Examination of Liquidity of the Secondary Corporate Bond Markets

Consultation Report

The Board
OF THE
INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS

CR01/2016	**AUGUST 2016**

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Foreword

The Board of the International Organization of Securities Commissions (IOSCO) has published this Consultation Report on liquidity of the secondary corporate bond markets, with a view to encouraging the public to comment on its analysis, data and conclusions. The Board also requests that market participants provide any data relating to liquidity in the corporate bond market that they believe would assist IOSCO in further refining its analysis.

Comments may be submitted by one of the three following methods **on or before 30 September**. To help us process and review your comments more efficiently, please use only one method.

Important: All comments will be made available publicly, unless anonymity is specifically requested. Comments will be converted to PDF format and posted on the IOSCO website. Personal identifying information will not be edited from submissions.

1. Email

- Send comments to consultation-2016-01@iosco.org
- The subject line of your message must indicate '*Examination of Liquidity of the Secondary Corporate Bond Market*s.'
- If you attach a document, indicate the software used (e.g., WordPerfect, Microsoft WORD, ASCII text, etc) to create the attachment.
- Do not submit attachments as HTML, PDF, GIFG, TIFF, PIF, ZIP or EXE files.

2. Facsimile Transmission

Send by facsimile transmission using the following fax number: + 34 (91) 555 93 68.

3. Paper

Send 3 copies of your paper comment letter to:

Alp Eroglu
International Organization of Securities Commissions (IOSCO)
Calle Oquendo 12
28006 Madrid
Spain

Your comment letter should indicate prominently that it is a '*Public Comment on Examination of Liquidity of the Secondary Corporate Bond Markets.*'

Contents

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 the present date. 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 recognizes 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 trading,[1] 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 analyzed, 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

[1] For example, less liquid assets being traded relatively less.

IOSCO Board has expressed its support for 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 liquidity[2] 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 bond[3] 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.[4] To this end, IOSCO Committee 2 conducted a fact-finding exercise,

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2 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.

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

4 Our examination, however, focusses 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

which 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.[5]

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.[6] Moreover, the information available to regulators varies widely, particularly with respect to its granularity, methodological basis, timeliness and accessibility (see **Annex 5**).[7] 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.

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

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

6 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 bond. 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/organized 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.

7 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 between 2004 and 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 between 2004 and 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.[8]

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.

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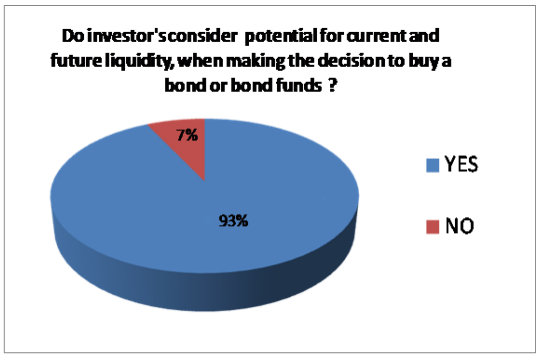
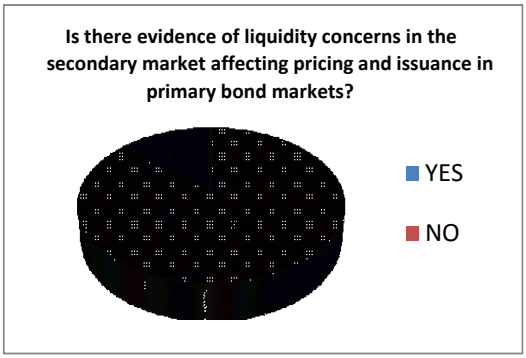
[8] BlackRock, *Corporate Bond Market Structure: the Time for Reform is Now*, BlackRock Viewpoint (Sept. 2014), *available at:* https://www.blackrock.com/corporate/en-mx/literature/whitepaper/viewpoint-corporate-bond-market-structure-september-2014.pdf.).

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 1** 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.

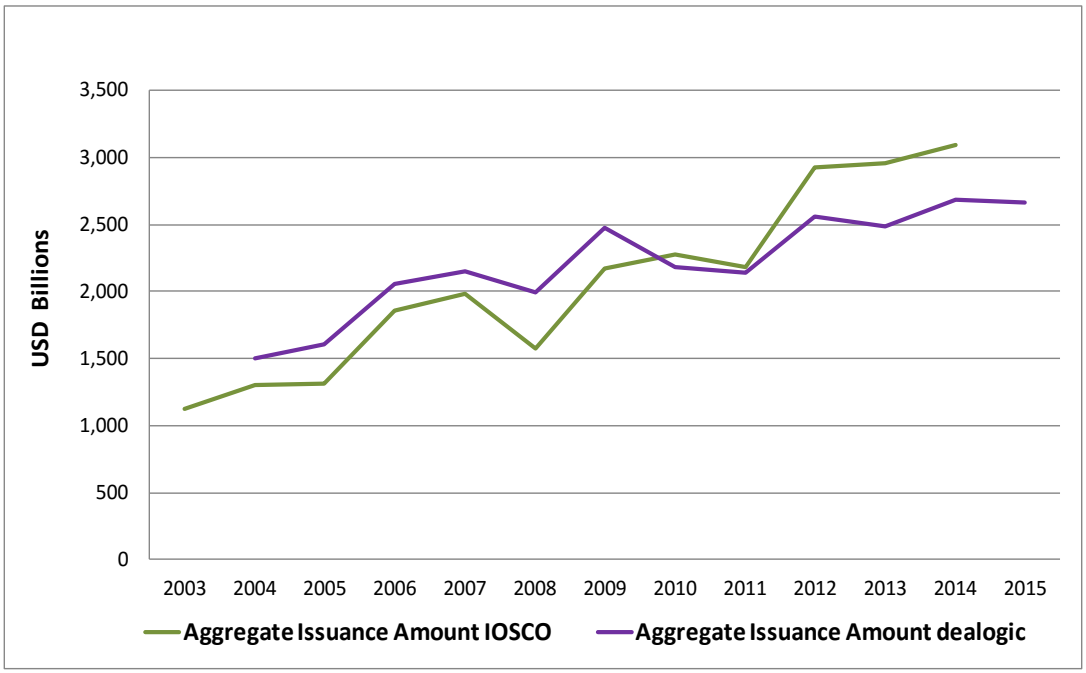
In recent years, corporate bond issuances have reached record highs in most IOSCO member jurisdictions. See Figure 1. Moreover, according to aggregate data provided in response to the IOSCO survey to regulators and from Dealogic,[9] which are broadly consistent with one another, the trend of global corporate 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 incentivized 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.

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

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

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.[10]

Figure 1: Aggregate Annual Corporate Bond Issuance Compared (Value)[11]



Source: Regulator responses to IOSCO survey and Dealogic

Based on the data[12] obtained by IOSCO, new corporate bond issuances in the developed markets have been growing steadily in recent years (Figure XB). After declining during the

[10] *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).

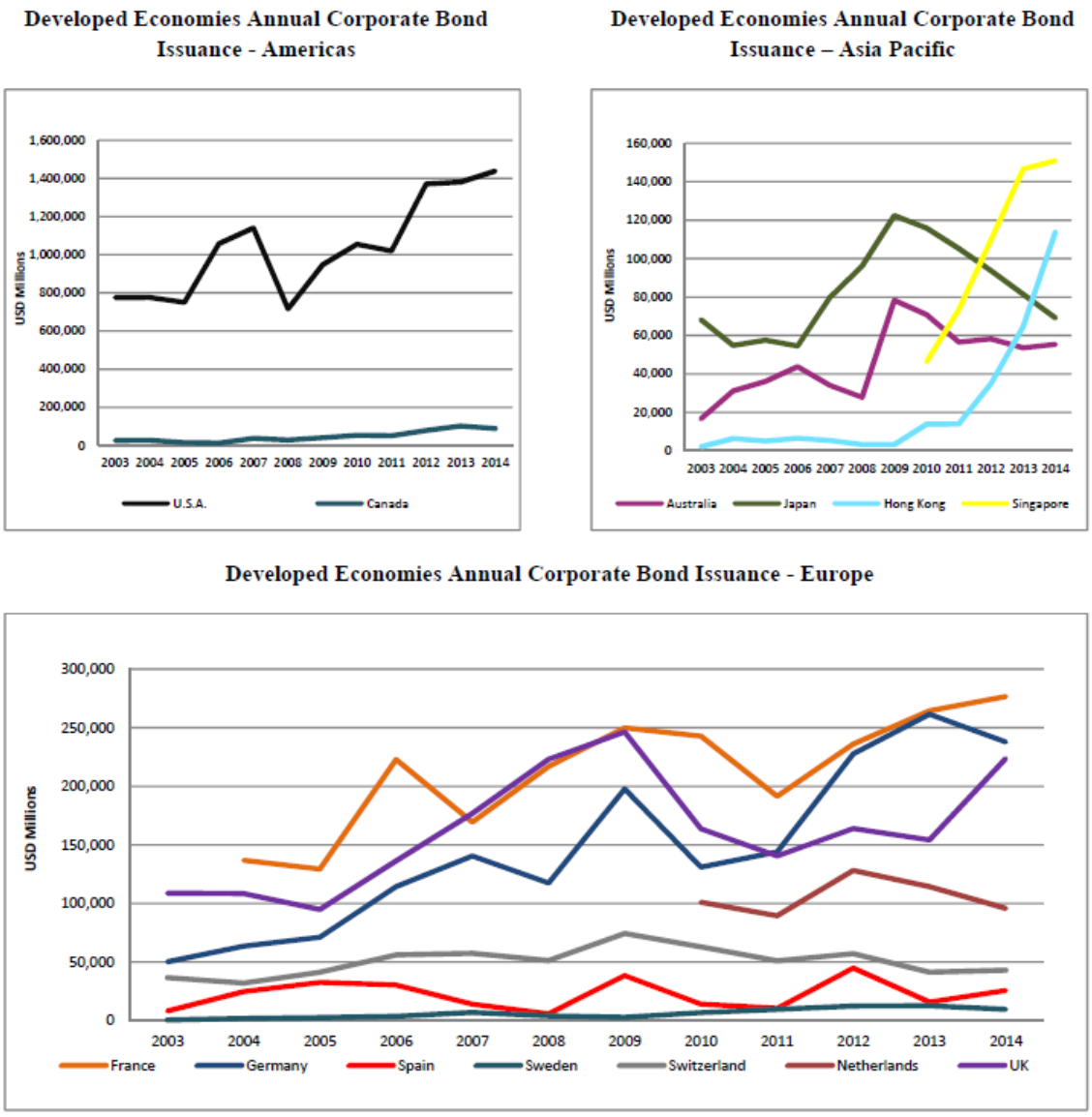
[11] IOSCO data was obtained from regulator responses to IOSCO survey, including from Australia, Brazil, Canada, France, Germany, Hong Kong, India, Japan, Korea, Malaysia, Mexico, Netherlands, Romania, Singapore, South Africa, Spain, Sweden, Russia, Switzerland, Turkey, U.K. and the U.S. (SEC and FINRA).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

[12] 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 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.

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 2**) 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



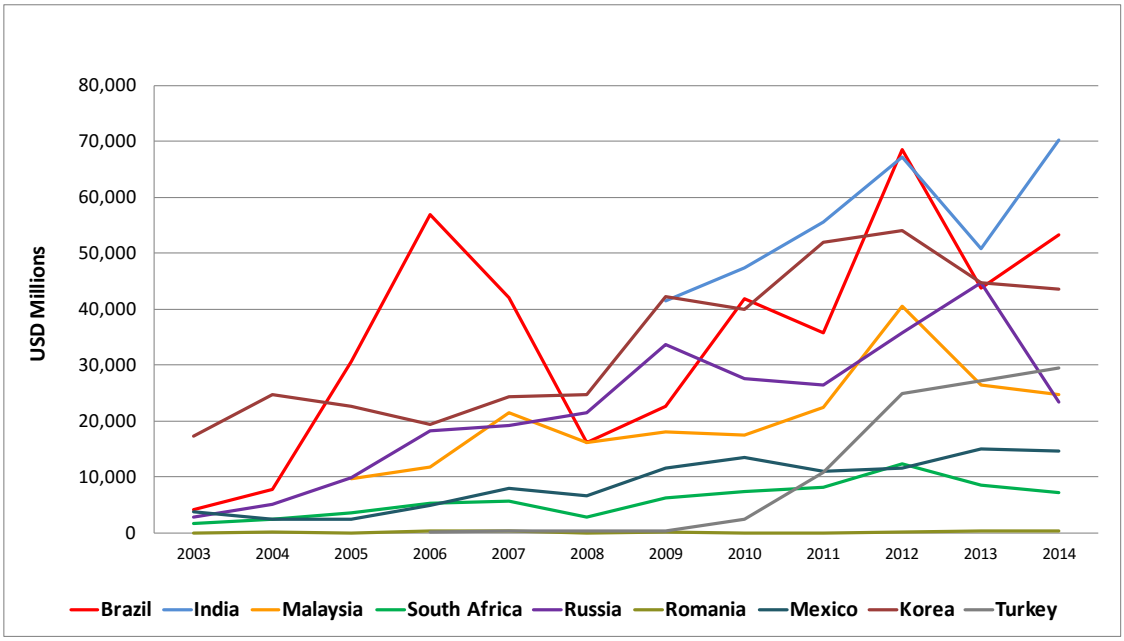
Source: Regulator responses to IOSCO survey

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 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.[13] 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.[14] 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



Source: Regulator responses to IOSCO survey

13 *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).

14 *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-Prospects-January-2016-Global-Outlook.pdf.

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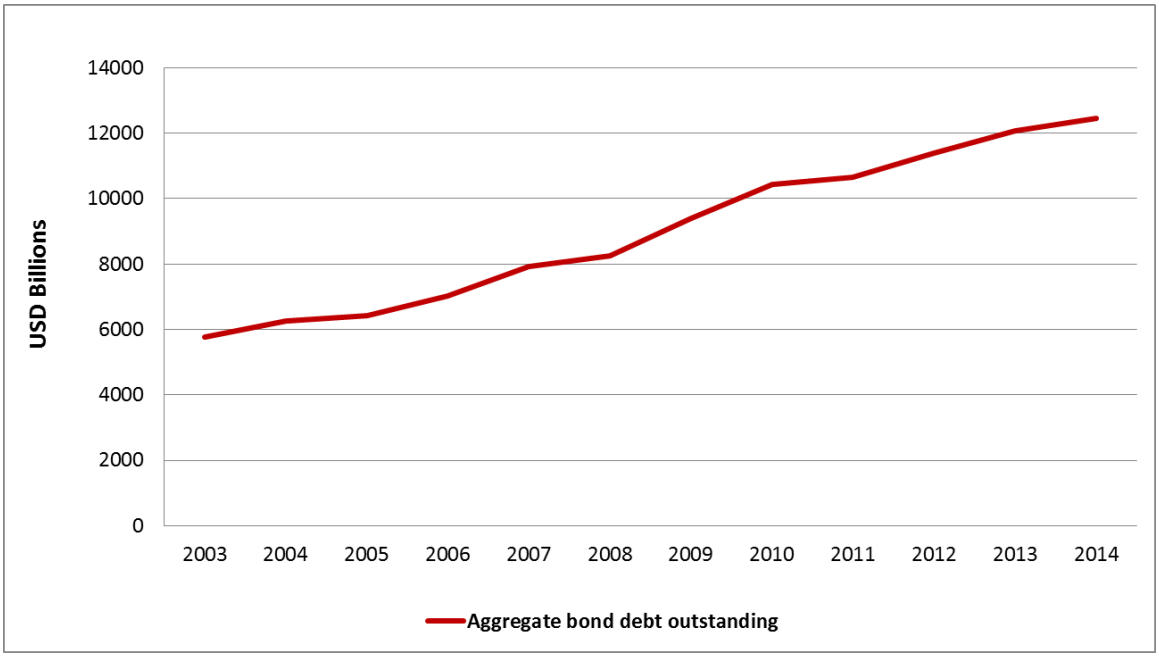
Total outstanding debt needs to be discussed in conjunction with trading volumes, since the relationship between the two, the turnover ratio,[15] is considered an important liquidity metric. Consistent with the increase in issuance, the total amount of outstanding corporate bond debt globally has increased steadily since 2003. In the U.S., corporate debt outstanding achieved a record-high of $7.8 trillion at the end of 2014.[16] 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 Outstanding[17]



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.

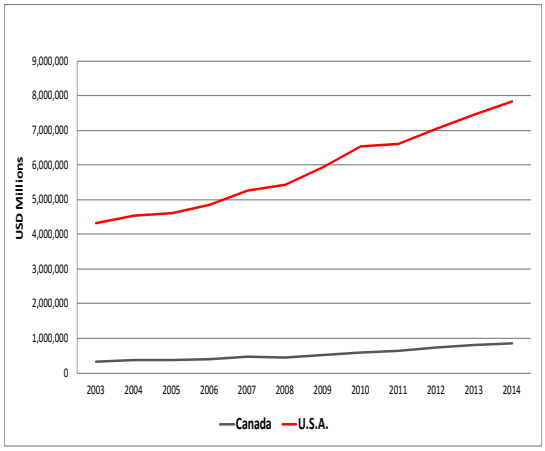
15 Turnover ratio is typically calculated as total trading volume per year divided by total debt outstanding.

16 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).

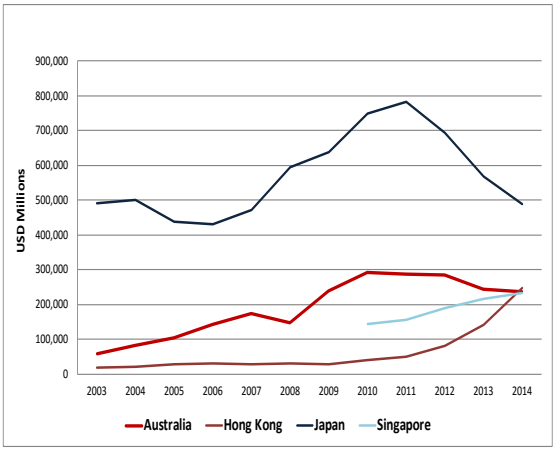
17 Data is obtained from regulator responses by Australia, Brazil, Canada, Germany, Hong Kong, Japan, Korea, Malaysia, Saudi Arabia, South Africa, Spain, Sweden, Romania, Russia, Switzerland, Turkey, U.S. to IOSCO' survey.

Figure 5: Corporate Bond Debt Outstanding-Developed Economies

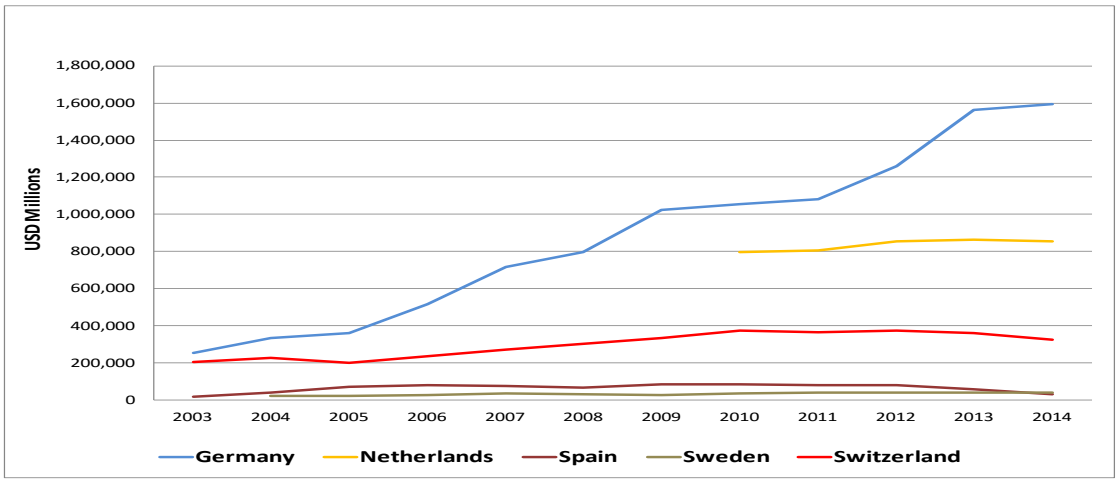
Developed Economies Outstanding - Americas



Developed Economies Outstanding – Asia Pacific



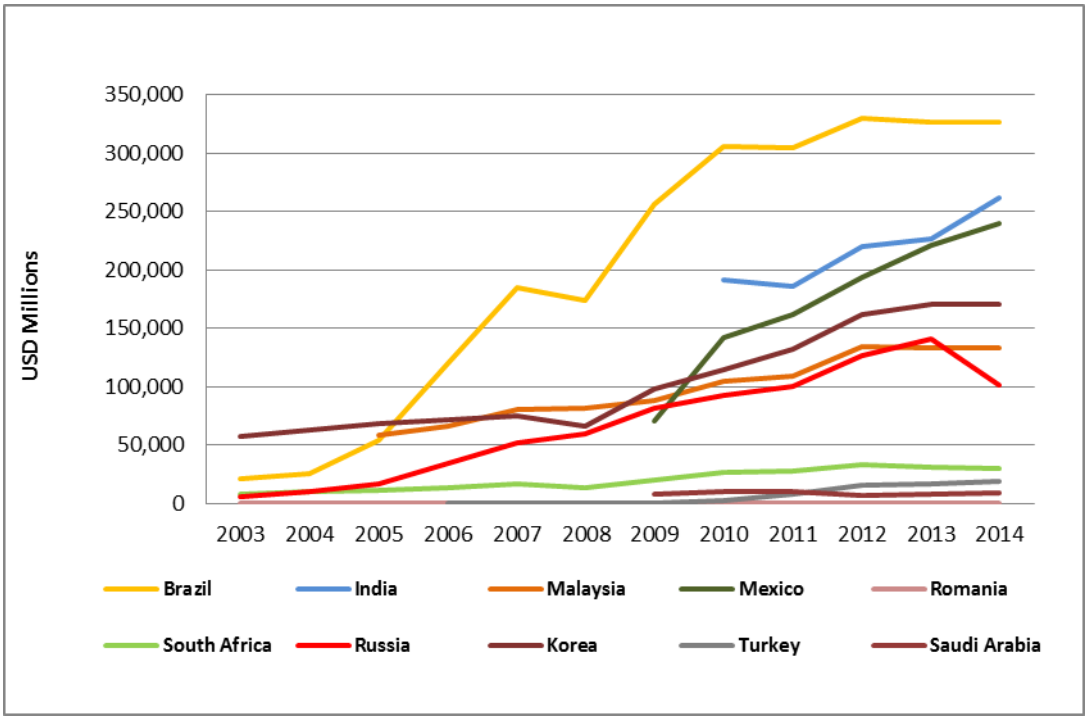
Developed Economies Outstanding – Europe



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.[18] 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

[18] 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.

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.[19] 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.[20]

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.[21] 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.[22]

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

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19 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 internalizers (SIs). RMs and MTFs are all order driven (except one MFT). Trading can be only on principal basis through SIs, while it can be both on a principal and agency basis on RMs and MTFs.

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

21 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 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.

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

principal"[23] 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 assertion. Industry representatives noted in particular their belief that dealers are more reluctant to take on large positions.[24]

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.[25] 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.[26] However, some are of the 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

Institutions remain the dominant investors in the corporate bond market and are becoming more diversified (*e.g.*, asset managers and hedge funds play a more prominent role). While the direct investment of retail investors remains low, there

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23 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.

24 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.

25 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.

26 *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.").

seems to be an increase in indirect participation through mutual funds and exchange-traded products (*e.g.*, exchange-traded funds).

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. 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 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.[27] By purchasing these products, retail investors are able to gain exposure to the underlying corporate bonds.

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[27] 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*

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 3**. However, the data is not comparable because each IOSCO member jurisdiction uses a different methodology to estimate the amount of retail participation.[28]

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 electronification 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 standardized 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,[29] while in others, trading volumes on electronic platforms has been low, including in emerging markets.[30]

Dealers use technology to offer single-dealer platforms to facilitate trading with their clients.[31] 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 organized trading facilities (OTFs) in the future.[32]

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since 2008 and now account for some $7.3 trillion in total.") (Nov. 2014), *available at* http://www.bis.org/publ/cgfs52.pdf.

28 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.

29 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.

30 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.

31 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.

32 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

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.[33]

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.

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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.

[33] 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.

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 participation in the market, tightens bid-ask spreads, and contributes to price discovery, thus leading to increased liquidity.[34] 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.[35]

IOSCO recognizes 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.

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[34] 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).

[35] 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.

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.

Some have expressed the concern that low interest rates have led to "herd" behavior 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 analyzed 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.[36] 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.[37]

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[36] 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.

[37] 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 cognizant 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.[38] 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).[39]

IOSCO also considered whether liquidity in the CDS market (looking in particular at the CDS-bond basis)[40] is informative about the liquidity in the cash bond market.[41] 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.[42] This report, therefore, does not consider the CDS-bond basis as a metric for purposes of its liquidity analysis (see Section IV, below).

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38 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.

39 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.

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

41 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 arbitraged 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.

42 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.

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.[43] 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.

[43] 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.

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.

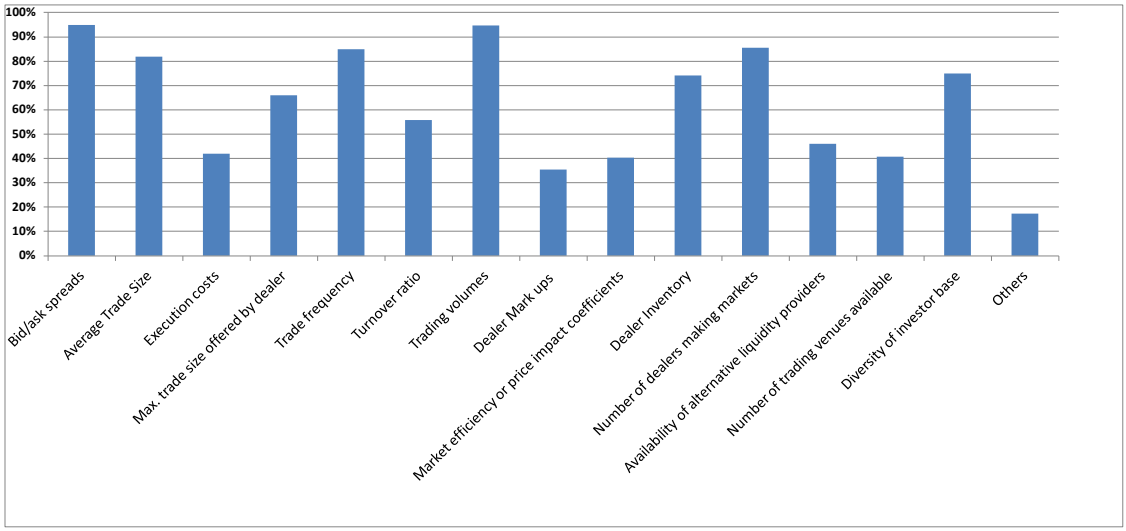
In gathering data for this report, IOSCO found that no single metric could alone serve as a reliable measure of liquidity. Rather, by examining many different metrics in aggregate, IOSCO was able to see a more complete picture of corporate bond market liquidity. IOSCO cautions, however, that due to certain 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.

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;[44] 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.

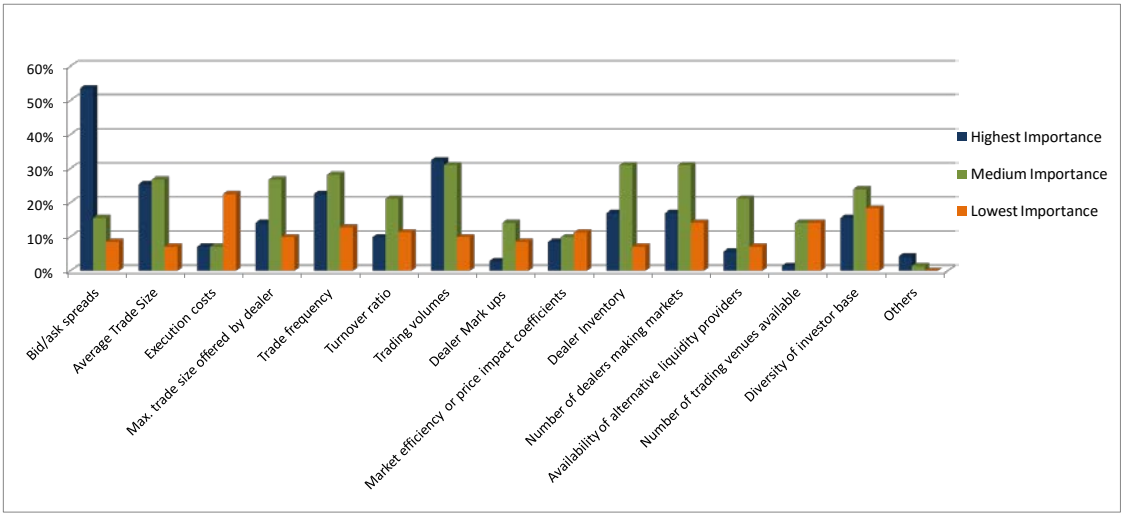
[44] This refers to the time it takes to trade a bond ("immediacy"), which is an important aspect of liquidity. A common complaint heard by C2 is that it takes buy-side clients longer to buy/sell a given notional amount of bonds than previously. IOSCO found some academic evidence to support the notion 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 who use a particular Liquidity Metric



Source: Industry participant responses to IOSCO survey

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 behavior 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 summarized in **Annex 4**.[45]

[45] The academic measures generally show improving liquidity based on combinations of various metrics.

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 5**.

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 centralized or organized 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.

B. Metrics

1. Trading Volume

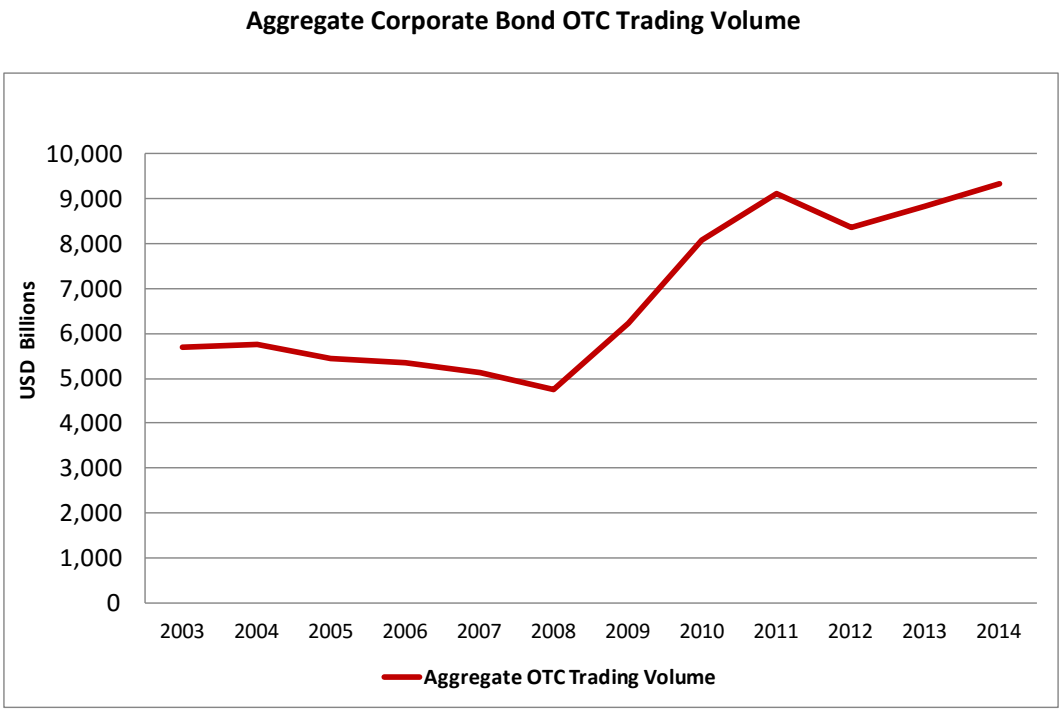
Trading volume has increased in the majority of jurisdictions. In some jurisdictions, trading volume has not kept pace with the large increase in new issuance.

Trading volume, or notional amount traded,[46] 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.

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

Figure 7: Aggregate OTC Corporate Bond Trading Volume (notional)[47]

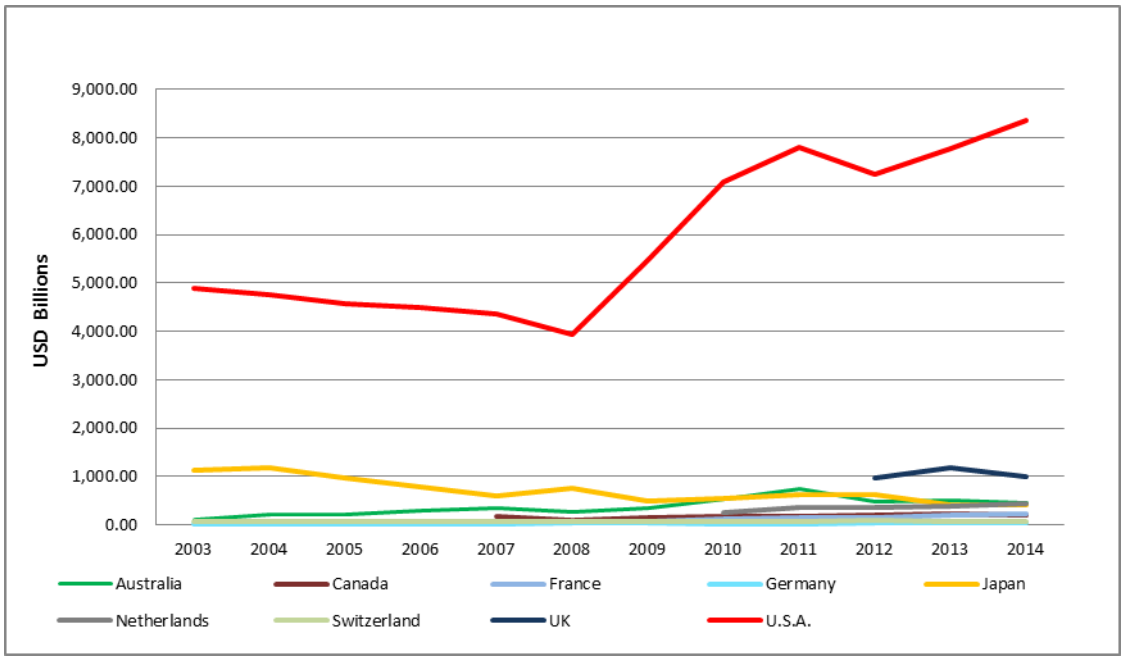


Source: Regulator responses to IOSCO survey

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

[47] 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.

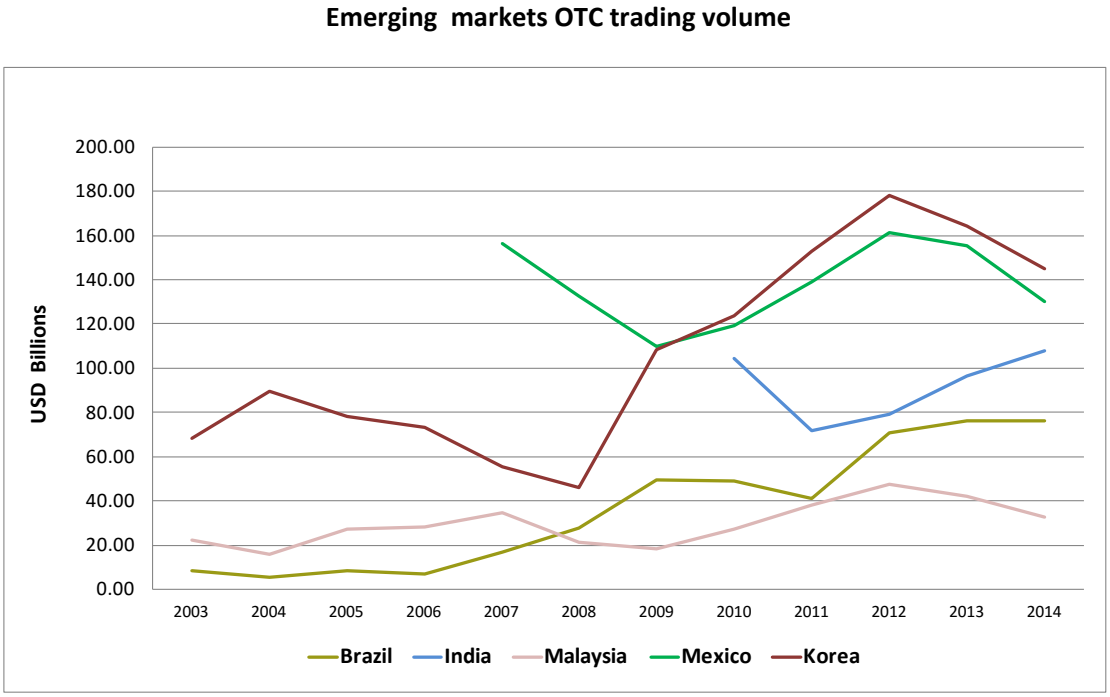
Figure 8: OTC Trading Volume in developed markets



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 is 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.[48] 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.

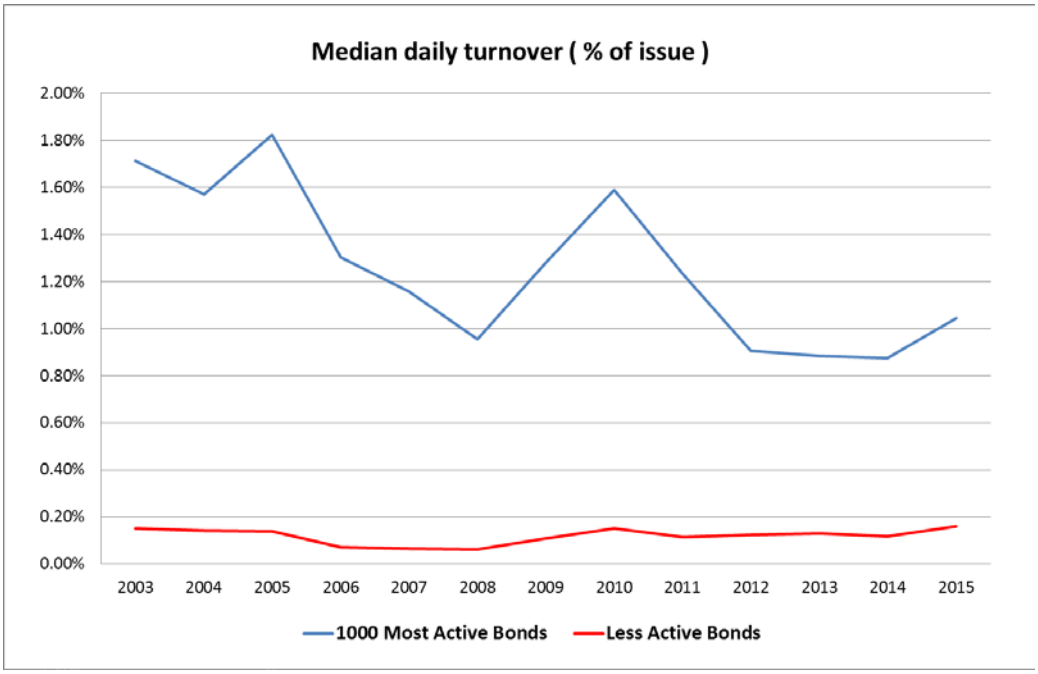
The bifurcation argument was put into doubt by a recent FINRA study that examined the differences in the market behaviors for actively traded and less actively traded bonds by looking at percentage of investment grade securities in the actively traded and less actively traded category.[49] It concluded that, to the extent that its analysis found differences in the market behaviors for actively traded and less actively traded bonds, those differences do not appear to be driven by differences in credit quality across the portfolios.[50] 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.

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

49 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.

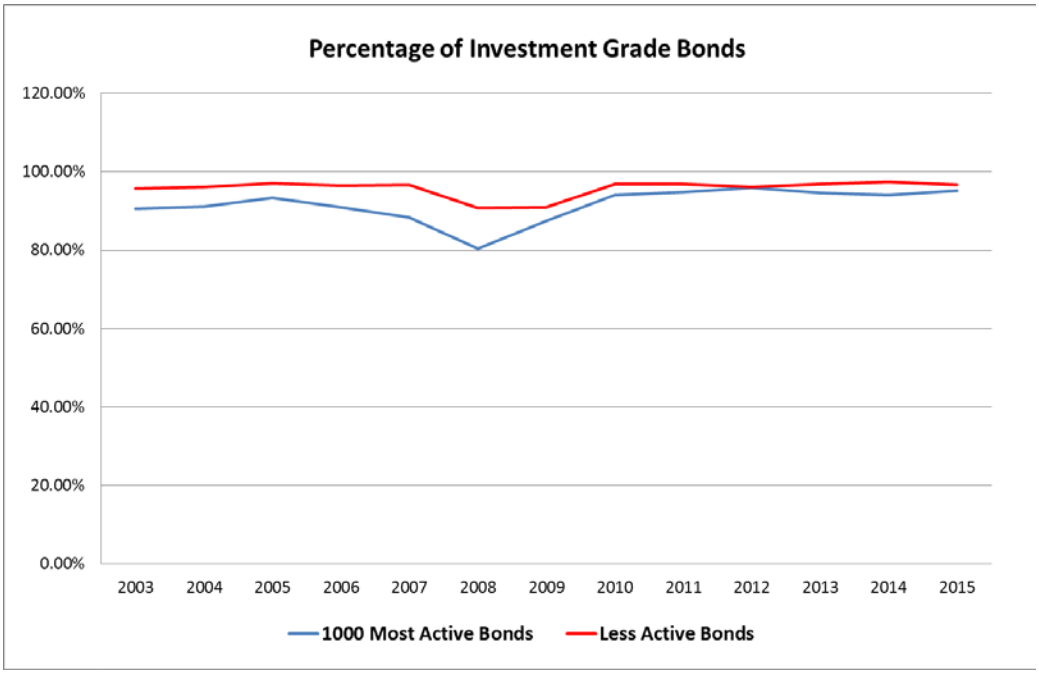
50 *Id.* at 5.

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 ratio[51] 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 study[52] 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.[53]

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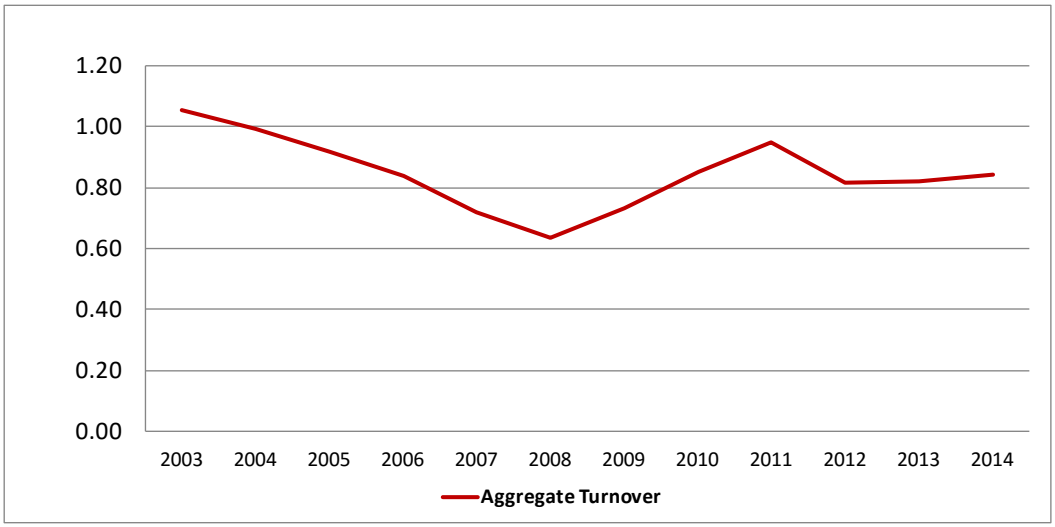
51 Turnover ratio is typically calculated as total trading volume per year *divided by total debt outstanding.*

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

53 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 turnover[54]



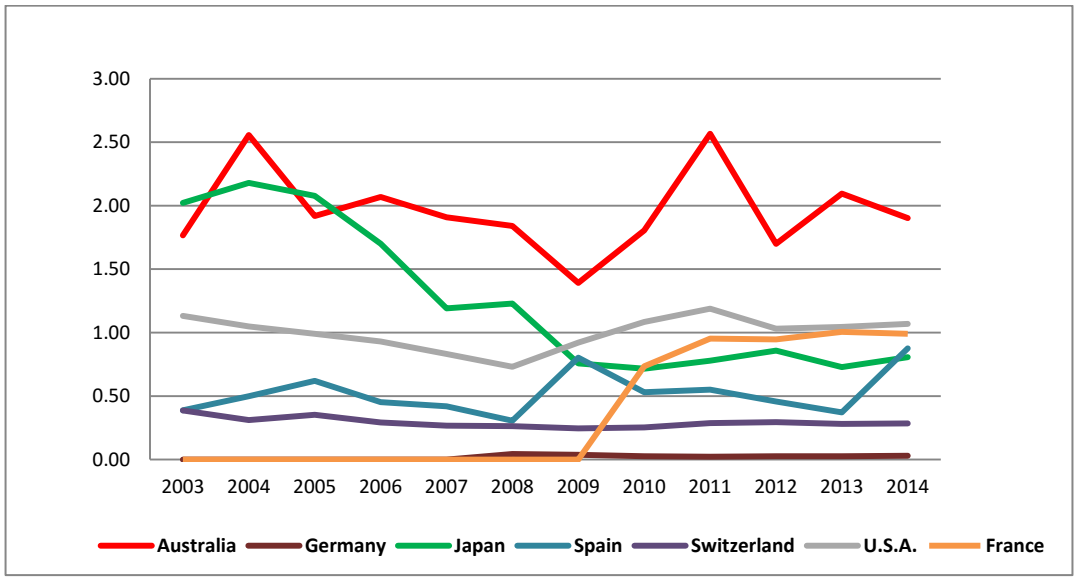
Source: Regulator responses to IOSCO survey

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.[55] 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.

[54] 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.

[55] *See* discussion under Section III.C.

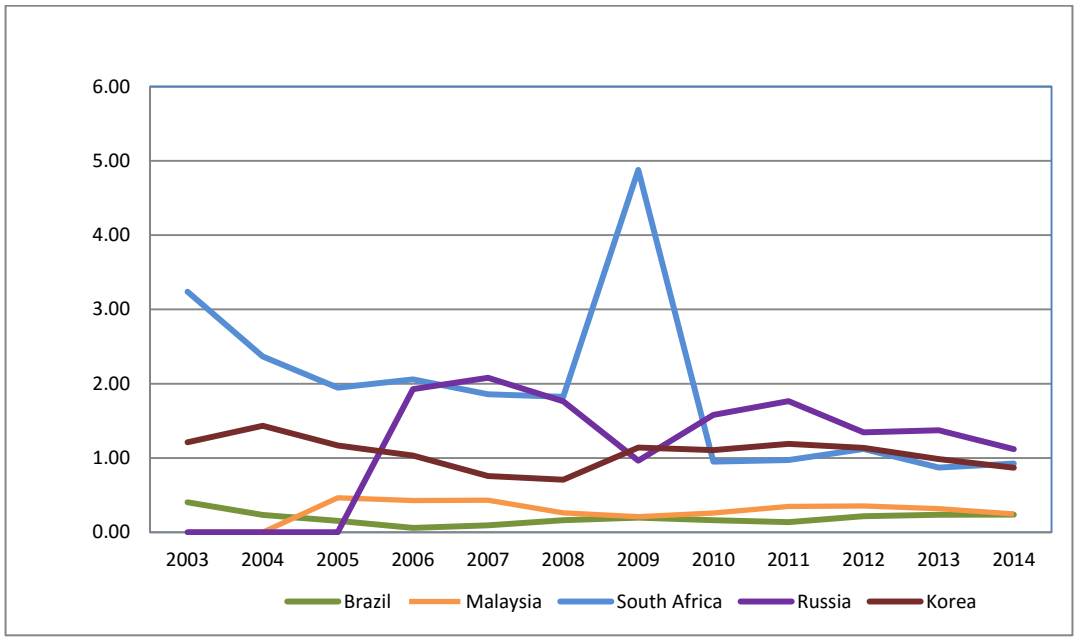
Figure 13: Corporate Bond turnover-Developed Markets



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 stabilized 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)[56] 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.[57]

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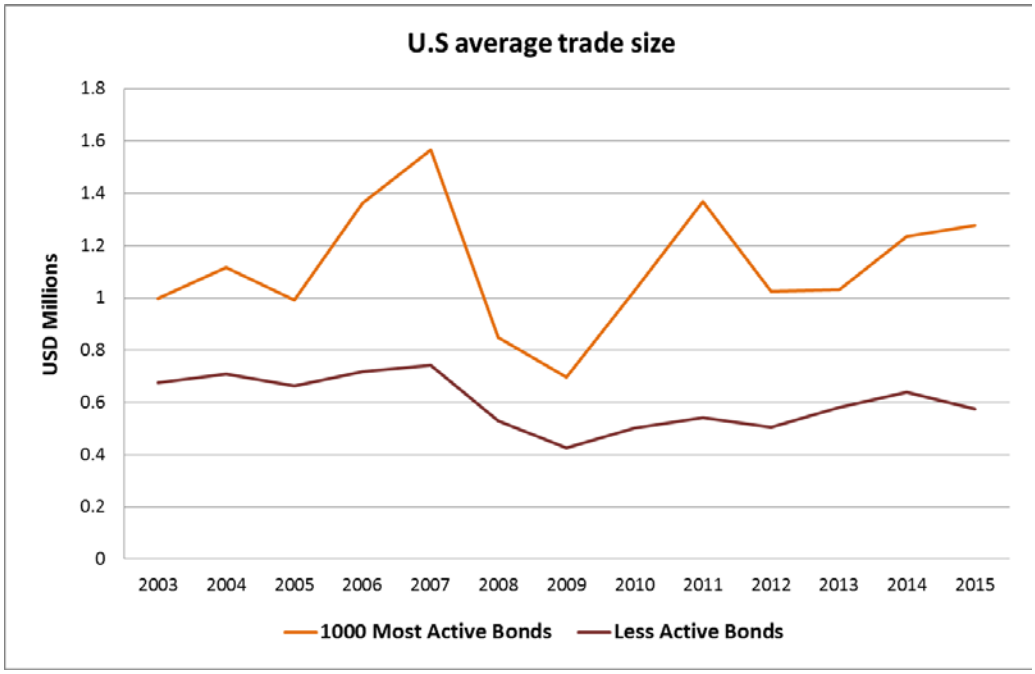
56 Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, (Dec. 2015), at 8, *available at* https://www.finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12.pdf.

57 *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*").

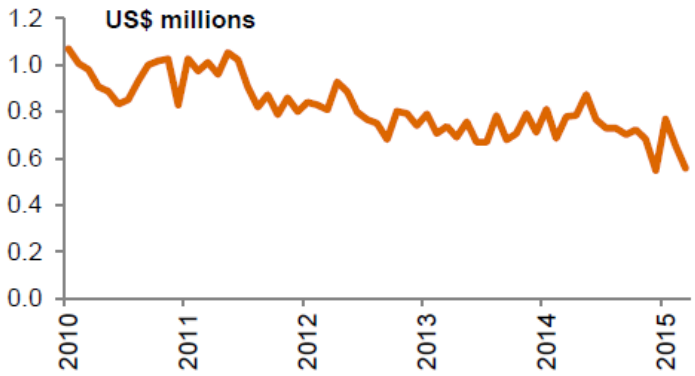
Figure 15: U.S. average trade size



Source: FINRA

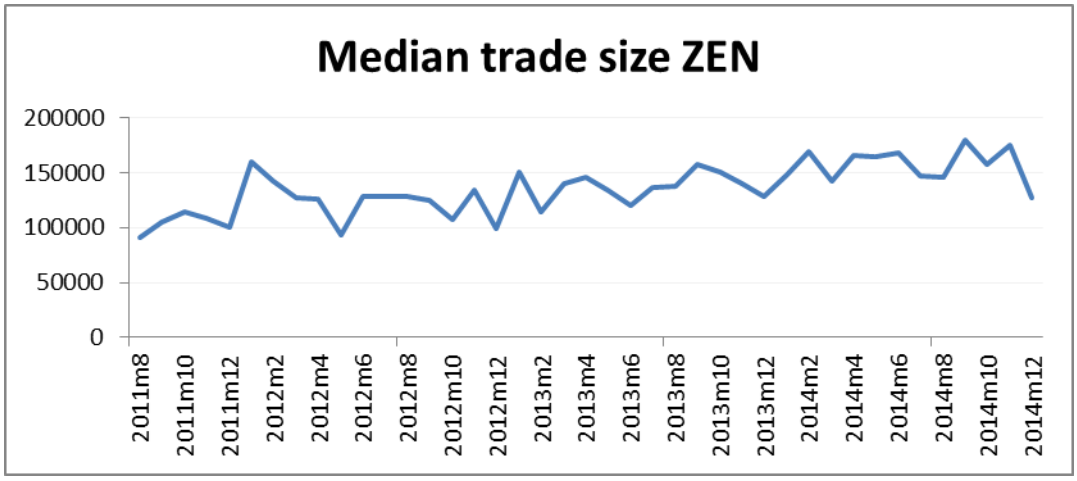
In Europe, average trade size may have decreased more significantly, as demonstrated in Figure 16. IOSCO cautions, however, that this data may be affected by exchange rate changes, given it is converted into U.S. dollars. This trend is also not corroborated by transaction reporting data provided by the 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).[58]

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. However, the decrease in block orders could also be attributed to an increase in smaller trades due to greater electronification of the market.

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.[59] 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, but could also mean that participants are choosing to sell relatively small-size blocks (*e.g.*, between $5m and $10m) in multiple, smaller pieces, as demonstrated in Figure 20 (U.S.). Larger blocks (*i.e.*, greater than $25m) are not less frequently executed today than pre-crisis.

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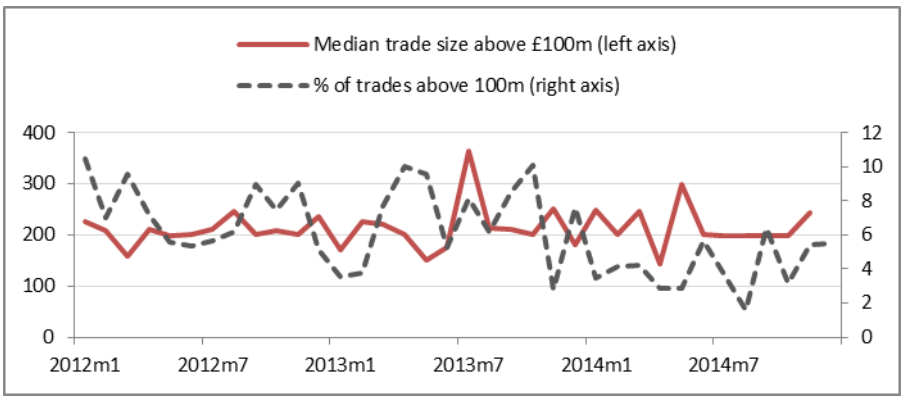
58 Based on ZEN, the U.K. FCA's surveillance and monitoring program, data beginning in Aug. 2011 through Dec. 2014.

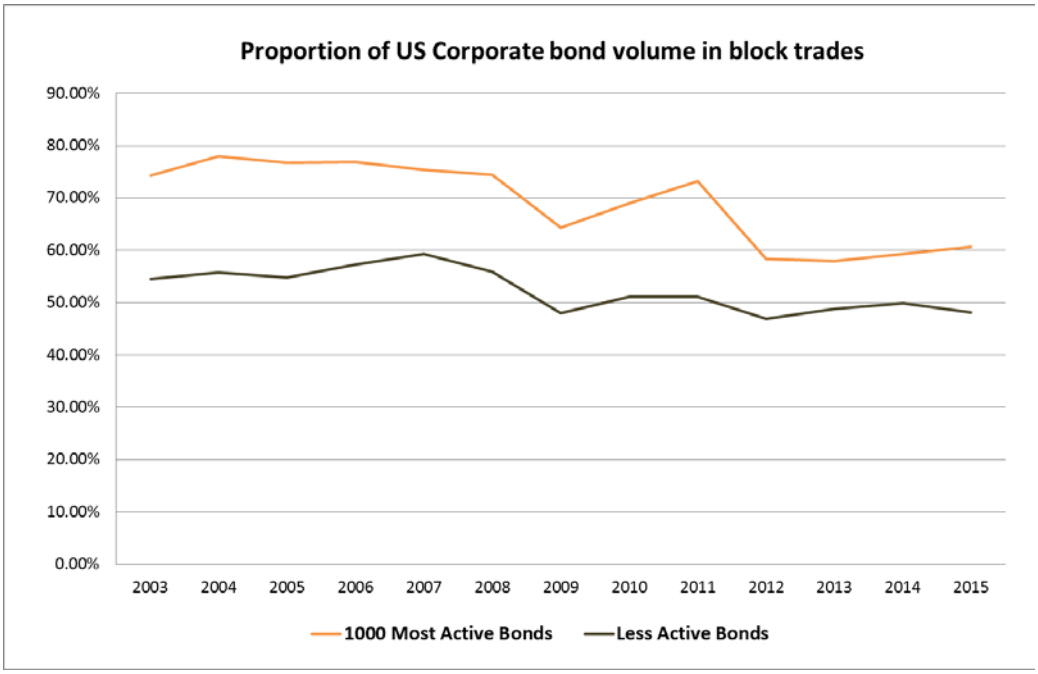
59 This figure is more accurate than using block trade volumes alone, as block trades might be rising simply as the market is growing. The FCA used a large trade size threshold of £100m and FINRA used a block trade threshold of $5m (in accordance with TRACE).

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



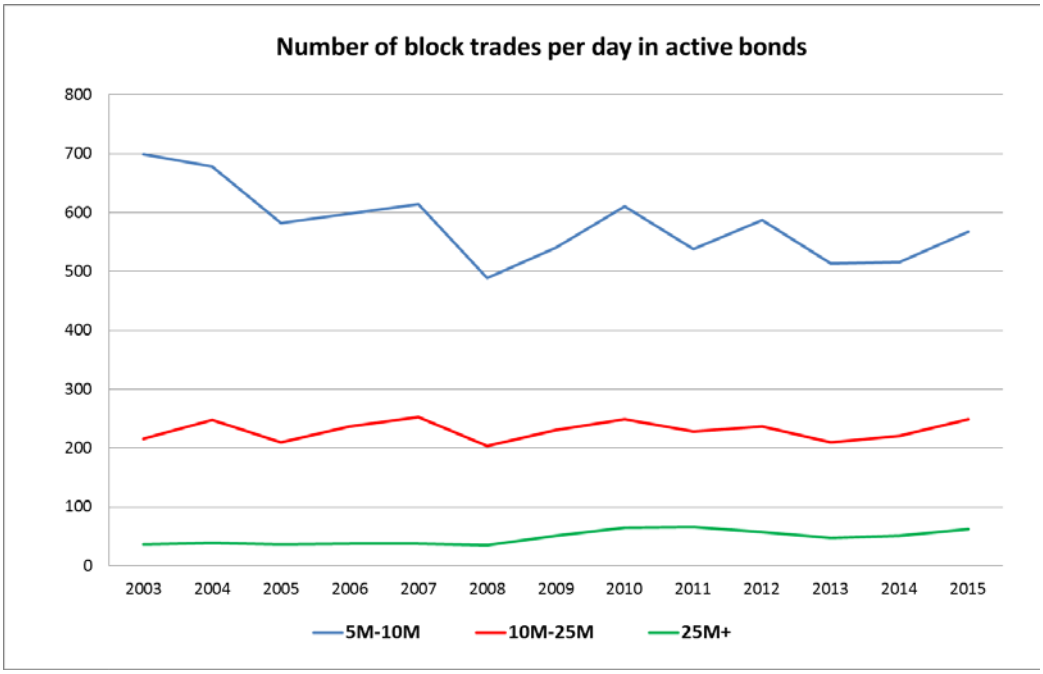
Source: Aquilina, Matteo & Suntheim, Felix, *"Liquidity in the U.K. corporate bond market: evidence from trade data"*, FCA Occasional Paper 14 (Mar. 2016), using transaction reporting data

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

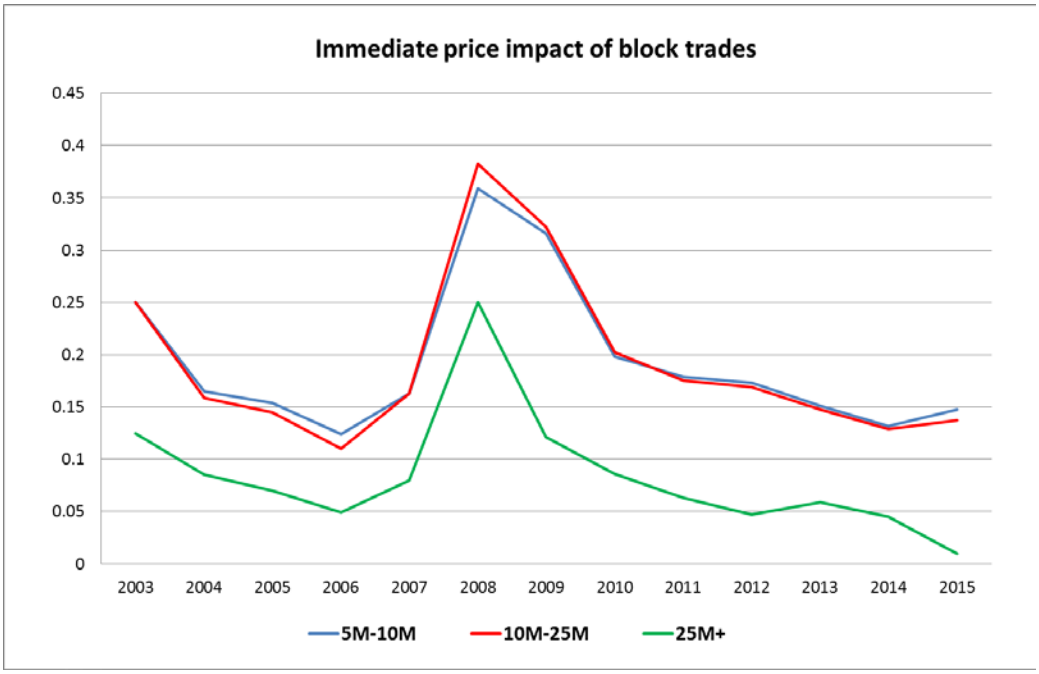
There is evidence of a steady decline post-crisis in the price impact of trades, which would indicate improving liquidity.

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.[60] It found a decline in price impact post-crisis, which could indicate improving liquidity in U.S. secondary corporate bond markets.

[60] 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.

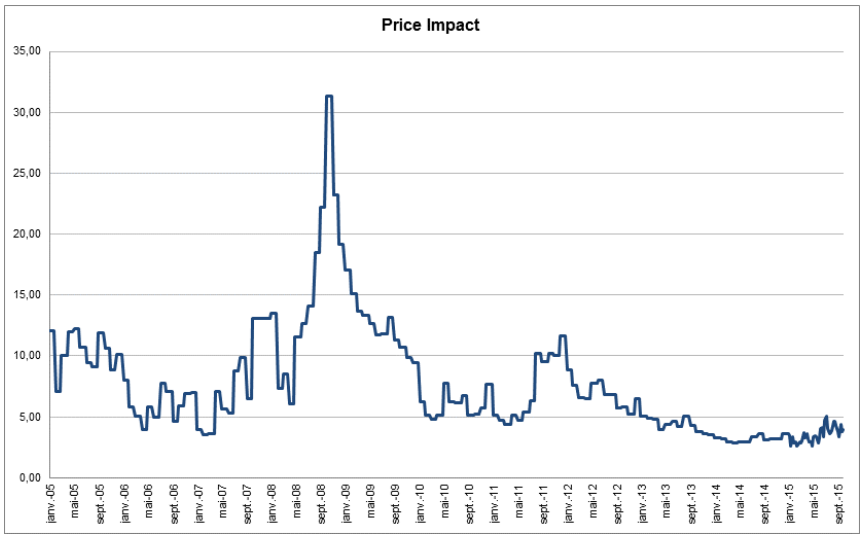
Figure 21: Immediate price impact of block trades



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

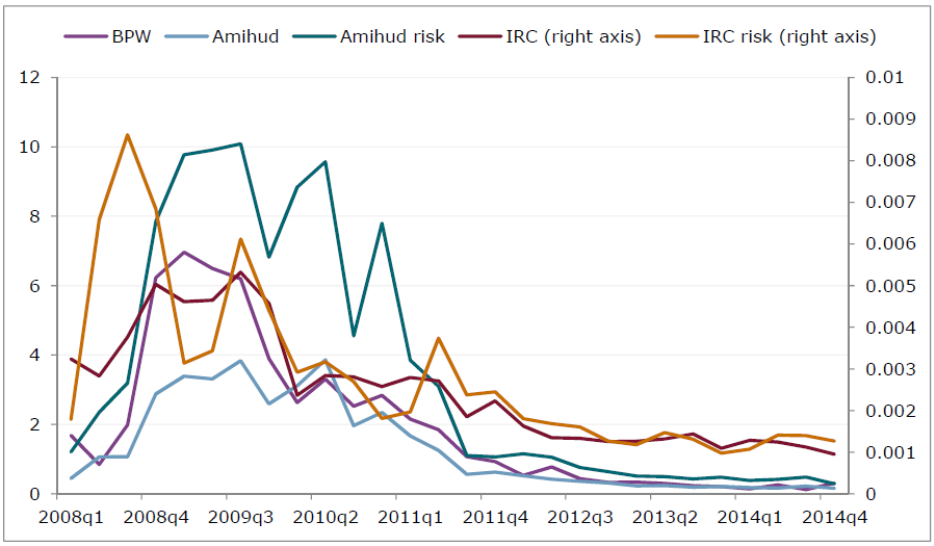


Source: AMF -Bloomberg

Likewise, economists at the U.K. FCA analyzed 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.[61]

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 conditions.

Figures 24 and 26 show that corporate bond bid-ask spreads have narrowed in the U.S. and Europe since the financial crisis.[62] In fact, in the U.S., the current level of bid-ask spreads is even lower than pre-crisis levels (see Figure 24). The trend is the same for both investment-grade and high-yield corporate bonds.[63]

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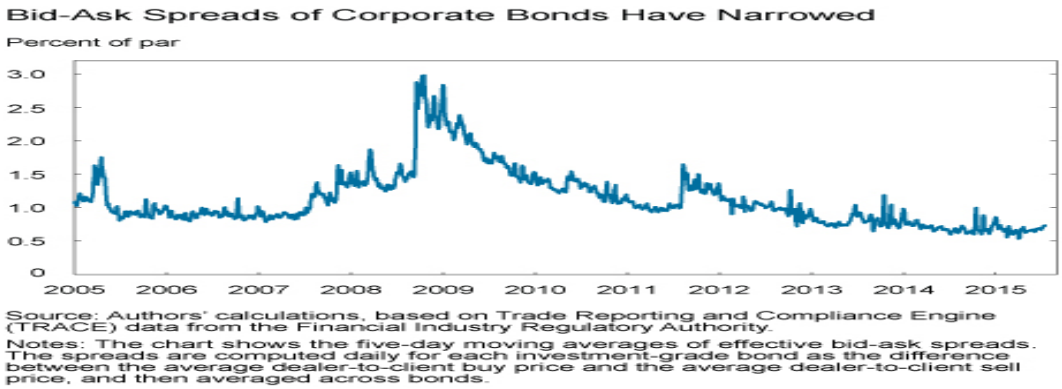
61 Matteo Aquilina & Felix Suntheim, *"Liquidity in the U.K. corporate bond market: evidence from trade data"*, FCA Occasional Paper 14 (Mar. 2016).

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

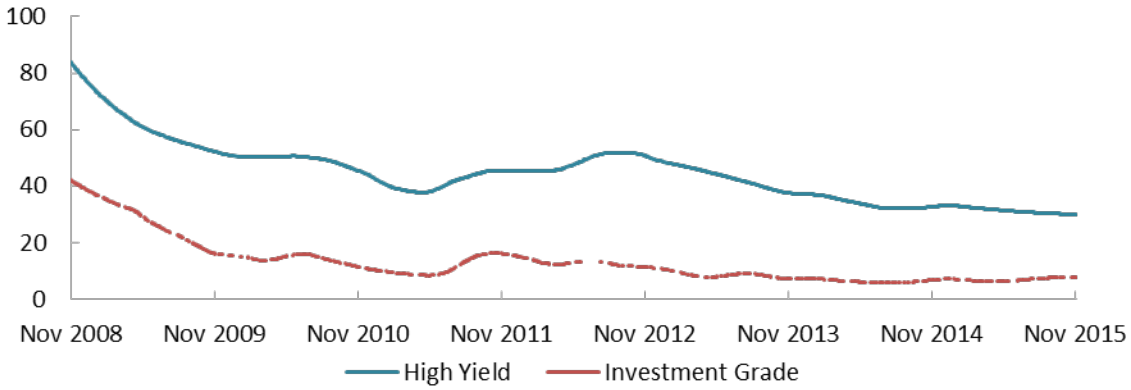
63 IOSCO Research Department, *IOSCO Securities Markets Risk Outlook 2016*, at 34, *available at* https://www.iosco.org/library/pubdocs/pdf/IOSCOPD527.pdf .

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



Source: Federal Reserve Bank of New York

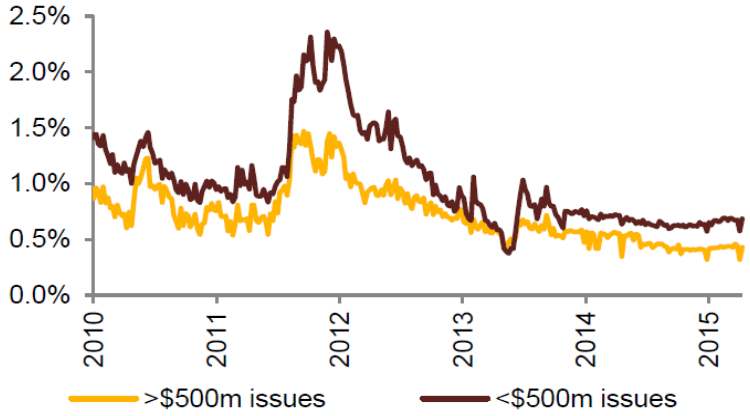
Figure 25: Bid Ask Spreads[64]



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

64 *Id.*

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

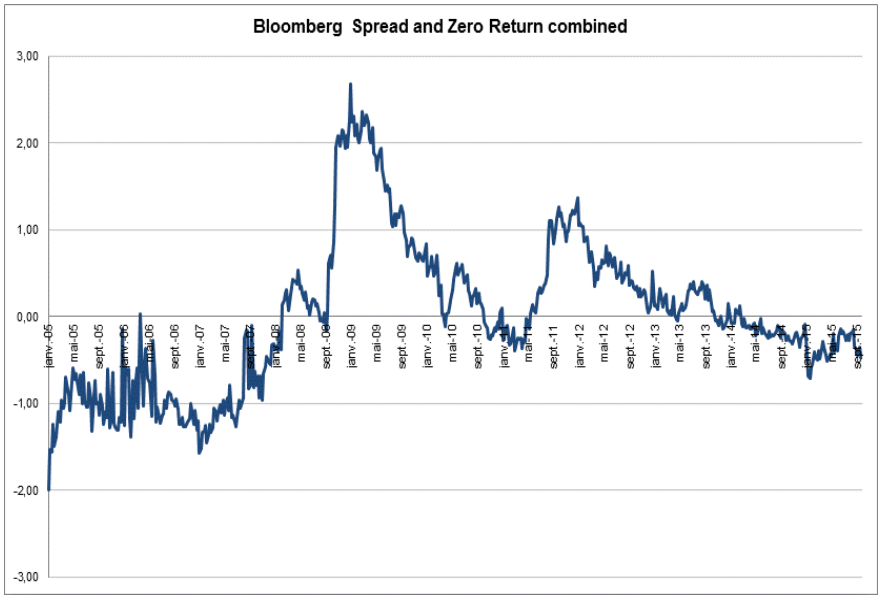


Source: Thomson Reuters, Trax, PwC analysis

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.[65] 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.

65 "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 analyzing 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.[66]

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.[67]

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.

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

66 *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).

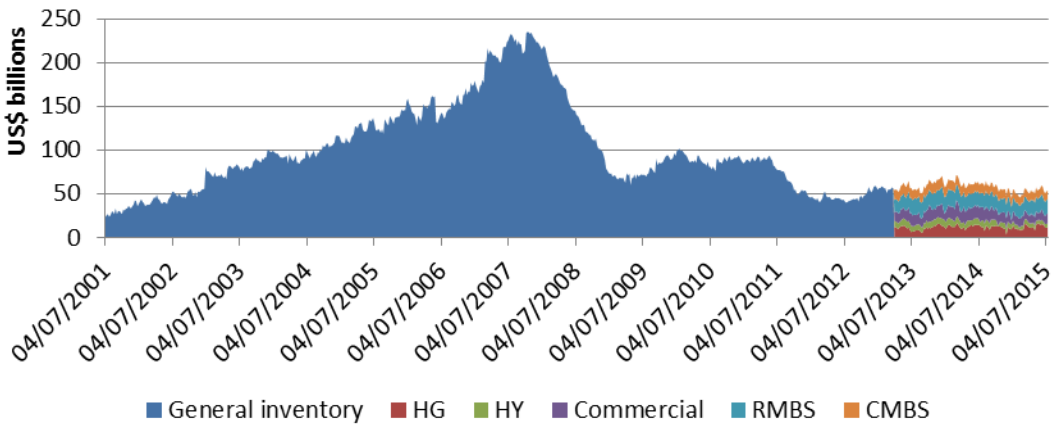
67 *For example,* Dodd-Frank reforms, including the so-called Volcker rule, along with Basel III capital requirements and leverage ratios.

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.[68] 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.[69] 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.[70] The inclusion of these securities in inventory statistics therefore very likely exaggerates the decline in corporate bond inventories.

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.

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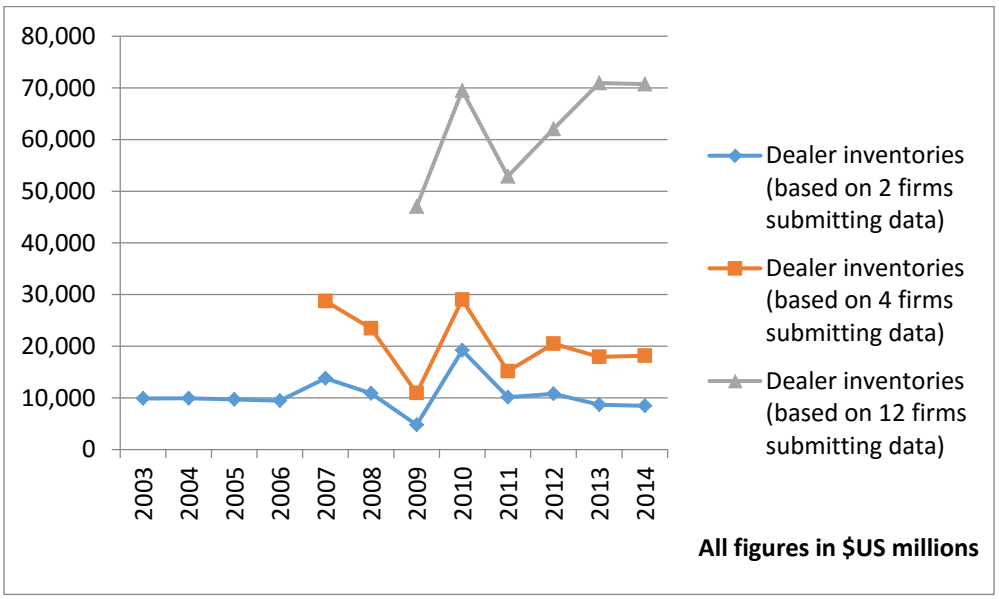
68 For the purposes of this report, when IOSCO uses the term "dealer inventories", it is referring to inventories of corporate bonds held by dealers *for market-making purposes*.

69 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.

70 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.

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 bonds[71] 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,[72] it appears that (1) within Asia, dealers have generally increased their corporate bond inventory levels at a greater pace than their 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

[71] 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.

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

inventories remain subdued below their pre-crisis peak – arguably an abnormally high period[73] – 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 four 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.

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 study[74] 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).

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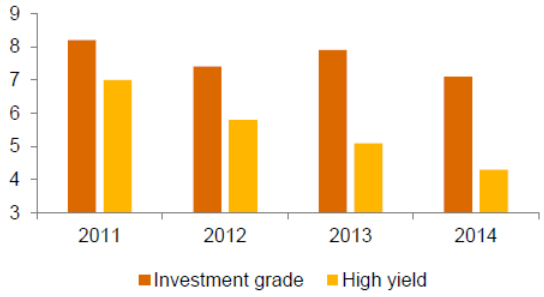
[73] *See, e.g.*, Allen N. Berger & Christa H.S. Bouwman, *Financial Crises and Bank Liquidity Creation*, (Oct. 2008).

[74] 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.

Figure 30: Average number of active market makers – European corporate bonds[75]



Source: Trax, PwC analysis

In the U.S., emerging academic evidence[76] 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.[77] 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."[78]

In addition, the Federal Reserve Bank of New York recently examined corporate bond market-making returns at major dealers.[79] Its report stated, "if it were true that these higher capital requirements were leading dealers to withdraw from market making, one would expect 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."[80]

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75 *Id.* at 66.

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

77 *Id.* at 30.

78 *Id.* at 1.

79 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.

80 *Id.*

Figure 31: Corporate Bond Market-Making Returns

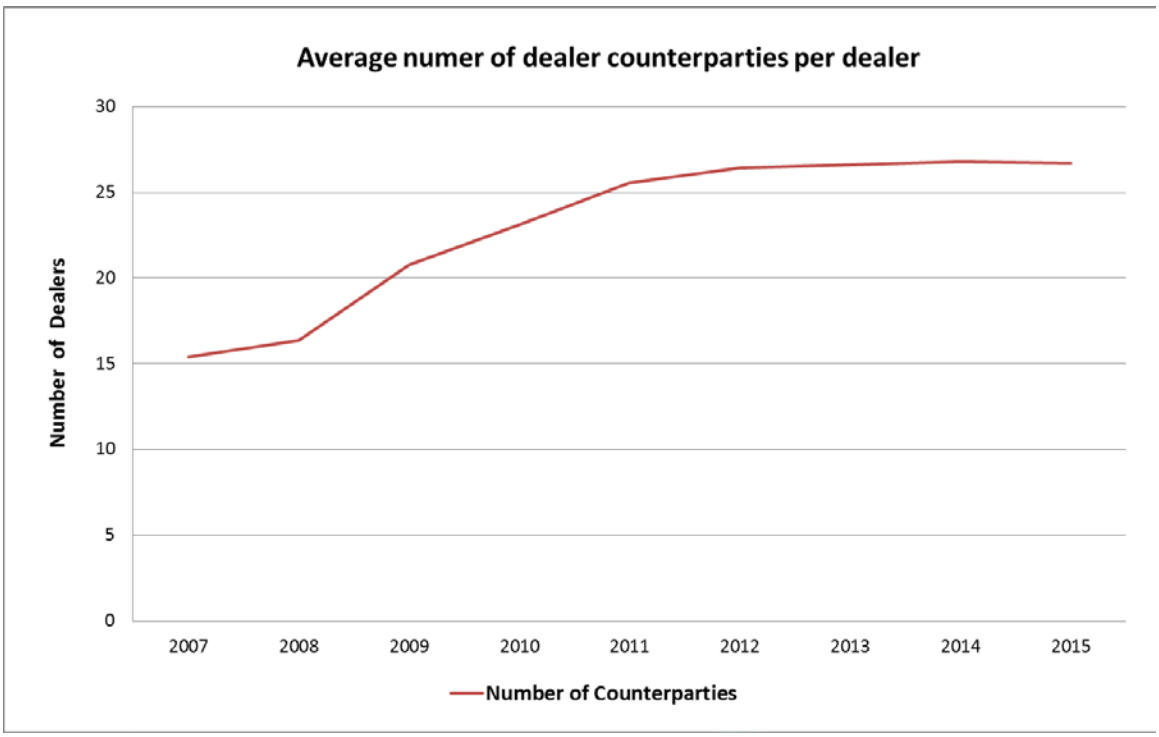
Source: Federal Reserve Bank of New York

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%.

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 commentators 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 the present. Our primary goal was to determine whether current liquidity is 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.

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,[81] 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.[82]

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 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 5**.

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

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81 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).

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

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.

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.[83]

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.

VI. REQUEST FOR COMMENT AND ADDITIONAL DATA

IOSCO strongly encourages the public to comment on the analysis, data and conclusions of this report. IOSCO also requests market participants to provide any data relating to liquidity in the corporate bond market that they believe would assist IOSCO in refining its analysis further. Of particular interest to IOSCO would be specific dealer inventory levels (gross and net) of corporate bonds held for the purpose of market making in corporate bonds, between 2004 to the present date; statistics concerning dealer quoting behavior; more information about the number of counterparties that various buy-side and sell-side firms are trading with; any data related to orders that investors tried to execute but could not do so for various reasons; as well as any data around the time it takes participants to execute trades in secondary corporate bond markets.

[83] 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.

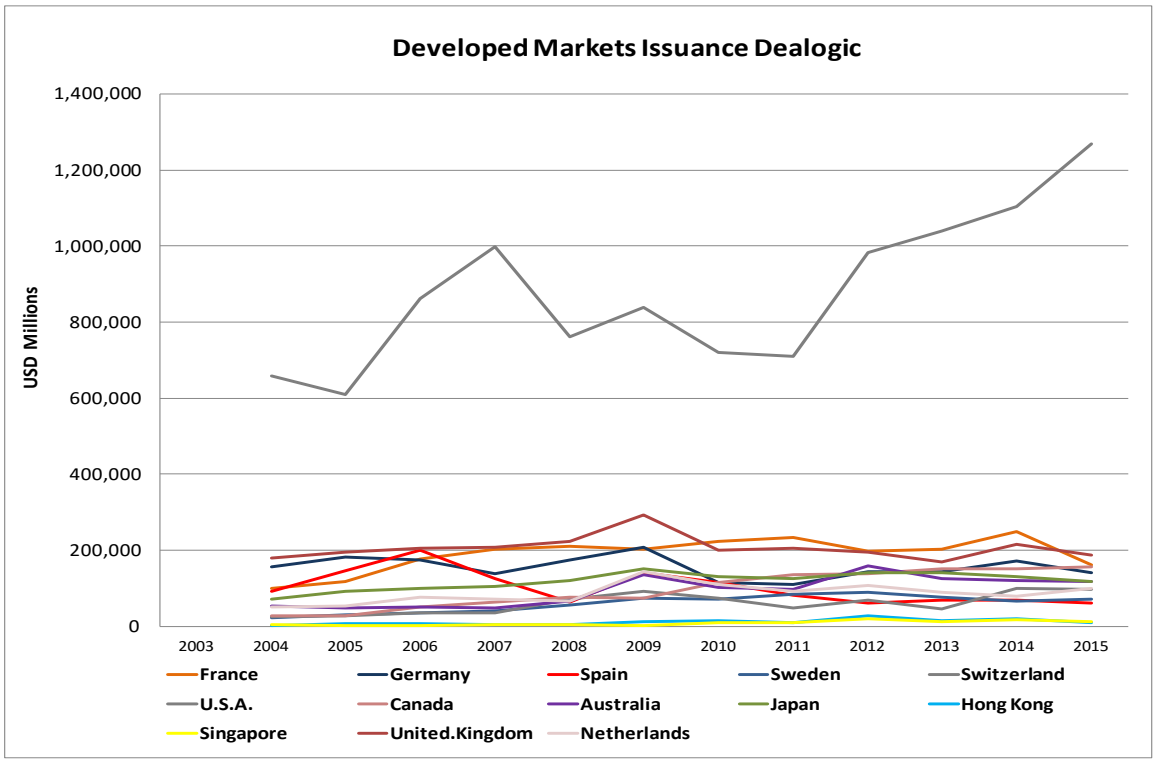
ANNEX 1

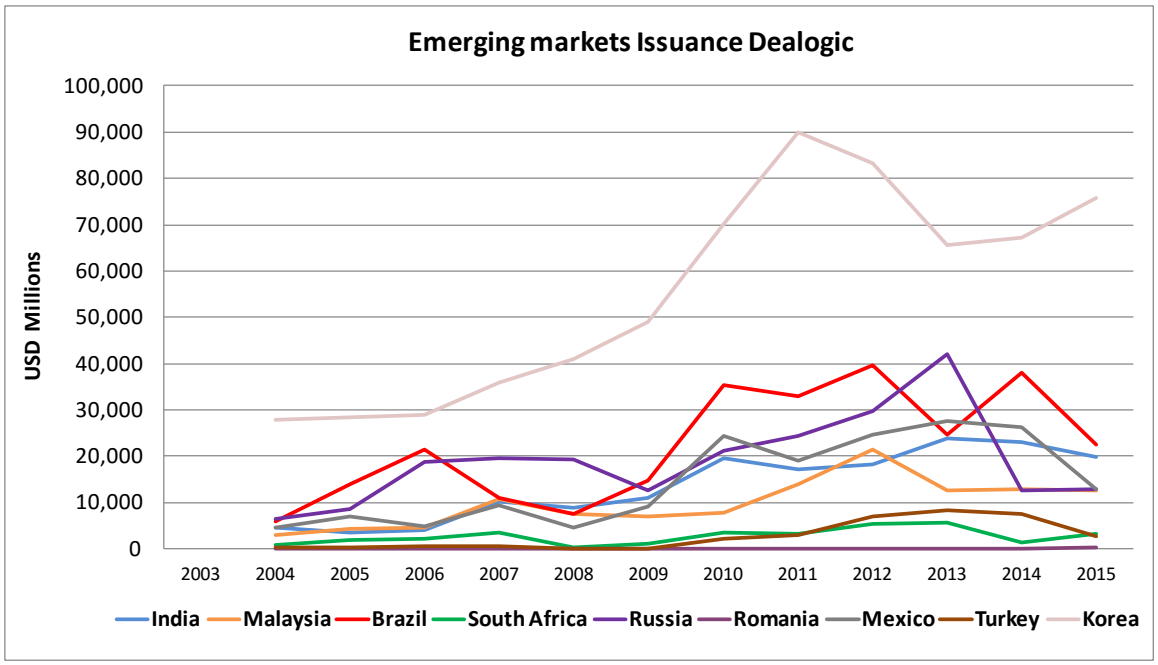
FACTORS CONSIDERED BY MARKET PARTICIPANTS IN DECIDING WHETHER, HOW, WITH WHOM AND WHAT KIND OF BOND THEY WILL TRADE

The following chart summarizes 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 2
DEALOGIC DATA





ANNEX 3

IOSCO SURVEY RESULTS ON PERCENTAGES OF RETAIL VERSUS INSTITUTIONAL PARTICIPATION IN THE CORPORATE BOND MARKETS[84]

IOSCO members use different methodologies to estimate the amount of retail participation.[85] 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.

[84] 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.

[85] 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	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	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	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	68.54%	70.07%	71.56%
	Retail investors	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	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 4

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.[86]

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.[87] 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."[88] Using estimates based on TRACE data, bid-ask spreads "reached record lows in 2014 [and had] a slight increase in 2015"[89] 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.

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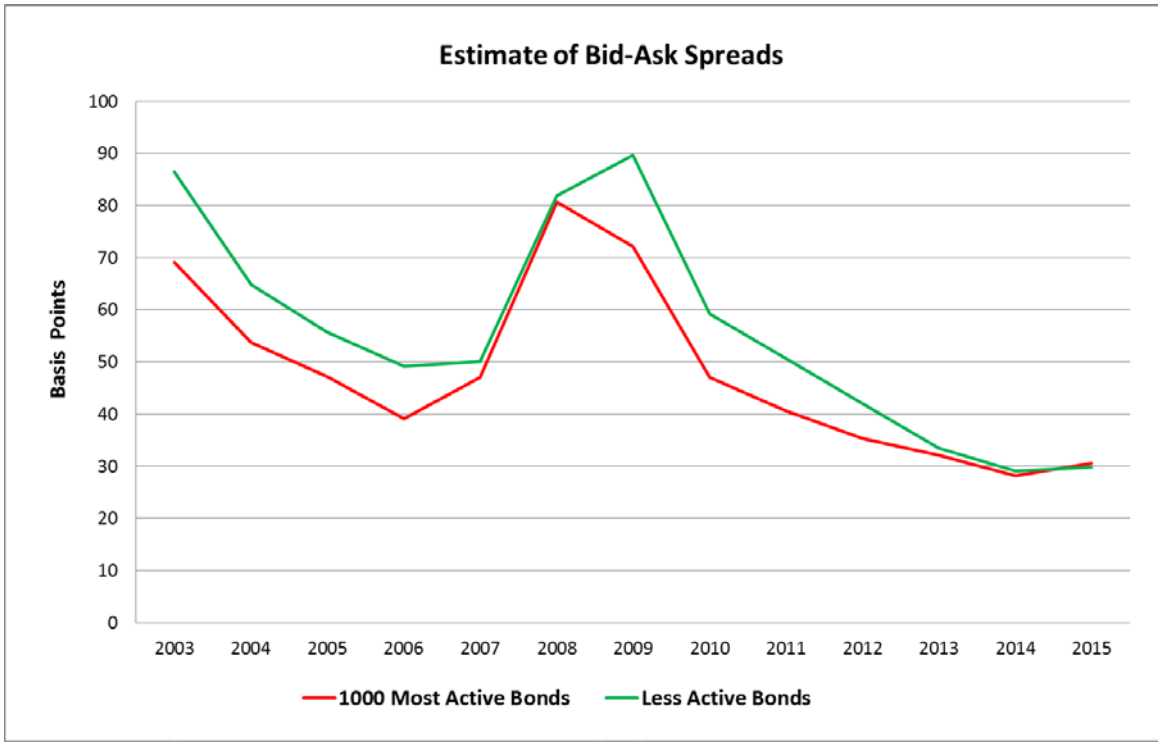
86 Tobias Adrian et al., *Has U.S. Corporate Bond Market Liquidity Deteriorated?*, Liberty Street Economics - Federal Reserve Bank of New York (Oct. 5, 2015) (reviewing various measures of liquidity, including: bid-ask spreads, average trade size, trade volume, turnover rates, and price impact measures); 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).

87 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").

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

89 *Id*. at 12.

Figure 33

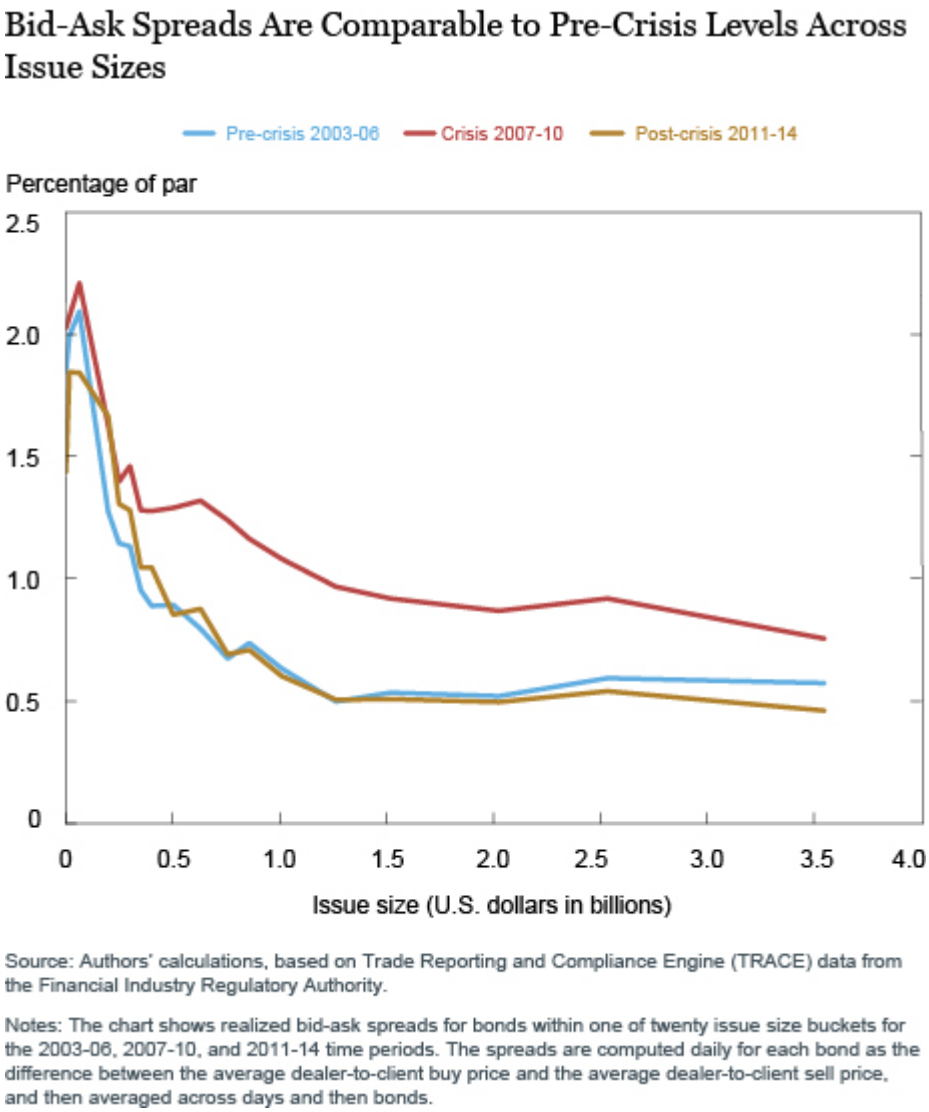


Source: Bruce Mizrach, *Analysis of Corporate Bond Liquidity*, FINRA Office of the Chief Economist, Research Note (Dec. 2015).

The results generally hold when corporate bonds are analyzed 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."[90]

[90] 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

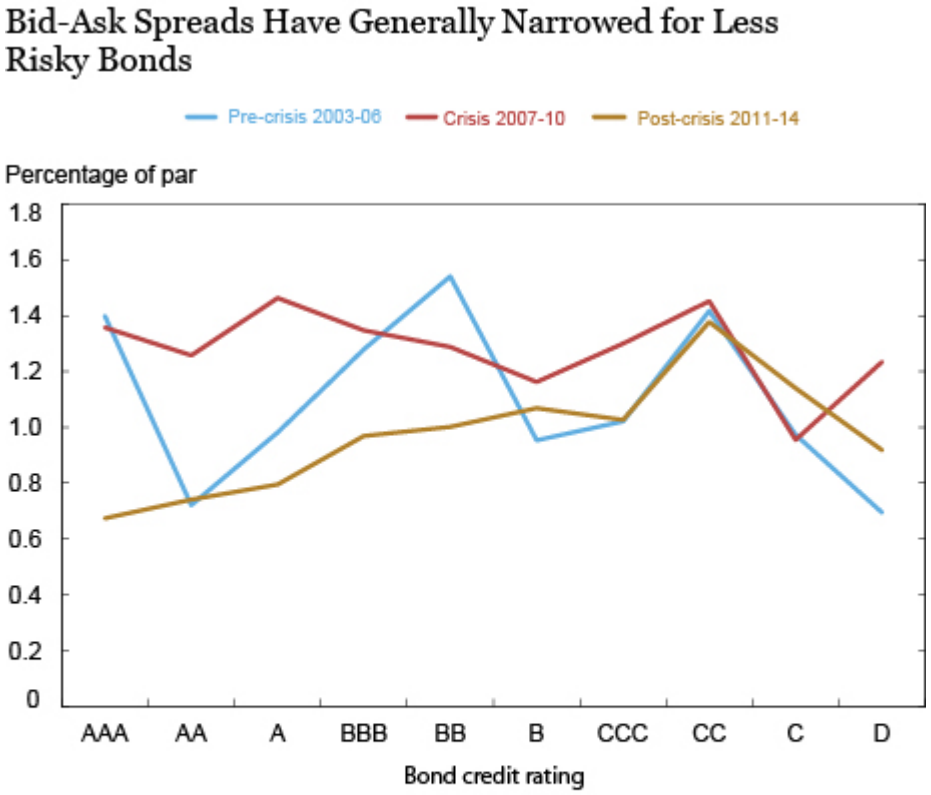


Source: Tobias Adrian et al., *Further Analysis of Corporate Bond Market Liquidity*, Liberty Street Economics – Federal Reserve Bank of New York (Feb. 10, 2016).

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."[91]

[91] *Id.*

Figure 35



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."[92] 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.[93]

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

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

93 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.

view in 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."[94] Although there are articles that contend that the "growth in corporate bond trading has actually kept pace with the growth in outstanding bonds,[95] the general consensus in the literature is that turnover ratios for corporate bonds have declined post-crisis.[96] Similarly, trading volumes relative to annual issuance has also declined.[97]

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.[98] 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."[99] To some commentators, the reduction in average trade size is "evidence that investors find it more difficult to execute large trades and so are splitting orders into smaller trades to lessen price

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

95 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.").

96 *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)."); Sedar Ceilk 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.").

97 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).

98 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")

99 *Id.* at 30.

impact."[100] 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.[101]

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.[102] 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."[103]

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…."[104] 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."[105]

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.[106] "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."[107] 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.[108] 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.[109] One study finds that "price impact is higher for illiquid assets (like HY bonds), and higher still during periods of market duress."[110]

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

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

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

103 *Id.*

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

105 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)).

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

107 *Id.*

108 *Id.* at 6.

109 *Id.* at 11.

110 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

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."[111] 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."[112] 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.[113]

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

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

112 *Id.*

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

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."[114] There also seems to be agreement that the market structure for corporate bonds has changed.[115] 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."[116] One estimate cited in the literature is that liquidity in the U.S. corporate bond market shrank by 70% between 2005 and 2014.[117]

The Federal Reserve Bank of New York created its own index measuring illiquidity in U.S. corporate bond markets by combining three liquidity measures.[118] 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."

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

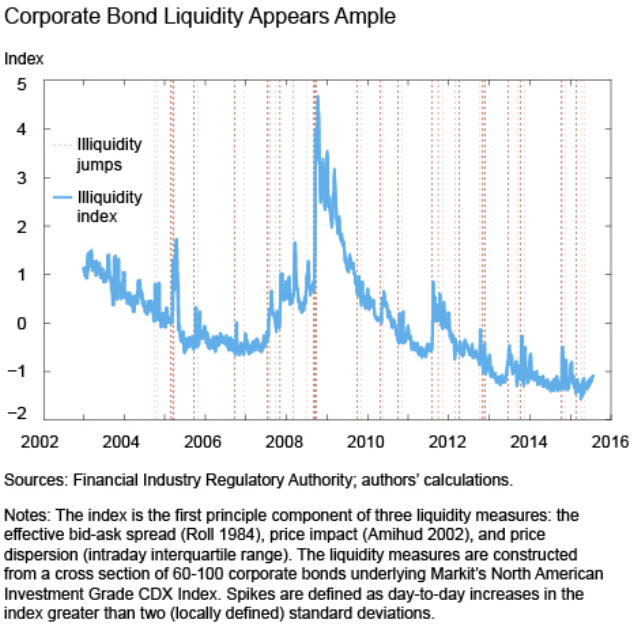
115 *Id*.

116 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.").

117 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 Marches 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).

118 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.

Figure 36



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)."[119] 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:

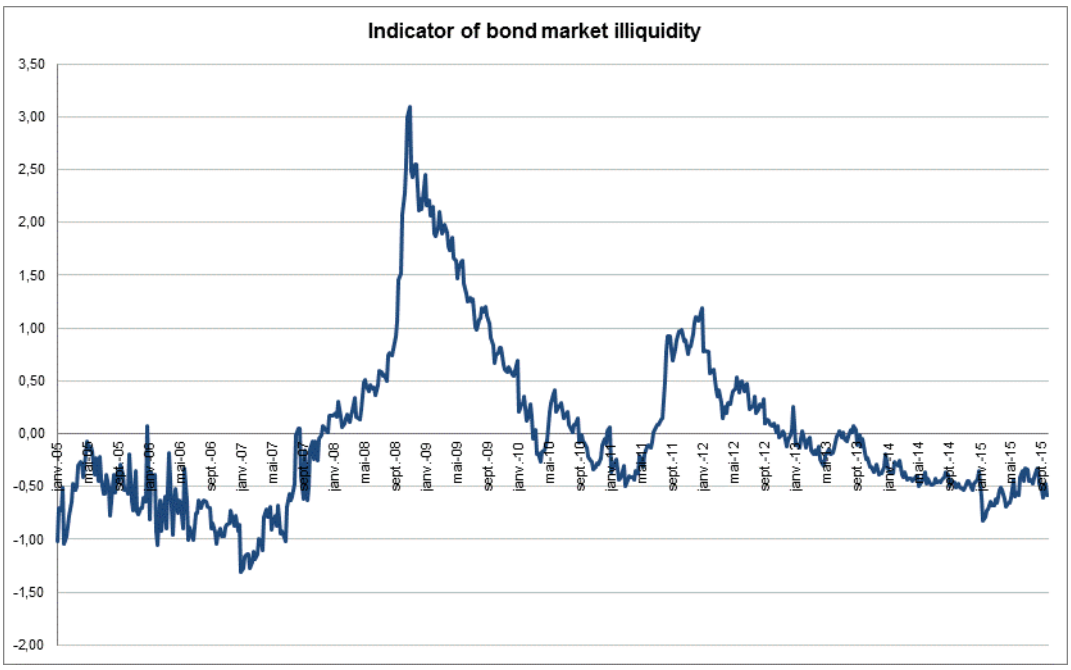
$$CI = \frac{Z(spread) + Z(zero\ return) + Z(price\ impact)}{3}$$

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

[119] Autorité Des Marches Financiers, *Study of liquidity in French bond markets*, (Nov., 2015), at 3.

Figure 37


Indicator of bond market illiquidity
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
janv.-05
mai-05
sept.-05
janv.-06
mai-06
sept.-06
janv.-07
mai-07
sept.-07
janv.-08
mai-08
sept.-08
janv.-09
mai-09
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sept.-15

ANNEX 5

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 Europe.[120]

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:

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120 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.