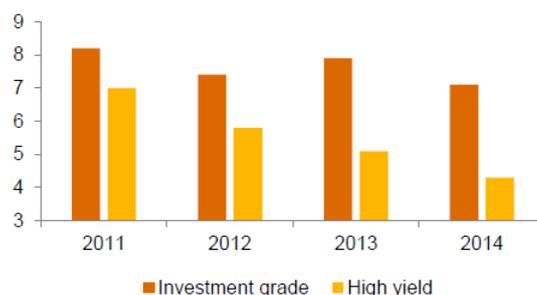
⁸² See, *e.g.*, Allen N. Berger & Christa H.S. Bouwman, *Financial Crises and Bank Liquidity Creation*, (Oct. 2008).

b. Number of Counterparties

There appears to be a modest reduction in the number of market makers in corporate bonds. The average number of counterparties is increasing, however, possibly showing that the ability to find a counterparty remains unimpeded, although investors may need to contact more participants in order to execute trades.

PwC analyzed in a study⁸³ transaction-reporting data from market data provider Trax to estimate for European corporate bonds an average number of dealers making markets in a given year. The number of European dealers actively making markets seems to be declining although the decline in the number of market makers is steeper for high yield bonds (Figure 30).

Figure 30: Average number of active market makers – European corporate bonds⁸⁴



Source: Trax, PwC analysis

In the U.S., emerging academic evidence⁸⁵ casts some doubt on the common assertion that increased regulatory requirements on broker-dealers following the financial crisis have negatively affected their willingness in the U.S. to make markets in corporate bonds.⁸⁶ In their recent paper, “Regulation and Market Liquidity,” authors Francesco Trebbi and Kairong Xiao statistically found “no evidence of liquidity deterioration during periods of regulatory intervention. Instead, breaks towards higher liquidity are often identified.”⁸⁷

In addition, the Federal Reserve Bank of New York recently examined corporate bond market-making returns at major dealers.⁸⁸ Its report stated, “[i]f it were true that these higher capital requirements were leading dealers to withdraw from market making, one would expect

⁸³ Miles Kennedy et al., *Global financial markets liquidity study*, PwC, (Aug. 2015), at 65-67, available at <https://www.pwc.se/sv/financial-services/assets/global-financial-markets-liquidity-study.pdf>.

⁸⁴ *Id.* at 66.

⁸⁵ Francesco Trebbi & Kairong Xiao, *Regulation and Market Liquidity*, (May 2016), at 21-23, available at <http://faculty.arts.ubc.ca/ftrebbi/research/tx.pdf>.

⁸⁶ *Id.* at 30.

⁸⁷ *Id.* at 1.

⁸⁸ Tobias Adrian et al., *Changes in the Returns to Market Making?* Liberty Street Economics – Federal Reserve Bank of New York (Oct. 7, 2015), available at: <http://libertystreeteconomics.newyorkfed.org/2015/10/changes-in-the-returns-to-market-making.html>.

market-making returns to widen, especially in that market." However, as the next chart illustrates, reversal returns for corporate bonds show no such increase, and thereby do not support the conclusion of a withdrawal of market-making activity in this market."⁸⁹

Figure 31: Corporate Bond Market-Making Returns



Source: Federal Reserve Bank of New York

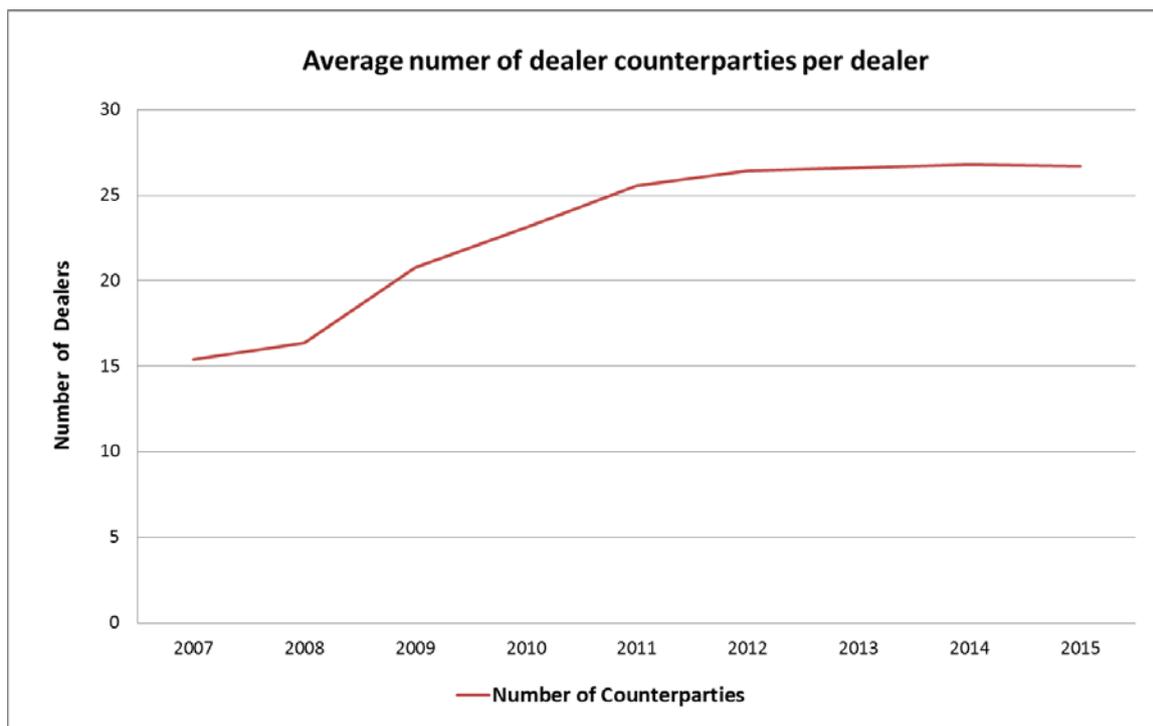
While the extent that dealers may be reducing their market making activity is debatable, based on the data, several buy-side respondents to the IOSCO survey asserted that many dealers are increasingly focusing their remaining services on larger clients with whom they can make the most money, rather than on smaller clients. IOSCO was unable as part of its research to find statistics to either support or rebuke this assertion definitively. However, the apparent widening by some dealers of their customer and dealer networks may mitigate to some extent any possibility of smaller clients not being serviced by market makers.

In the U.S., FINRA used TRACE reporting data to examine the average number of counterparties per dealer. FINRA found dealers are interacting with a larger group of counterparties today than before the financial crisis: in 2007, the top ten dealers traded with an average of 245 counterparties; in 2015, the average network size had risen to 287. It is possible that this increase in network size reflects, in part, reduced costs in identifying new counterparties through, for example, better technology.

Figure 32 shows a related metric representing changes in the size of dealer-to-dealer networks (dealers carry out a lot of their trading with each other on dealer-to-dealer platforms). The chart plots the average number of dealer-to-dealer counterparties reported in TRACE: in 2007, a dealer only traded with 15.38 counterparties on average, but by 2012, this had risen to more than 26, an increase of almost 70%.

⁸⁹ *Id.*

Figure 32: Average number of dealer counterparties per dealer



Source: FINRA

V. CONCLUSION

IOSCO engaged in this project in light of concerns raised by some industry participants and commenters concerning a perceived deterioration of liquidity in the secondary corporate bond markets due to changes in market structure and regulation. Some industry participants expressed the view that, while the global corporate bond markets have grown rapidly in recent years, liquidity indicators in the secondary corporate bond markets, such as bond turnover ratio, dealer inventories, bid ask spreads, size and concentration of trades, have declined.

The focus of its work was to examine the current liquidity of the secondary corporate bond markets in IOSCO Committee 2 member jurisdictions, including the impact of structural and regulatory developments since 2004, with a particular focus on the period just prior to the financial crisis to 2015. Our primary goal was to determine whether liquidity was consistent with historical levels. Our examination did not, however, focus on the likely consequences of a possible crisis or stress scenario, given the inherently speculative nature of any such endeavor, not to mention the dearth of globally comparable data that would be needed for such an analysis.⁹⁰

⁹⁰ With regard to stress scenarios, not covered by the Final Report, we note a staff working paper, *The Volcker Rule and Market-Making in Times of Stress*, published in September 2016 (after the Consultation Report). See Bao, Jack, Maureen O'Hara, and Alex Zhou (2016), "The Volcker Rule and Market-Making in Times of Stress," Finance and Economics Discussion Series 2016-102. Washington: Board of Governors of the Federal Reserve System, <https://doi.org/10.17016/FEDS.2016.102>. The paper's authors, focusing on downgrades as stress events that drive the selling of corporate bonds, find

A. Assessment of the Liquidity of the Secondary Corporate Bond Markets

Based upon its detailed analysis of liquidity metrics, survey results (both qualitative and quantitative) from industry and regulators, roundtables with industry, and a review of academic, government and other research articles, IOSCO did not find substantial evidence showing liquidity has deteriorated markedly from historic norms for non-crisis periods. IOSCO also notes that there is no reliable evidence that regulatory reforms have caused a substantial decline in the liquidity of the market, although regulators continue to monitor closely the impact of regulatory reforms.

IOSCO is aware, of course, that liquidity could shift rapidly due to major events or changes in market conditions,⁹¹ such as the significant deterioration of liquidity in the secondary corporate bond markets during the historic 2008-9 financial crisis. Specifically, the academic price impact measures show the impact of a trade during that period was extremely elevated during the crisis. In addition, bid-ask spreads widened.⁹²

Notwithstanding these findings, it should be noted that changing market structure, participant behavior, regulations and cyclical factors, such as low interest rates, have impacted the secondary corporate bond market. Yet this is a dynamic environment, where stakeholders and participants have demonstrated ability to change and adapt. For example, dealers have been observed shifting from a principal model to an agency model and increasing the use of electronic trading venues to trade fixed income products. There also appears to be a decoupling of the traditional relationship between dealer inventory and trading volume for the cash corporate bond market. Further, research suggests that alternative products, such as CDS, could alleviate trading frictions in cash markets improving overall liquidity conditions (in normal market conditions).

B. Data Needed to Assess Market Liquidity

One of the primary challenges faced by IOSCO during this assessment was a lack of useful data in most jurisdictions on the trading of corporate bonds in the secondary market in their country. This problem stems in part from the fact that bonds are mostly traded through decentralized, dealer intermediated, OTC markets. Although the use of electronic trading venues has also been growing in recent years, the corporate bond markets are still fragmented among national and regional OTC markets.

A key feature of OTC markets are that, with few exceptions (*e.g.*, TRACE in the U.S.), transaction prices are generally not reported or disclosed to any central repository, unlike an

that the illiquidity of stressed bonds has increased after the Volcker Rule, and that dealers regulated by the Rule have decreased their market-making activities while non-Volcker-affected dealers have stepped in to provide some additional liquidity. According to the Federal Reserve, staff working papers in the Finance and Economics Discussion Series (FEDS) are preliminary materials circulated to stimulate discussion and critical comment.

⁹¹ IOSCO would expect, during a crisis, for three out of the four key dimensions of liquidity to deteriorate, spread, depth (quantity of an asset that can be traded), immediacy (speed of execution) and resiliency (speed of price adjustment after a large order flow imbalance).

⁹² Matteo Aquilina & Felix Suntheim, “*Liquidity in the UK corporate bond market: evidence from trade data*”, FCA Occasional Paper 14 (Mar. 2016).

exchange, and market participants are under no obligation to disclose them. Differences in data collection methods amongst IOSCO members, data quality and consistency made it difficult to aggregate data across jurisdictions or to make meaningful comparisons between jurisdictions, not to mention data gaps in individual countries. A further elaboration on data issues is set forth in **Annex 6**.

This study into the liquidity of the corporate bond markets reinforced IOSCO's view that regulators should have access to timely, accurate and detailed information regarding secondary markets, as well as changes in market structure, to assess adequately changes in the secondary markets and monitor trends in trading and trading behavior. Data should be as complete and accurate as possible to inform policy and assist regulators in determining whether there is a need to take action. With access to higher-quality and comprehensive data, regulators would be better able to assess liquidity in corporate bonds markets and react accordingly. Moreover, more effective comparisons over time and across jurisdictions would be possible, which could lead to a better understanding of the similarities and differences in the functioning of the markets, both individually and collectively. However, IOSCO intends to continue monitoring the corporate bond markets and to consider new data when available. During its fact-finding, IOSCO found that in a number of jurisdictions reforms to transparency regimes of corporate bond markets are underway. As noted above, transparency might have an impact on market liquidity; it may also play a role for enhancing access to corporate bond market data to assess corporate bond market liquidity. As a result, IOSCO has commenced work to build upon its 2004 Report on the Transparency in the Corporate Bond Markets.⁹³

The purpose of the transparency project will be to examine in detail the transparency regimes and regulatory requirements in place in IOSCO Committee 2 jurisdictions that have developed since 2004. As part of that examination, IOSCO expects to discuss in more detail the relationship between transparency and liquidity and the decisions regulators have made to address it (volume caps, delayed dissemination, etc.). The new project is also expected to be an opportunity for regulators to study current data reporting requirements regarding the corporate bond markets and the goal of collecting data that is comparable and useful on a cross border basis, particular for the purpose of assessing liquidity. Finally, the project will examine and update the 2004 "core measures" (i.e., recommendations), as appropriate.

⁹³ Technical Committee, *Transparency of Corporate Bond Markets*, International Organization of Securities Commissions (May 2004), available at: <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD168.pdf>.

ANNEX 1

FEEDBACK STATEMENT

A. Introduction

Comments to the Consultation Report were submitted by the following organizations to the IOSCO Board.

1. BlackRock
2. Bundesverband Investment und Asset Management e.V. (BVI)
3. CFA Institute
4. Federation of European Securities Exchanges
5. Global Financial Markets Association (GFMA) / Institute of International Finance (IIF)
6. ICE Data Services
7. ICI Global
8. IHS Markit
9. International Capital Market Association (ICMA)
10. International Council of Securities Associations (ICSA)
11. Nasdaq
12. Sabadell
13. Swedish Securities Dealers Association
14. Tradeweb
15. Vanguard
16. World Federation of Exchanges (WFE)

These comments⁹⁴ were considered by IOSCO as it prepared the Final Report. In a number of instances, as noted below, the Final Report was edited in response to particular comments.

Overall, there was general support for the Consultation Report. All commenters agreed that the corporate bond markets are an important source of financing for economic growth. There was general agreement that the structure of the corporate bond markets is changing. For example, commenters agreed that the use of technology to facilitate trading in corporate bonds is growing in many jurisdictions. However, there was no consensus regarding whether liquidity had deteriorated during the period covered by the Consultation Report. This feedback statement seeks to summarize and respond to the issues and ideas raised by commenters.

⁹⁴ These submissions may be viewed at:
http://www.iosco.org/publications/?subsection=public_reports&publicDocID=537

B. Summary of Comments and Feedback

1. Overview of the Secondary Corporate Bond Markets

a. The Global Focus of the Report

A number of commenters questioned the Consultation Report’s global focus on corporate bond markets. For example, one commenter observed that different jurisdictions have different bond market characteristics in terms of structure, participant composition and liquidity dynamics;⁹⁵ it believes that an analysis of the potential bifurcation of liquidity across credit ratings within individual jurisdictions would help highlight some of the more localized nuances and liquidity dynamics of the various markets.⁹⁶

Feedback

IOSCO acknowledges that there is no *global* corporate bond market. IOSCO’s goal and mandate, however, was not to analyse the liquidity of corporate bond markets in individual jurisdictions *per se*. Indeed, individual IOSCO members are best placed to conduct such an analysis for their own markets.

IOSCO’s goal was to provide a *cross-jurisdictional, global* overview of the liquidity of the secondary corporate bond markets, including the impact of structural and regulatory developments since 2004, with a particular focus on the period just prior to the financial crisis to 2015. IOSCO sought to illuminate the differences and commonalities across markets.

IOSCO acknowledges that the state of corporate bond markets differs in IOSCO Committee 2 member jurisdictions, with some jurisdictions having large and liquid corporate bond markets, while others having small and illiquid markets. The Consultation Report also noted “these variables make comparisons of the liquidity of the corporate bond markets in different jurisdictions particularly challenging, and underscores the risk of over generalization about liquidity conditions.”⁹⁷

As IOSCO sought to identify commonalities across jurisdictions, certain themes stood out. Chief amongst these was that in the developed markets of the world, particularly in Europe and the U.S., dealer inventories may have decreased from pre-2008 crisis levels, market structures have changed, and dealers in some markets may be less motivated to make markets than they once did. Nonetheless, IOSCO’s holistic approach in identifying and analysing numerous metrics to assess liquidity, including recognizing the strengths and weaknesses of individual metrics, led us to the ultimate conclusion that there is an important commonality *across jurisdictions*, i.e., the *available data* supports the conclusion that, from a macro-economic perspective, there is no substantial evidence showing liquidity has deteriorated markedly from historic norms for non-crisis periods.

⁹⁵ ICMA letter at 4.

⁹⁶ *Id.* at 8.

⁹⁷ Consultation Report at 3.

In summary, the Consultation and Final Reports present a data-driven analysis of corporate bond markets, providing a global view of market development within the broader economic and financial landscape, clearly noting that it might not address some of the different market characteristics in particular jurisdictions or regions.

For that reason, the Final Report retains the Consultation Report's global focus on corporate bond markets.

b. Issuer's Perspective

One commenter noted that its corporate bond issuer constituents have been frustrated about being left out of the discourse around secondary market liquidity, which is of vital importance to issuers. The commenter continues that a number of issuers have pointed to the events of early 2016 when, following a sharp sell-off in the European credit markets, the primary market virtually closed, particularly for lower credits.⁹⁸ The commenter recommends "that IOSCO complement its analysis with input from the issuer community across the different regions and jurisdictions, and...highlight the dynamics between secondary and primary market liquidity, particularly from an historical perspective."

Feedback

As a threshold matter, IOSCO notes that the scope of the mandate for this project focused only on an examination of liquidity in the secondary market. In addition, the IOSCO Research Department looked at both primary and secondary markets in 2014,⁹⁹ and again in 2015 (with regard to emerging market economies (EME)). In the latter case, the Research Department already considered the possible need to conduct further research on secondary market activity and the implications for EME primary market issuers.¹⁰⁰

Like the Consultation Report, the Final Report continues to focus on its mandate, *i.e.*, an examination of liquidity in the secondary corporate bond markets.

c. Exchange Traded Funds (ETF)

Some commenters noted that one of the most noteworthy changes to the structure of the bond markets is the rising popularity of alternative credit vehicles such as bond exchange traded funds (ETFs).¹⁰¹ A commenter also stated that the ETFs have emerged as a new source of bond market liquidity.¹⁰²

⁹⁸ ICMA letter at 6.

⁹⁹ Staff Working Paper of the IOSCO Research Department: Corporate Bond Markets: A Global Perspective, Volume 1, April 2014 available at: <http://www.iosco.org/research/pdf/swp/SW4-Corporate-Bond-Markets-Vol-1-A-global-perspective.pdf>.

¹⁰⁰ See Staff Working Paper of the IOSCO Research Department, Corporate Bond Markets: An Emerging Markets perspective Volume II (Sept. 25, 2015), at 97 ("Further research may focus on explaining the divergence in the turnover ratio, and general secondary market activity of EME bonds on US and European Secondary markets, and what implications this may have for primary market issuers in EME)," <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD510.pdf>.

¹⁰¹ Blackrock at II; BVI at 1.

¹⁰² Vanguard at 6.

Feedback

The Consultation Report acknowledged that across several jurisdictions retail investors are increasingly participating in the corporate bonds markets indirectly through mutual funds and ETFs. It further noted that these investment vehicles have grown significantly over the last decade.¹⁰³

With respect to the impact of ETF trading on bond liquidity, IOSCO Committee 2 consulted with IOSCO Committee 5 (Investment Management), which has examined the regulation of ETF markets.¹⁰⁴ IOSCO Committee 5 is currently considering a specific examination of this issue, but it is not complete. As a result, IOSCO Committee 2 is unable to draw any conclusions at this time regarding the degree to which ETFs contribute to the liquidity of the secondary corporate bond markets.

The Final Report continues to acknowledge the growth of mutual funds and ETFs, along with increased (albeit indirect) participation of retail investors in the corporate bond markets through these investment vehicles.

d. Central Bank Bond Purchase Programs

One commenter noted that central bank bond purchase programs reduce the eligible corporate bond portfolios available for trading.¹⁰⁵ The implication of this statement is that in some respects central bank purchases may have impacted liquidity negatively.

Feedback

It is true that some have expressed the view that central bank purchases may have impacted liquidity negatively. For example, the Bank for International Settlements (BIS) has said: “*central banks’ asset purchase programs may also have reduced liquidity and reinforced liquidity illusion in certain bond markets. In particular, such programs may have led to portfolio rebalancing by investors from safe government debt towards riskier bonds. This new demand can result in narrower spreads and more trading in corporate and EME bond markets making them look more liquid. However, this liquidity may be artificial and less robust in the event of market turbulence.*”¹⁰⁶ However, the existing objective data available shows that this is not a universally held view.

In the U.S., the Federal Reserve has engaged in three successive rounds of expansionary policies-known as quantitative easing (QE)-since 2008, i.e., within the period of time covered by the Consultation Report.¹⁰⁷ Economic academic studies have shown that, although there is

¹⁰³ Consultation Report at 14.

¹⁰⁴ See, e.g., Principles for the Regulation of Exchange Traded Funds Final Report (June 2013), <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD414.pdf>.

¹⁰⁵ BVI Letter, at 1.

¹⁰⁶ <http://www.bis.org/publ/arpdf/ar2015e.pdf>, at p. 39.

¹⁰⁷ In QE1 (Dec. 2008), the Federal Reserve bought long-term treasuries, corporate debt of Fannie Mae and Freddie Mac, and mortgage-backed securities (MBS). In QE2 (November 2010), the Federal Reserve bought \$75 million per month of longer-termed treasuries, up to a total of \$600 billion. In QE3 (September 2012), the Federal Reserve announced an open-ended commitment to purchase up to \$85

some evidence that QE may lead to increased demand for corporate bonds and hence lower their yields, the longer-term effects of QE on corporate bond markets are inconclusive.¹⁰⁸

IOSCO also notes that the European Central Bank (ECB) began its corporate bond-buying program in June 2016, which is outside the assessment period for the Consultation Report. Thus, IOSCO has not expressed a view as to whether the ECB purchases have “reduced the eligible corporate bond portfolios available for trading.”

The Final Report reflects additional analysis concerning the Federal Reserve engagement. In addition, it clarifies that due to a different observation period, it does not take into account the ECB corporate bond purchase program.

e. Impact of Technological Advances (Electronic Trading Venues) on Corporate Bond Liquidity

A number of commenters highlighted the increasing role of electronic trading venues in corporate bond trading.¹⁰⁹ One commenter interpreted the Consultation Report as saying that technological advances are not having a positive impact on bond liquidity; in their view, it is “premature” to reach such a conclusion.¹¹⁰

Feedback

The Consultation Report highlights the increasing use of technology to facilitate trading in corporate bonds and acknowledges that industry participants believe that there are a number of advantages to the increased use of technology to trade corporate bonds, including helping to pool liquidity. While the Consultation Report notes that IOSCO *has not found evidence that the use of technology increases liquidity in the secondary corporate bond market, per se*, this does not mean that IOSCO believes that technological advances are not having a “positive impact on corporate bond liquidity.” At this stage, however, IOSCO did not find evidence to quantify the improvement in liquidity specifically because of the use of electronic venues

The Final Report continues to highlight the increased use of technology to facilitate trading in the corporate bond markets, while acknowledging the lack of clear evidence that technology has increased liquidity.

f. The Role of Institutional Investors when Compared to Dealers and Retail Investors

One commenter interpreted the Consultation Report, when discussing the increasing but still limited role of retail investors in the corporate bond market, as implying that institutions, such as funds and their asset managers, *play a dominant role in the corporate bond markets.*¹¹¹

billion per month of treasuries, MBS and corporate debt of Fannie Mae and Freddie Mac. The Federal Reserve ended QE3 and stopped expanding its balance sheet in late 2014.

¹⁰⁸ Yu, Edison, *Did Quantitative Easing Work?*, Economic Insights, Federal Reserve Bank of Philadelphia Research Department (First Quarter 2016).

¹⁰⁹ Tradeweb presentation at 12, et seq., and Vanguard letter at 7

¹¹⁰ ICE Data Services letter at 2.

¹¹¹ ICI Global letter at 9.

They interpreted that language as indicating that funds and their asset managers are more dominant than dealers and asserted that such a position relies on “incorrect data.”¹¹²

Feedback

The intent of the Consultation Report was not to create an impression that funds and asset managers are the new “dominant” players in the corporate bond market. In fact, the Consultation Report states that dealers continue to play a dominant role in secondary corporate bond markets, but institutional investors like asset managers and hedge funds are entering the market.

To address any confusion, however, the Final Report has been revised to clarify that institutions remain more dominant than retail investors in the corporate bond markets; it also notes that dealer market making activity remains dominant in providing liquidity to the markets.

g. CDS and Repo Markets

Two commenters suggest that the Consultation Report would benefit from further quantitative and qualitative analysis of the repo markets and single name credit default swap (SN-CDS) markets.¹¹³ They believe that these markets may negatively impact the liquidity of the underlying corporate bond markets.

Feedback

With regard to the repo markets, the Consultation Report already addresses the issue¹¹⁴ and notes industry suggestions that dealer-banks’ appetite to intermediate repo markets has changed recently, citing increased regulatory capital requirements as the alleged principal contributing factor behind a decline in repo market liquidity. However, none of the respondents to the IOSCO survey provided quantitative evidence supporting these assertions.

IOSCO appreciates the suggestion to examine the trends and conditions in SN-CDS markets across the respective regions and jurisdictions. Indeed, the Consultation Report acknowledges that CDS markets can have a significant impact on dealers’ ability to make markets in securities such as corporate bonds.

Although an in-depth examination of this topic as suggested by the commenters is beyond the scope of this mandate, our relatively extensive review of academic literature revealed that it is not at all clear that SN-CDS markets may *negatively* impact the liquidity of the underlying corporate bond markets. The Final Report now includes a review of academic literature that reflects this point.

Finally, we note that the Consultation Report had considered whether liquidity in the CDS market (looking in particular at the CDS-bond basis)¹¹⁵ is informative about the liquidity in

¹¹² *Id.* at 10.

¹¹³ ICMA letter at 4-5, ICSA letter at 2-3.

¹¹⁴ Consultation Report at 20.

¹¹⁵ The CDS-bond basis is the difference between the CDS premium for a reference entity and the credit spread of the underlying cash bond.

the cash bond market.¹¹⁶ IOSCO’s review of the economic literature suggested that CDS-bond basis seems to be more strongly related to variables other than bond liquidity that may impact or limit arbitrage opportunities.¹¹⁷ The Final Report therefore did not consider the CDS-bond basis as a metric for purposes of its liquidity analysis. The commenters did not address or seek to rebut the academic literature cited by IOSCO.

2. Metrics used to Assess the Liquidity in Secondary Corporate Bond Markets

a. Turnover Ratio

One commenter¹¹⁸ noted that the market sees the decrease in turnover ratio as a decrease in liquidity. This commenter points to a chart (Figure E) in Oliver Wyman’s report, *Interaction, Coherence and Overall Calibration of Post Crisis Basel Reforms* (Aug. 9, 2016) (Wyman Report), for support that turnover ratio is decreasing. However, another commenter agreed with IOSCO that a decline in turnover may be explained, in part, by strong primary market bond issuance over the past several years, and that newly issued bonds (within 90 days of the issue date) trade more than seasoned bonds.¹¹⁹

Feedback

The Consultation Report acknowledges that turnover ratio in recent years has decreased or been flat, but also notes that the turnover ratio has been stable or slightly increasing in recent years in the U.S., U.K. and France. Although the Consultation Report indicates that turnover ratio is one metric that reflects a more mixed view of liquidity, the report also notes that the decline in turnover ratio may not be attributable to a reduction in secondary market activity, but rather may be attributable to primary market growth outpacing secondary market trading volume.

The Final Report continues to include a balanced discussion of turnover ratio as a liquidity metric.

b. Block Trades

One commenter notes that there is no clear basis for IOSCO’s suggestion that market participants are “choosing” to transact trades in small block sizes.¹²⁰

Feedback

IOSCO acknowledges this comment and has revised the Final Report to reflect that IOSCO has merely observed smaller trade sizes, without offering an interpretation.

¹¹⁶ See Consultation Report at <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD537.pdf> and the Final Report at <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD558.pdf>.

¹¹⁷ *Id.*

¹¹⁸ ICSA letter at 2.

¹¹⁹ ICI Global letter at 3.

¹²⁰ ICMA letter at 9.

c. Bid-ask Spreads

Some commenters expressed the view that care should be taken in interpreting bid-ask spread data, as they are based on indicative levels to trade small sizes, rather than reflecting the transaction cost of trading large orders.¹²¹ Other commenters agreed that there are other variable costs, such as time to execution, that add to trading costs.¹²² Finally, one commenter pointed out that the quality, and therefore the meaningfulness of bid-ask spreads as a metric has been highly questioned in the context of the European markets because they are based on stale and un-executable quotes.¹²³

Feedback

The Consultation Report already acknowledges the limits of bid-ask spreads as a liquidity measure. The Consultation Report states that, given that corporate bonds generally trade over-the-counter and without central limit order books, the calculation of bid-ask spread is based on indicative prices rather than firm orders and may not fully reflect liquidity conditions.

IOSCO notes that when there are few or no actual transactions in a security, indicative prices could also be considered as a proxy for bid-ask spreads to inform a liquidity analysis. While indicative prices may not always be firm, they are nonetheless observable data points that may be available, and could inform a liquidity analysis. Nonetheless, in response to the comments, the Final Report notes that the use of indicative pricing may limit the reliability and usefulness of bid/ask spreads.

Other factors such as time-to-trade, and the need to break large size trades into multiple smaller size trades in order to trade into or out of large positions, are reasonable to consider, but there is a lack of reliable data to use. As a result, they have not been included in the Consultation or Final Report.

d. Market Making/Counterparties

One commenter noted that the Consultation Report cites a report by the Federal Reserve Bank of New York observing that if higher capital requirements were leading dealers to withdraw from market-making, then the Federal Reserve would expect market-making returns to widen. Instead, the Federal Reserve found that corporate bond market-making returns are historically low. The implication of the Federal Reserve report is that if dealers were withdrawing from the market, firms would face less competition and could earn more with wider returns (higher profits), and yet the evidence is that returns are very low suggesting robust competition and interest on the part of dealers in the market-making activity.

The commenter believes that instead, increased regulatory costs “go a long way” in explaining the decreased profitability in market making in the bond markets (rather than e.g., great interest and competition in market making), and cites the Wyman Report for support. According to the Wyman Report, bank balance sheets for bonds, foreign exchange and

¹²¹ BlackRock letter at I.

¹²² BVI letter at 1.

¹²³ ICMA letter at 10.

commodities have decreased approximately 25% from 2010 to 2015.¹²⁴ The commenter also cites tables and figures on changes in structures/activities,¹²⁵ examples of banks exiting/shrinking¹²⁶ and net positions of U.S. primary dealers-corporate bonds.¹²⁷

Feedback

The Consultation Report emphasizes that the structure and characteristics of the secondary corporate bond markets are changing. Intermediaries are embracing new trading models and bank inventories may be decreasing in certain markets. However, the global picture on bank inventories is mixed. As reflected in the Consultation Report, bank inventories in Asia are increasing, European inventories have recovered but remain below pre-crisis level, whereas inventories in the US remain subdued below their pre-crisis peak, but also appear to have stabilized. With respect to banks exiting business lines or shrinking, it is unclear how these business decisions will directly affect market making in corporate bonds since not all of the exited businesses relate to bond trading.

Finally, with respect to the decline of the net positions of U.S. primary dealers in corporate bonds, the data provided in the Wyman Report, like the Federal Reserve data it cites and cited in Figure 28 of the Final Report likely includes types of corporate credit *other than bonds*, such as asset-backed and mortgage-backed securities, with a breakdown of components only beginning in 2013. Because the issuance of asset- and mortgage-backed securities rose rapidly in the years before the financial crisis, followed by a sharp fall post-crisis, the inclusion of these securities in inventory statistics likely exaggerates the decline in corporate bond inventories.

The Final Report continues to reflect the description of dealer corporate bond inventories included in the Consultation Report.

e. Comments on Regulatory Studies

Two commenters raised questions regarding the studies prepared by the *Autorite des Marches Financier* of France and the Financial Conduct Authority (United Kingdom)¹²⁸. Specifically, they questioned the conclusions of the studies as well as their methodologies and underlying data. The commenters argued the approaches to liquidity modeling undertaken in the studies have potential limitations. For example, they stated the Amihud price impact model (used in both studies), despite being one of the most widely used liquidity proxies in financial academic literature, is actually not a very good indicator of liquidity and cited an academic paper supporting such an argument.

Feedback

IOSCO welcomes feedback from ICMA and others on the data, methodology and conclusions

¹²⁴ Wyman Report, Table B at xi.

¹²⁵ *Id.*, Figure 5.9 at 59.

¹²⁶ *Id.*, Table 5.2 at 59-60.

¹²⁷ *Id.*, Figure 5.5 at 55.

¹²⁸ ICMA letter at 11, GFMA/IIF letter, at 18.

of the AMF and FCA's recent reports on corporate bond market liquidity. The reports attempt to assess whether concerns about liquidity voiced by some European market participants are reflected in the data available to the AMF and FCA. Their findings were consistent with reports from several other authorities such as FINRA.¹²⁹

Regarding data quality concerns, the analyses are based on transaction data for corporate bonds for which the AMF or FCA are the national competent authority. This means that they observe nearly all the transactions that take place in Europe in these bonds in their jurisdictions and can be reasonably sure that they have a comprehensive picture of the entire market because of regulatory obligations of reporting firms. However, due to changes in data reporting requirements that took effect in 2011 for the FCA and the fact that data are considered sufficiently reliable after 2010 for the AMF, the reports noted that there are limitations pertaining to coverage of transactions prior to these dates. Nevertheless, metrics such as the composite indicators are calculated in such a way that they are statistically significant over the whole sample period. Further detail can be found in the reports.

Regarding ICMA's concerns about the methodologies of the AMF and FCA reports, the IOSCO consultation paper acknowledged there are many different approaches to measuring liquidity or proxies for liquidity. By nature, all proxies for liquidity or ways of modeling liquidity will have potential theoretical limitations. However, it is important for authorities to attempt to measure liquidity using metrics that are meaningful statistically and economically, while recognizing that qualitative opinions from European market participants are another meaningful source of information.

The Final Report retains a discussion of the AMF and FCA's recent reports on corporate bond market liquidity.

3. Metrics not specifically dealt with in the Consultation Report

IOSCO acknowledges that the metrics used in the Consultation Report are not a complete list of available metrics. The metrics used were those identified by respondents to the IOSCO survey as the most important ones. Some commenters mentioned specific metrics they thought to be relevant.

a. Liquidity Indicators

One commenter expressed a view that a key metric for estimating liquidity *for a given financial instrument* is a forecast of potential trade volume capacity rather than simple historical trade volume.¹³⁰

Feedback

¹²⁹ See http://www.finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12.pdf; Adrian, Fleming, Shacharand, Vogt, *Has U.S. Corporate Bond Market Liquidity Deteriorated?* (Oct. 15, 2015), available at: <http://libertystreeteconomics.newyorkfed.org/2015/10/has-us-corporate-bond-market-liquidity-deteriorated.html>. See also Trebbi and Ziao, *Regulation and Market Liquidity* (May 27, 2016), available at <http://faculty.arts.ubc.ca/ftrebbi/research/tx.pdf>.

¹³⁰ ICE Data Services letter at 2.

The intent of our investigations was to examine liquidity across the global corporate bond markets. A metric to assess the potential liquidity of a *given* financial instrument is outside the scope of this examination. As the commenter admits, this liquidity metric employs “statistical techniques to analyse the features and characteristics” of individual securities. Moreover, as the commenter also acknowledges, this liquidity metric is related to “immediacy measures,¹³¹” which the Consultation Report did not take into account due to data limitations.

The Final Report does not include a discussion of potential trade volume capacity for specific financial instruments since the focus is on liquidity across the global corporate bond markets.

b. Dropped Trades/Unfilled Quotes

One commenter expressed the view that focusing on data and metrics related to what has traded is misleading when analysing liquidity.¹³² They claim “perhaps the most important indicator of liquidity is not so much what has traded, but rather what could not be traded.”¹³³ In their view, while challenging to source, any analysis of data relating to unfilled orders or ‘dropped trades’ across the various markets would inform the overall analysis significantly. They also stated that prices quoted on screens are rarely executable¹³⁴ and that quotes also have a “last look” option, which allows the dealers to adjust or pull their prices when a counterparty tries to execute on them. They do not believe that anything can or should be inferred from the number of dealer quotes available.¹³⁵ In sum, they believe that dropped trades and unfilled orders are far more revealing variables for determining and measuring liquidity, as opposed to what actually did trade. Two other commenters representing the dealer perspective expressed similar views.¹³⁶

Feedback

IOSCO looked at liquidity on a macro level and used metrics that were most easily applied across all sources of liquidity, electronic platform or OTC and focused on *post-trade data*. Metrics such as “unfilled orders” or “dropped trades” constitute *pre-trade data*, which in most cases is unavailable. Another limitation with regard to this point is that the data would come from trading on electronic venues, which constitute a small portion of overall trading of

¹³¹ This refers to the time it takes to trade a bond (“immediacy”), which is an important aspect of liquidity.

¹³² ICMA at 8. *See also* Summary of Recommendations at 14.

¹³³ ICMA at 8.

¹³⁴ *Id.* at 10.

¹³⁵ *Id.*

¹³⁶ For example, Tradeweb (for Europe only) provided charts showing overall dealer quote rates and client hit rates on their electronic platform in European corporate bonds between Q1 2011 and Q2 2016. In their view, lower dealer quote rates imply an unwillingness or inability to provide quotes, whereas, lower client hit rates imply that not enough quotes were returned or quotes were not at an acceptable price level. Tradeweb observes that rates had improved after the ‘Euro crisis’ but then steadily declined from Q1-2014 (e.g., client hit rates hit a peak of about 85% in Q4-2013, but dropped to about 59% by Q1-2016, recovering to about 66% in Q2-2016). *See also* IHS Markit (“We note that the CR did not explicitly include the frequency of dealer quotes in the survey, but the Markit/Tabb survey listed it the third highest ranking of usefulness and our data indicates there is a correlation between trading activity and frequency of unique quotes in the US municipal bonds.”)

corporate bonds. As stated in the Consultation Report, trading in corporate bonds, particularly in the United States, remains an OTC market. A further challenge to such an exercise is that liquidity profiles may vary from venue to venue and it is unlikely that the data could be provided on a fully consolidated and comparable format. While the data ICMA offered to try to source would be representative of only a small portion of liquidity sources and would not take into account activity that occurs off of electronic platforms, it could, if it were available, serve as a limited proxy for a portion of corporate bond activity. However, as no data on dropped trades and unfilled quotes is currently available to IOSCO members, the Final Report does not include a reference to them.

4. Comments received on the Consultation Report's Conclusion

The Consultation Report concluded that IOSCO did not find substantial evidence showing that liquidity has deteriorated markedly from historic norms for non-crisis periods. While some commenters supported that view,¹³⁷ others did not. For example, one commenter cautioned against relying on academically derived liquidity models, and that anecdotal evidence should be relied upon until more data is available.¹³⁸

Feedback

The purpose of the Consultation Report and the Final Report is in part to consider and take seriously the qualitative concerns raised by market participants with respect to a possible decrease in liquidity in corporate bond markets. However, IOSCO's primary mandate in this case was to conduct a data-driven analysis. The data used in both the Consultation and Final Reports was obtained through surveys sent both to industry and regulators, roundtables with industry, along with academic, government and other research articles. The Consultation Report considers and identifies anecdotal (qualitative) views, but evaluates them in the context of the available objective data.

IOSCO also clearly addresses the challenges of data gathering¹³⁹ and acknowledges that the absence of a complete and comparable data set on corporate bond markets across the world's regions is an obstacle. During the consultation process, IOSCO sought additional data, but did not receive compelling new quantitative data. IOSCO acknowledges that since the timeframe of the data used (2004-2015), markets have continued to evolve and change. As a result, IOSCO and its members will continue to monitor corporate bond markets over time. The Final Report reflects the intention to continue to monitor the corporate bond market with the data that is available.

¹³⁷ WFE letter at 3, CI Global letter at 2, Vanguard at 1.

¹³⁸ ICMA letter at 12.

¹³⁹ See Consultation Report at 47.

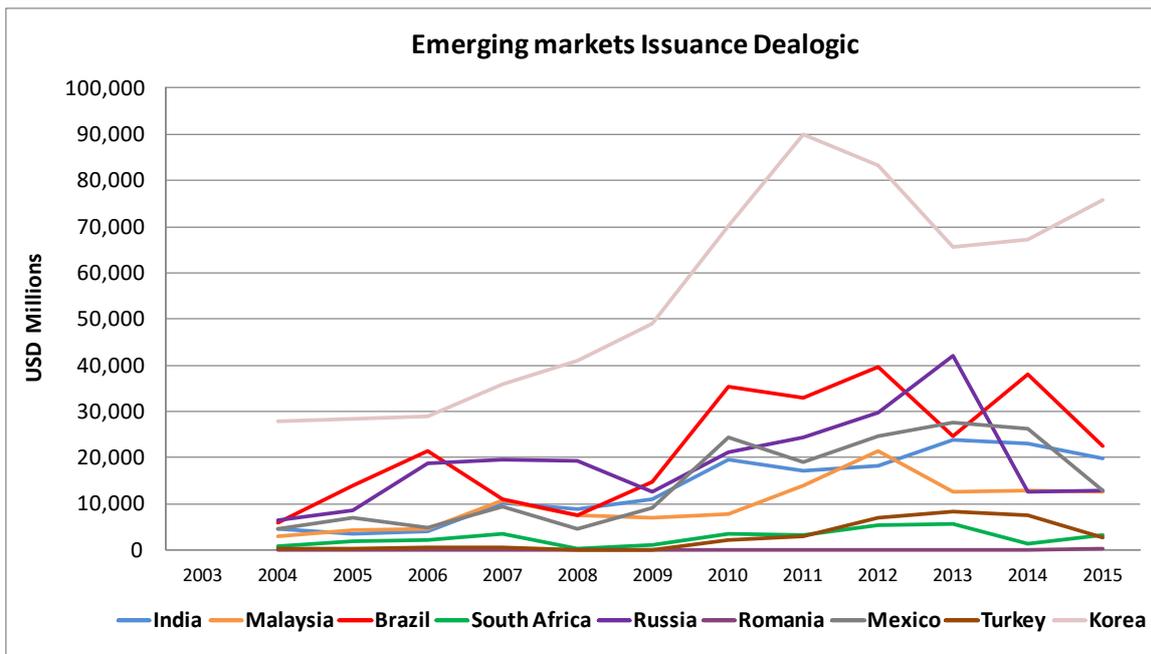
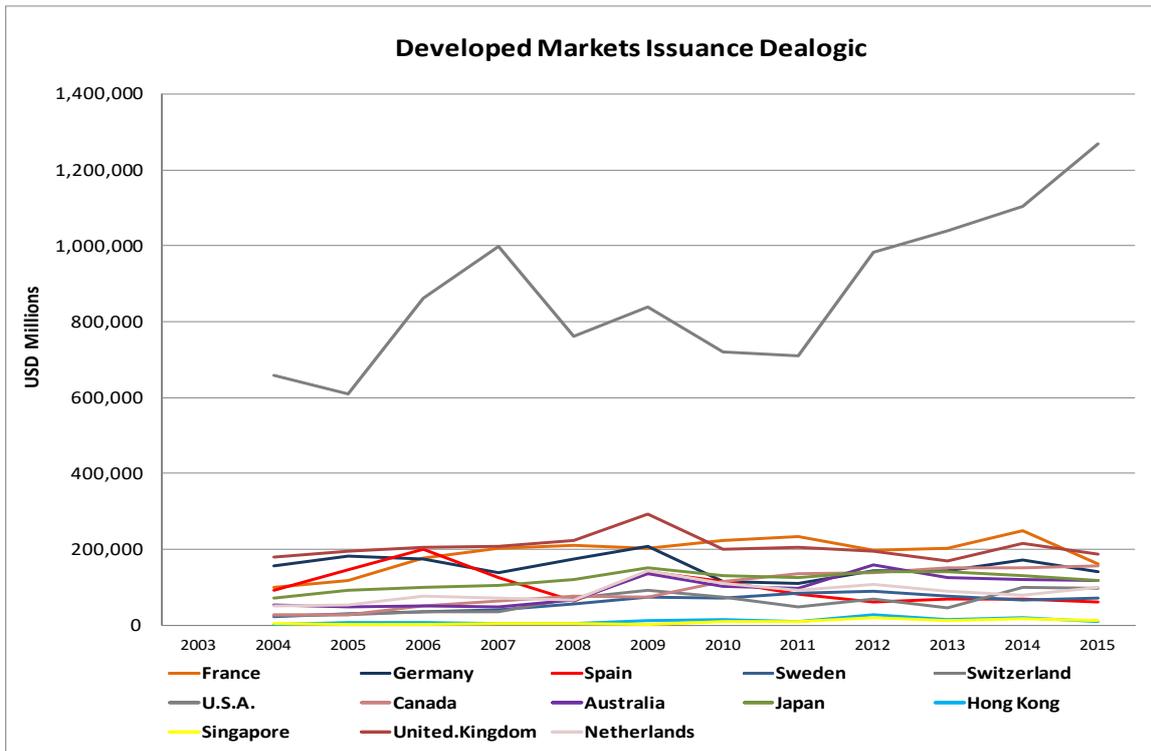
ANNEX 2

FACTORS CONSIDERED BY MARKET PARTICIPANTS IN DECIDING WHETHER, HOW, WITH WHOM AND WHAT KIND OF BOND THEY WILL TRADE

The following chart summarises some characteristics and factors that investors in different jurisdictions consider in making decisions regarding trading in corporate bonds.

Factor
Bond features , including price, issuer name, credit quality and outlook, issue size, free float, coupon, secured/unsecured, maturity date, rated/unrated, senior/subordinated, duration, call provisions, and significant covenants.
Execution quality , including speed and likelihood of execution, costs, including spread, transaction costs, market impact costs and information leakage.
Counterparty , including credit appraisal, ability to execute specific size orders, likelihood of settling, trading capabilities, balance sheet commitment, operational capabilities, track record, research capabilities, market knowledge, trading ideas, ability to execute large orders, immediacy of execution, and relationship (trusted, long term relationship; past transactions, etc.).
Macroeconomic conditions
Risk management limit/risk appetite
Market factors , including turnover velocity, relative value, fundamental value.

ANNEX 3 DEALOGIC DATA



ANNEX 4

IOSCO SURVEY RESULTS ON PERCENTAGES OF RETAIL VERSUS INSTITUTIONAL PARTICIPATION IN THE CORPORATE BOND MARKETS.¹⁴⁰

IOSCO members use different methodologies to estimate the amount of retail participation.¹⁴¹ Thus, the data provided to IOSCO on retail versus institutional participation in the corporate bond markets is not useful for comparison between jurisdictions. It provides, however, a helpful (albeit approximate) estimated trend between retail and institutional trading based on a reporting jurisdiction's own methodology.

¹⁴⁰ Readers are cautioned, as stated earlier in this report, that IOSCO members use different methodologies to estimate the amount of retail participation. Thus, the data provided to IOSCO on retail versus institutional participation in the corporate bond markets is not useful for comparison between jurisdictions, but does provide an individual jurisdiction's perception of the rough division between retail and institutional participation in their country.

¹⁴¹ Some consider a trade below a certain threshold as retail size. For example, for FINRA's TRACE system, any trade at or below USD 100,000 is generally considered retail. The CNMV Spain presumes that trades below a settlement value of EUR 100,000 euros are retail trades (for the purpose of this IOSCO Survey). Others have differentiated based on the nature / type of customer involved in a transaction (Australia; Brazil; Germany (2007-14 only); Japan; Romania (data unavailable between 2003-2005 and 2012-14 due to system changes); Malaysia; South Korea (2006-14 only); Turkey (2012-2014); Russia.

Country		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia (ASIC; RBA)	Institutional investors	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Retail investors	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Brazil (CVM)	Institutional investors	99.94%	99.96%	99.95%	99.87%	97.32%	98.79%	96.34%	97.33%	97.93%	96.38%	95.98%	95.98%
	Retail investors	0.06%	0.04%	0.05%	0.13%	2.68%	1.21%	3.66%	2.67%	2.07%	3.62%	4.02%	4.02%
Germany (BAFIN)	Institutional investors	n/a	n/a	n/a	n/a	90.00%	89.00%	84.00%	83.00%	81.00%	81.00%	82.00%	85.00%
	Retail investors	n/a	n/a	n/a	n/a	10.00%	11.00%	16.00%	17.00%	19.00%	19.00%	18.00%	15.00%
Japan (FSA)	Institutional investors	98.26%	98.20%	98.15%	99.90%	99.90%	99.90%	98.48%	98.03%	97.27%	95.70%	94.69%	92.85%
	Retail investors	1.74%	1.80%	1.85%	0.10%	0.10%	0.10%	1.52%	1.97%	2.73%	4.30%	5.31%	7.15%
Malaysia (SC)	Institutional investors	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.88%	99.94%
	Retail investors	n/a	0.12%	0.06%									
Romania (FSA)	Institutional investors	n/a	n/a	n/a	71.00%	96.07%	89.06%	93.37%	99.61%	98.60%	n/a	n/a	n/a
	Retail investors	n/a	n/a	n/a	29.00%	3.93%	10.94%	6.63%	0.39%	1.40%	n/a	n/a	n/a
South Korea (FSS)	Institutional investors	n/a	n/a	n/a	97.83%	96.26%	95.86%	94.81%	96.19%	96.85%	96.31%	97.30%	97.69%
	Retail investors	n/a	n/a	n/a	2.17%	3.74%	4.14%	5.19%	3.81%	3.15%	3.69%	2.70%	2.31%

Spain (CNMV)	Institutional investors	4.29%	4.91%	6.57%	5.78%	7.13%	13.41%	21.67%	28.76%	39.11%	27.90%	19.45%	24.58%
	Retail investors	95.71%	95.09%	93.43%	94.22%	92.87%	86.59%	78.33%	71.24%	60.89%	72.10%	80.55%	75.42%
Turkey (CMB)	Institutional investors	n/a	68.54%	70.07%	71.56%								
	Retail investors	n/a	31.46%	29.93%	28.44%								
U.S. (SEC)	Institutional investors	35.00%	36.00%	36.00%	38.00%	39.00%	31.00%	29.00%	33.00%	37.00%	40.00%	42.00%	46.00%
	Retail investors	65.00%	64.00%	64.00%	62.00%	61.00%	69.00%	71.00%	67.00%	63.00%	60.00%	58.00%	54.00%

ANNEX 5

ACADEMIC MEASURES OF LIQUIDITY

Published academic literature on liquidity in secondary corporate bond markets focuses on the following measures of liquidity: bid/ask spreads; trade volumes, particularly in relation to outstanding debt (i.e., turnover ratios); average trade size; trade frequency; and price impact.¹⁴²

A. Bid-ask Spreads

There is near uniform agreement that bid-ask spreads since the financial crisis have tightened significantly, some stating that bid-ask spreads are actually below pre-crisis levels.¹⁴³ Because bid-ask spreads in corporate bond markets are generally not directly observable, the literature relies on a statistical method for estimating bid-ask spreads: “the average of non-zero price changes in the transactions data.”¹⁴⁴ Using estimates based on TRACE data, bid-ask spreads “reached record lows in 2014 [and had] a slight increase in 2015”¹⁴⁵ as is demonstrated in Figure 33, which charts estimates of bid-ask spreads for the 1,000 most active issuances and for the other issuances over time.

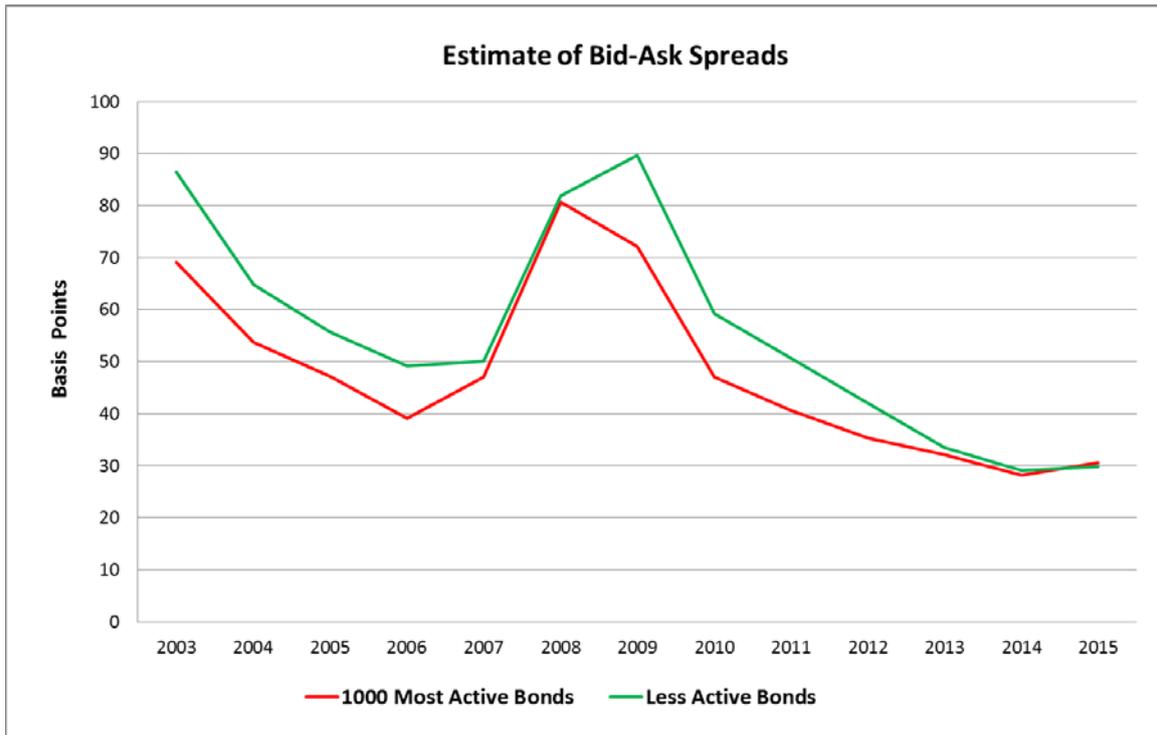
¹⁴² Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015) (reviewing various measures of liquidity, including: bid-ask spreads, average trade size, trade volume, turnover rates, and price impact measures); Rohini Tendulkar, *Corporate Bond Markets: An Emerging Markets Perspective (Vol. II)*, OICU-IOSCO, (Sept. 25, 2015) (reviewing trade volumes, average trade size and turnover ratios in emerging markets); Miles Kennedy et al., *Global financial markets liquidity study*, PwC (Aug. 15) (examining trading volumes, average trade size, bid-ask spreads, and liquidity premiums); Devi Aurora & Bernard De Longevialle, *The Shifting Shape of Risk: How a Liquidity Shock Could Move Ratings on U.S. Banks and Nonbank Finance Entities*, Standard & Poor's Rating Services (July 1, 2015) (highlighting turnover ratios and bid-ask spreads); Barbara Novick et al., *Addressing Market Liquidity*, BlackRock (July 1, 2015) (addressing turnover ratios and price impact); Anastasia Amoroso & Ainsley Woolridge, *Living in a less liquid world: The do's and don'ts for bond investors*, JPMorgan Asset Management, Market Insights: Market Bulletin (June 11, 2015) at 2 (identifying bid-ask spreads and average trade size as a facets of liquidity).

¹⁴³ Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015) (finding that the “current level of bid-ask spreads is even lower than pre-crisis levels”); Ingo Fender & Ulf Lewrick, *Shifting tides – market liquidity and market-making in fixed income instruments*, BIS Quarterly Review (Mar. 2015), at 101 (finding that “bid-ask spreads in major corporate bond markets have narrowed sharply in recent years, but remain somewhat wider than the levels observed immediately before the global financial crisis”); John Tierny & Kunal Thakkar, Deutsche Bank Research Haus, *Corporate Bonds-The Hidden Depth of Liquidity*, *Konzept* (Jan. 19, 2015), at 29 (noting that since 2007 “spreads have moved tighter and are now around 0.4 per cent”); Charlie Himmelberg & Bridget Bartlett, Goldman Sachs, *Why Market Liquidity has Deteriorated*, *Global Macro Research – Top of Mind* (Aug. 2, 2015), at 6 (“For example, bid-ask spreads for corporate bonds have narrowed materially over the post-crisis period.”); Anastasia Amoroso & Ainsley Woolridge, *Living in a less liquid world: The do's and don'ts for bond investors*, JPMorgan Asset Management, Market Insights: Market Bulletin (Jun. 11, 2015), at 5 (finding that “in 2015 spreads have tightened”).

¹⁴⁴ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of Chief Economist, Research Note, at 11-12 (Dec. 2015).

¹⁴⁵ *Id.* at 12.

Figure 33



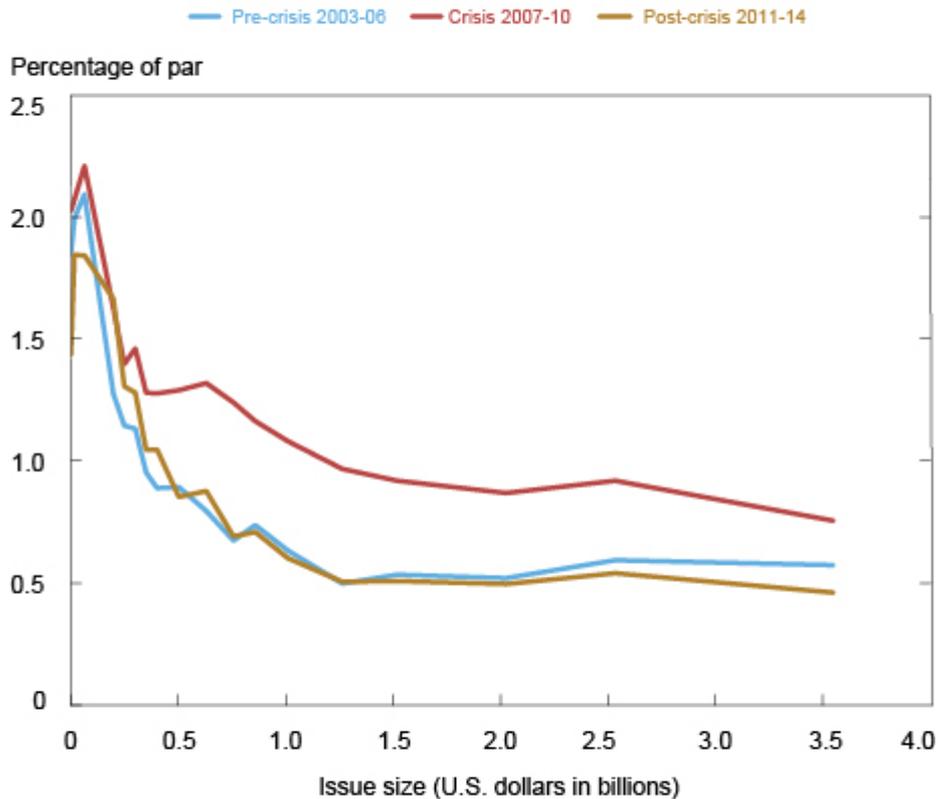
Source: Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, Research Note (Dec. 2015).

The results generally hold when corporate bonds are analysed by size and credit rating. Generally, as is shown in Figure 33, bid-ask spreads “are now narrower than in the crisis period [and] are now comparable to those observed pre-crisis, although there are some differences for the smaller issue size.”¹⁴⁶

¹⁴⁶ Tobias Adrian et al., *Further Analysis of Corporate Bond Market Liquidity*, Liberty Street Economics - Federal Reserve Bank of New York (Feb. 10, 2016).

Figure 34

Bid-Ask Spreads Are Comparable to Pre-Crisis Levels Across Issue Sizes



Source: Authors' calculations, based on Trade Reporting and Compliance Engine (TRACE) data from the Financial Industry Regulatory Authority.

Notes: The chart shows realized bid-ask spreads for bonds within one of twenty issue size buckets for the 2003-06, 2007-10, and 2011-14 time periods. The spreads are computed daily for each bond as the difference between the average dealer-to-client buy price and the average dealer-to-client sell price, and then averaged across days and then bonds.

Source: Tobias Adrian et al., *Further Analysis of Corporate Bond Market Liquidity*, Liberty Street Economics – Federal Reserve Bank of New York (Feb. 10, 2016).

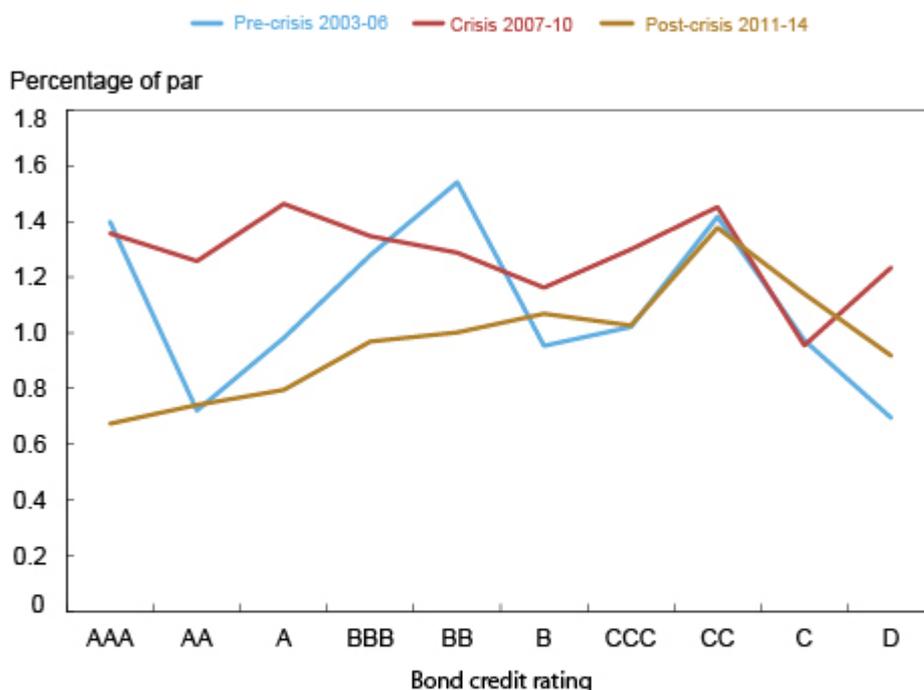
It appears, however, as is displayed in Figure 35, that “the narrowing of bid-ask spreads relative to the crisis period is concentrated in the more highly rated securities.”¹⁴⁷

¹⁴⁷

Id.

Figure 35

Bid-Ask Spreads Have Generally Narrowed for Less Risky Bonds



Source: Authors' calculations, based on Trade Reporting and Compliance Engine (TRACE) data from the Financial Industry Regulatory Authority.

Notes: The chart shows realized bid-ask spreads conditional on credit rating for the 2003-06, 2007-10, and 2011-14 time periods. The spreads are computed daily for each bond as the difference between the average dealer-to-client buy price and the average dealer-to-client sell price, and then averaged across days and then bonds.

Source: Tobias Adrian et al., *Further Analysis of Corporate Bond Market Liquidity*, Liberty Street Economics – Federal Reserve Bank of New York (Feb. 10, 2016).

By comparison, there is some evidence that “the liquidity conditions may be more severe for investment grade bond markets in EU and the UK than in the US” because “the average bid-ask spread on investment grade bonds in 2013-2014 was twice as large for GBP-denominated bonds and six times as large for EUR-denominated corporate bonds.”¹⁴⁸ That being said, the evidence for the recent trend seems to show a “narrowing in spreads for both European high grade and high yield” during 2013.¹⁴⁹

B. Trading Volume

Trading volumes are almost always discussed in the academic literature in conjunction with total outstanding debt; the relationship between the two is turnover ratio. Although there is near uniform agreement in the literature that turnover ratios have declined post-crisis, the view in

¹⁴⁸ Serdar Celik et al., *Corporate Bonds, Bondholders and Corporate Governance*, OECD Corporate Governance Working Papers, No. 16 (2015), at 31.

¹⁴⁹ Andy Hill, The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market, ICMA Secondary Market Practices Committee (Nov. 2014), at 10.

the literature on the post-crisis trend in trading volumes, standing alone, depends on the category of bonds that are examined.

Generally, “trading volumes in corporate bonds and government debt are for the most part climbing.”¹⁵⁰ Although there are articles that contend that the “growth in corporate bond trading has actually kept pace with the growth in outstanding bonds,”¹⁵¹ the general consensus in the literature is that turnover ratios for corporate bonds have declined post-crisis.¹⁵² Similarly, trading volumes relative to annual issuance has also declined.¹⁵³

There is recent research that finds the “[t]otal par bond trading volume in the secondary market reported to TRACE has already reached \$7.7 trillion in the first three quarters of 2015. It is on pace to be the most active year ever.”

C. Trade Size

Although the consensus in the literature review is that the average trade size in the corporate bond market has declined post-crisis, there is no consensus as to whether that fact suggests a liquidity concern.¹⁵⁴ For example, based on TRACE data, the average trade size went “from \$700,000-\$800,000 before 2008 to \$550,000-\$600,000 over the past year.”¹⁵⁵ To some commenters, the reduction in average trade size is “evidence that investors find it more difficult

¹⁵⁰ Robin Wigglesworth, *Liquidity pitfalls threaten parched markets*, Financial Times (June 18, 2015).

¹⁵¹ John Tierny & Kunal Thakkar, *Corporate Bonds-The Hidden Depth of Liquidity, Konzept*, Deutsche Bank Research Haus, (Jan. 19, 2015), at 29 (citing Trace data that “the average trading volume of corporate bonds has been gradually rising, from \$14bn before 2008 to around \$20bn over much of last year, with high yield accounting for more than one-third of the total”); Kashif Riaz et al., *The Liquidity Challenge: Exploring and Exploiting (Il)liquidity*, BlackRock Investment Institute (June 1, 2014), at 3 (“Trading volumes have not kept up. Just half of corporate bonds (by value) were traded in 2013.”).

¹⁵² See Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, “Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015) (“Trading volume has risen over time, especially since the financial crisis, but at a slower rate than debt outstanding.”); Ingo Fender & Ulf Lewrick, *Shifting tides – market liquidity and market-making in fixed income instruments*, BIS Quarterly Review (Mar. 2015),) at 101 (finding that “corporate bonds seem to have witnessed a decline in liquidity in many jurisdictions – at least according to [turnover ratios]”); Martin Sandbu, *Free Lunch: Who's afraid of illiquid markets?*, Financial Times, June 23, 2015 (“The turnover in corporate bonds. . . as a share of the total volume outstanding has fallen by up to one-half since the crisis. . . .”); Charlie Himmelberg & Bridget Bartlett, *Why Market Liquidity has Deteriorated*, Goldman Sachs, Global Macro Research – Top of Mind (Aug. 2, 2015), at 7 (“One simple piece of evidence we do find convincing is the decline in trading volumes relative to the size of the overall market (or trading turnover.”); Serdar Celik et al., *Corporate Bonds, Bondholders and Corporate Governance*, OECD Corporate Governance Working Papers, No. 16 (2015), at 32 (“Figure 22 reveals that liquidity, as illustrated by turnover of investment grade U.S. US corporate bonds, actually declined during this 18-month period and has stayed relatively steady since then at a level even below its 2008 ‘crisis’ level.”).

¹⁵³ Kashif Riaz et al., *The Liquidity Challenge: Exploring and Exploiting (Il)liquidity*, BlackRock Investment Institute (June 1, 2014), at 6 (“Trading volumes were 3.3 times annual issuance in 2013, versus seven times in 2002”) (citing SIFMA).

¹⁵⁴ John Tierny & Kunal Thakkar, *Corporate Bonds-The Hidden Depth of Liquidity, Konzept*, Deutsche Bank Research Haus, (Jan. 19, 2015), at 30 (addressing the “common-liquidity complaint. . . that even when trading activity is up, it is more difficult to trade in large size”).

¹⁵⁵ *Id.* at 30.

to execute large trades and so are splitting orders into smaller trades to lessen price impact.”¹⁵⁶ However, others argue that the reduction in average trade size may not be a meaningful indicator of illiquidity because the frequency of trading has nearly doubled since the crisis.¹⁵⁷

The general view in the literature is that in the U.S. “[t]rading has become fragmented” because of the need to “slice and dice” orders into smaller sizes, which are executed through multiple venues or counterparties.¹⁵⁸ The basis for this argument is that “[t]he average daily number of trades in U.S. corporate bond market has surged, but the size of these trades has declined to an average of \$536,000 per transaction, down from a high of \$948,000 in 2007.”¹⁵⁹

D. Price Impact

There are various measures of price impact cited in the literature, which are designed to estimate the cost of executing a particular trade. A frequently used impact metric is the Amihud measure, which can be constructed by dividing the price difference between two trades by volume...”¹⁶⁰ One article applying the Amihud formula to the U.S. corporate bond market “shows that price impact has been declining since the crisis and is now below pre-crisis levels.”¹⁶¹

Similar to the Amihud formula, Barclay’s publishes a liquidity cost score (LCS), which “is expressed as a percentage of the bond value’s, for various asset classes, including corporate bond indices.”¹⁶² “An LCS of 0.750 means that it costs 75bp in price value to execute a typical institutional-size round-turn transaction in the bond.”¹⁶³ After adjusting for variations in bond attributes, the USD corporate market was more liquid than the European market in 2010 and 2011, but less liquid thereafter.¹⁶⁴ The USD market is more liquid than the attribute adjusted GBP market, but generally the EUR, USD and GBP markets have similar levels of liquidity.¹⁶⁵ One study finds that “price impact is higher for illiquid assets (like HY bonds), and higher still during periods of market duress.”¹⁶⁶

¹⁵⁶ Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015).

¹⁵⁷ John Tierny & Kunal Thakkar, *Corporate Bonds-The Hidden Depth of Liquidity*, Konzept, Deutsche Bank Research Haus, (Jan. 19, 2015), at 30.

¹⁵⁸ Kashif Riaz et al., *The Liquidity Challenge: Exploring and Exploiting (Il)liquidity*, BlackRock Investment Institute (June 1, 2014), at 3.

¹⁵⁹ *Id.*

¹⁶⁰ Autorité Des Marchés Financiers, *Study of liquidity in French bond markets*, (Nov. 16, 2015), at 7.

¹⁶¹ Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015) (using the methodology in Amihud (2002)).

¹⁶² Vadim Konstantinovskiy & Bruce Phelps, *Corporate Liquidity across Markets*, Barclays Quantitative Portfolio Strategy, (Sept. 30, 2014), at 2.

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 6.

¹⁶⁵ *Id.* at 11.

¹⁶⁶ Charlie Himmelberg & Bridget Bartlett, *Why Market Liquidity has Deteriorated*, Global Macro Research – Top of Mind, Goldman Sachs, (Aug. 2, 2015), at 7 (“One simple piece of evidence we do find

E. Turnover Ratio

The evidence on turnover ratio until recently has shown a decline, but recently “has risen in 2015 though, reversing a three-year decline.”¹⁶⁷ In fact, “[d]espite the long tail in the number of corporate issues, the turnover in the less active securities has risen to its highest level.”¹⁶⁸ Moreover, market depth appears to be increasing—somewhat. One piece of evidence is the fact that the “concentration in U.S. corporate bond trading is less pronounced than in equities, according to JPMorgan. The 500 top-traded stocks made up 79% of total turnover by value in 2013, compared with 60% for the 500 top-traded corporate bonds...” “This means liquidity is spread more evenly in corporate bonds—relatively speaking.”¹⁶⁹

F. Country Specific Liquidity Studies

1. United States

There appears to be a consensus within the literature on the direction and measurement of certain liquidity metrics of the U.S. market: “transaction volumes have continued to grow, the number of trades is rising, bid-ask spreads have narrowed and the impact of trades on price continues to fall.”¹⁷⁰ There also seems to be agreement that the market structure for corporate bonds has changed.¹⁷¹ In that respect, the view is that, at least structurally, secondary corporate bond market in the U.S. may be less liquid than they were in the run-up to the financial crisis, but it is not clear that this is a problem, “since those liquidity levels were unsustainable.”¹⁷² One estimate cited in the literature is that liquidity in the U.S. corporate bond market shrank by 70% between 2005 and 2014.¹⁷³

convincing is the decline in trading volumes relative to the size of the overall market (or trading turnover”).

¹⁶⁷ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, Research Note (Dec. 2015), at 3.

¹⁶⁸ *Id.*

¹⁶⁹ Kashif Riaz et al., *The Liquidity Challenge: Exploring and Exploiting (Il)liquidity*, BlackRock Investment Institute (June 1, 2014), at 4.

¹⁷⁰ Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, Research Note (Dec. 2015), at 1.

¹⁷¹ *Id.*

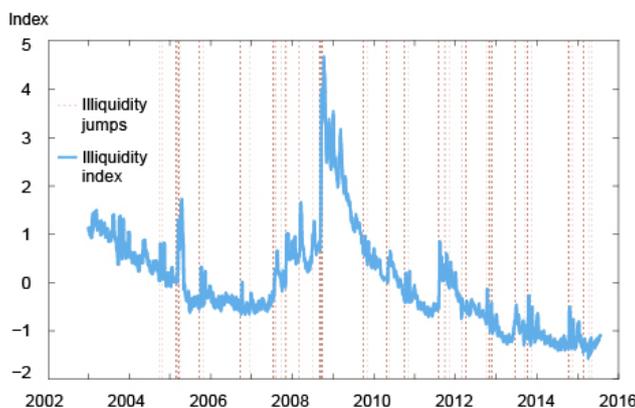
¹⁷² Douglas J. Elliot, *Is there a problem with liquidity in the financial markets?*, Brookings Institution – UpFront (June 16, 2015) (“Pretty much everyone agrees that markets are less liquid than they were in the run-up to the financial crisis, but it is not clear that this is a problem, since those liquidity levels were unsustainable.”); Charlie Himmelberg & Bridget Bartlett, *Why Market Liquidity has Deteriorated*, Global Macro Research – Top of Mind, Goldman Sachs, (Aug. 2, 2015), at 6 (“Investors increasingly agree that trading liquidity (or market liquidity) in the corporate bond market ‘ain’t what it used to be.”).

¹⁷³ Andy Hill, *The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market*, ICMA Secondary Market Practices Committee (Nov. 2014), at 11; Autorité Des Marchés Financiers, *Study of liquidity in French bond markets* (Nov. 2015), at 3 (citing *The Revolver- The credit liquidity trap*, The Royal Bank of Scotland, July 23, 2014).

The Federal Reserve Bank of New York created its own index measuring illiquidity in U.S. corporate bond markets by combining three liquidity measures¹⁷⁴. The authors of the accompanying report find that liquidity appears to be ample: “The low level of the index, shown in the chart below, suggests that corporate bonds are quite liquid by historical standards, although the market was extremely illiquid during the financial crisis. Furthermore, days on which market liquidity deteriorated markedly from the previous day, indicated by red vertical lines, are distributed fairly evenly across the sample.”

Figure 36

Corporate Bond Liquidity Appears Ample



Sources: Financial Industry Regulatory Authority; authors' calculations.

Notes: The index is the first principle component of three liquidity measures: the effective bid-ask spread (Roll 1984), price impact (Amihud 2002), and price dispersion (intraday interquartile range). The liquidity measures are constructed from a cross section of 60-100 corporate bonds underlying Markit's North American Investment Grade CDX Index. Spikes are defined as day-to-day increases in the index greater than two (locally defined) standard deviations.

Source: Federal Reserve Bank of New York

2. France

In other jurisdictions, such as France, there is evidence that “liquidity has improved steadily in the French bond markets since the beginning of 2012 albeit without recovering to its pre-crisis level (2005-2007).”¹⁷⁵ The AMF built its own index: a final composite indicator (CI) that is an equally weighted average of the three indicators (spreads, zero return and price impact), whose values are centered and reduced:

$$CI = \frac{Z(\text{spread}) + Z(\text{zero return}) + Z(\text{price impact})}{3}$$

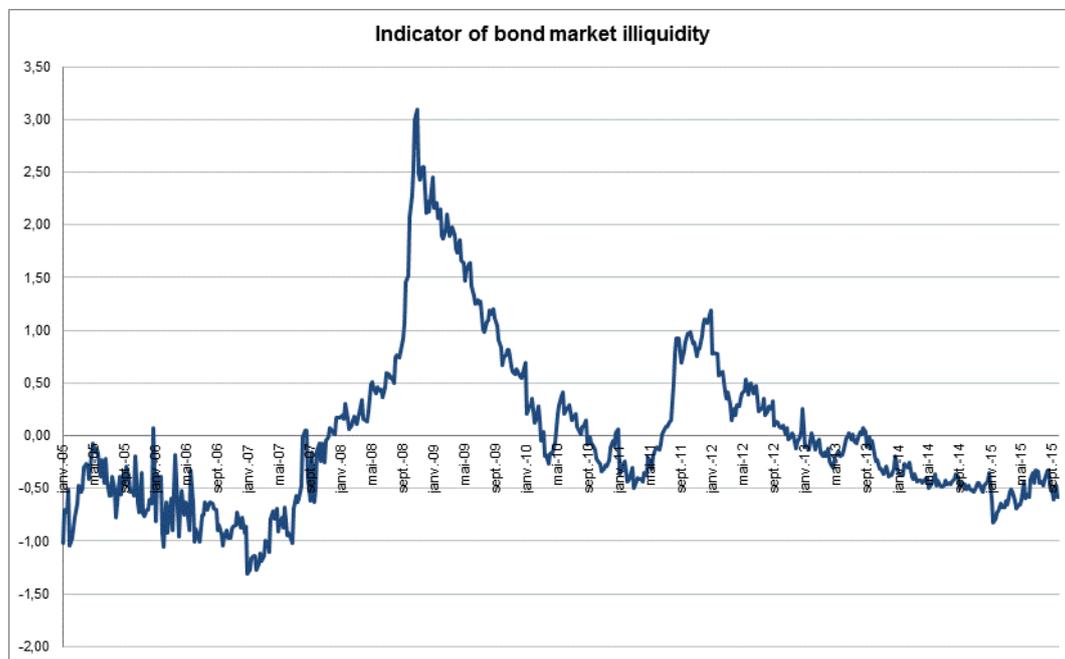
¹⁷⁴ Tobias Adrian et al., *Has Liquidity Risk in the Corporate Bond Market Increased?* Liberty Street Economics – Federal Reserve Bank of New York (Oct. 6, 2015) available at: <http://libertystreeteconomics.newyorkfed.org/2015/10/has-liquidity-risk-in-the-corporate-bond-market-increased.html>.

¹⁷⁵ Autorité Des Marchés Financiers, *Study of liquidity in French bond markets*, (Nov., 2015), at 3.

Where $Z(x)$ is the centred/reduced variable of x . Thus, by construction, the sum of the CIs over the period is equal to 0.

According to the indicator, liquidity has not vanished from French bonds. If anything, it has improved since beginning 2012, returning to levels seen before the outbreak of the sovereign debt crisis, while remaining below those seen in the 2005-06 period.

Figure 37



ANNEX 6

DATA CHALLENGES

It was challenging for IOSCO to aggregate data across jurisdictions or to make meaningful comparisons jurisdictions because of differences in data collection methods amongst IOSCO members, issues associated with data quality and inconsistency in data collection.

For example, in the U.S., regulators and the public have access to post-trade data on corporate bond trades dating back to 2002 under TRACE. TRACE provides a comprehensive overview of the activity in the U.S. corporate bond markets. Further, the information is publicly available and the same type of transaction data has been collected in the same manner over years. Such data can be used for a broad array of regulatory purposes, including assessment of the liquidity of the secondary corporate bond markets.

In comparison, since 2007, European investment firms have been required to report under MiFID details of transactions in financial instruments to their national regulator as quickly as possible, and no later than the next working day. The primary purpose of MiFID reporting is to provide information for regulators to conduct day-to-day oversight of their markets and detect market abuse. As a directive, MiFID sets out the results that all EU Member States must achieve. In implementing the directive, however, national authorities have a choice of form and method to meet this result. In addition, European transaction reporting is not limited to corporate bonds. Regulators must therefore extract data regarding corporate bonds from the overall data set to assess activity in this market. Therefore, although individual jurisdictions in Europe may have access to quality data on corporate bond activity within their jurisdiction, differences in data collection methodologies may make it difficult to aggregate data on corporate bond trading across Europe¹⁷⁶.

In other IOSCO jurisdictions, regulators rely on a variety of other data sources for corporate bond trading activity such as local trade reporting, data vendors, trading venues, exchanges and clearinghouses. However, there is no consistency in the way these jurisdictions obtain data on the activity in their corporate bond markets.

Finally, the term “corporate bond” may have different meanings in different countries. Although there appears to be general agreement that the corporate bond markets include non-financial and financial issuers, the scope of what is included under these terms may differ, which of course may lead to inconsistent data that cannot be meaningfully compared. For example, some jurisdictions:

¹⁷⁶ For example in Germany, the Securities Trading Act (Wertpapierhandelsgesetz) (Section 9) requires investment services enterprises and branches within the meaning of section 53b of the Banking Act (*Kreditwesengesetz*) to report to the Supervisory Authority not later than the next working day (excluding Saturdays) after conclusion of the transaction any transactions in financial instruments that are admitted to trading on an organized market or are included in the regulated market (*Regulierter Markt*) or the regulated unofficial market (*Freiverkehr*) of a German stock exchange. As such, Germany has implemented reporting requirements above mandated MiFID I level. However, for the reason of comparability between EU jurisdictions, the data provided by Germany in response to the IOSCO survey was adjusted to MiFID I level.

- Exclude from the concept of “financial issuers” those issuers of structured products that do not have a funding purpose.
- Include preferred stocks, while others may not.
- Include corporate bonds issued by government owned issuers, while others limit the scope to only private issuers.