

Committee on the Global Financial System

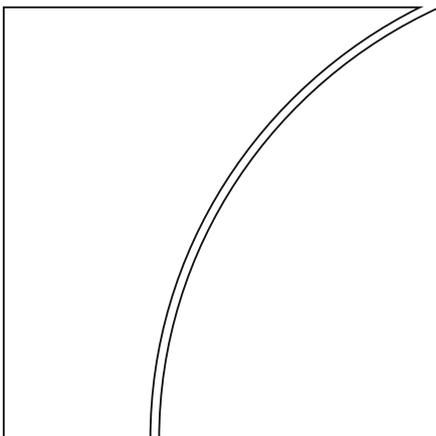
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Market-making and proprietary trading: industry trends, drivers and policy implications

Report submitted by a Study Group established by the
Committee on the Global Financial System
The Group was chaired by Denis Beau (Bank of France)

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Preface

Market-makers serve a crucial role in financial markets by providing liquidity to facilitate market efficiency and functioning. Post crisis, several developments suggest that the behaviour of these liquidity providers may change. Such changes and their potential impact on fixed income markets are of particular interest to policymakers, given the relevance of these markets to monetary policy and financial stability.

Against this background, in September 2013, the Committee on the Global Financial System (CGFS) established a Study Group on market-making and proprietary trading (chaired by Denis Beau, Bank of France) to facilitate a better understanding of how ongoing changes in these activities may affect the provision of immediacy services and, hence, liquidity in fixed income markets.

This report presents the Group's findings. It identifies signs of increased liquidity bifurcation and fragility, with market activity concentrating in the most liquid instruments and deteriorating in the less liquid ones. Drivers are both conjunctural and structural in nature, and it remains difficult at this stage to provide a definitive overall assessment. Yet, given signs that liquidity risks were broadly underpriced in the run-up to the financial crisis, it seems likely that the compressed pricing of immediacy services observed in the past will give way to liquidity premia more consistent with actual market-making capacity and costs. The report outlines a number of possible policy implications that, if pursued, would help making this outcome more likely and would support the robustness of market liquidity.

I hope that the report, and the trends and drivers described therein, will prove to be an important contribution to ongoing discussions about the changing nature of the market-making industry as well as a valuable resource for policymakers and market practitioners interested in the broader implications of these changes.

William C Dudley

Chairman, Committee on the Global Financial System
President, Federal Reserve Bank of New York

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Executive summary

Market-makers serve a crucial role in financial markets by providing liquidity to facilitate market efficiency and functioning. Changes in the behaviour of market-makers as well as other liquidity providers and their impact on liquidity in fixed income markets are of particular interest to policymakers, given the relevance of these markets to monetary policy and financial stability. This report studies current trends and drivers that determine these behaviours before going on to assess their implications for market functioning and robustness. The main findings are:

Observed trends in market liquidity conditions

Diverging liquidity trends. Market liquidity in most sovereign bond markets has returned to levels comparable to those before the global financial crisis, as suggested by a variety of metrics and feedback from market participants. There are, however, signs of increased liquidity bifurcation and fragility, with market activity concentrating in the most liquid instruments and deteriorating in the less liquid ones, such as corporate bonds.

These signs reflect changes under way in market-making supply and demand, which are following diverging paths, prompting market participants to seek ways to limit any impact on trading costs and market liquidity.

Decline in dealer risk-taking capacity and/or willingness. One apparent trend is market-makers' increasing focus on activities requiring less capital and balance sheet capacity. In line with this development, banks in many jurisdictions report allocating less capital to their market-making activities and are reducing their inventories by cutting back on their holdings of, in particular, less liquid assets.

Increasing differentiation and greater focus on core markets. A number of market-makers have reportedly adopted a more selective approach to offering client services (eg focusing on core clients), whereas others are narrowing the scope of their services (eg focusing on a smaller range of markets). In many jurisdictions, market-making has been shifting towards a more order-driven and/or brokerage model. As a result, the execution of large trades tends to require more time, with many market-makers being more reluctant to absorb large positions.

Diminishing proprietary trading by banks. Proprietary trading has reportedly diminished or assumed more marginal importance for banks in most jurisdictions, particularly in the euro area. Expectations are for banks' proprietary trading to generally decline further or to be shifted to less regulated entities in response to regulatory reforms targeting these activities. This contrasts with trends in individual jurisdictions, particularly in Asia, that have been less affected by the recent crisis.

Growing and more concentrated demand for immediacy services. Primary bond market expansion amid significant flows of funds to market participants that require immediacy services point to growing demand for market-making. There are also signs of increasing concentration among market participants that demand immediacy services, such as asset managers. As a result, market liquidity could become more dependent on the portfolio allocation decisions of only a few large institutions.

In addition, some market players have become more exposed to changes in the availability of market-making services. For one, bond funds that promise “daily” liquidity have grown significantly in past years, amid incentives to invest in less liquid instruments in a low-yield environment. Yet, given reduced immediacy provision by dealers, liquidating these assets could prove more difficult than expected when market sentiment deteriorates.

Adjustment in trade execution. Portfolio managers are adjusting the way they execute their trades to the changing costs and availability of immediacy services. Some are increasingly exploring trading strategies that split transactions into smaller amounts or use other means to optimise trading performance. While these adjustments would tend to mitigate the effects of rising demand for immediacy services, the associated costs (eg for IT infrastructure investments) may be difficult to bear for smaller firms.

Expansion of electronic trading. The use of electronic trading in bond markets has been growing, although from relatively low levels, with market participants seeking more price transparency and cheaper trade execution. Trading platforms (if not single dealer-based) tend to support market functioning by pooling liquidity from multiple dealers. That said, existing electronic platforms are often used only for a limited range of typically standardised and smaller-sized transactions, and they often remain dependent on the provision of immediacy services by the same entities that otherwise provide liquidity outside of these platforms.

Drivers and implications

Both market-based and regulatory drivers. The available evidence suggests that observed trends are the result of a broader post-crisis response, raising questions about the extent to which these trends will be cyclical or structural in nature. Given recent crisis experiences, market participants from various jurisdictions underscore the decline in dealers’ risk tolerance as one major driver of the reduction in market-making. Market-makers in many jurisdictions are thus raising the risk premia they demand, reassessing their risk management frameworks and developing more granular assessments of the value of trades, driving up the cost of taking risk.

The post-crisis response also includes regulatory change that has been initiated to reduce systemic risks in the financial system, including in terms of strengthening the balance sheets and funding models of key market-making institutions. These improvements will reduce the probability of banks becoming a source of illiquidity contagion and can contribute to more robust market-making. However, many market participants also expect ongoing changes in regulation to raise the cost of providing immediacy services during normal times, potentially reinforcing the observed trend towards liquidity bifurcation – although to different degrees across asset classes and jurisdictions.

Market implications. Diverging trends for market-making supply and demand generally imply upward pressure on trading costs, reduced market liquidity in secondary markets and, potentially, higher costs of financing in primary markets. At the same time, the compressed pricing of immediacy services observed before the global financial crisis will likely give way to liquidity premia more consistent with actual market-making capacity and costs.

At this stage, there is no conclusive evidence of a widespread rise in trading costs, as a number of factors may be containing the pass-through to clients and issuers. Yet, liquidity may become increasingly fragile in some market segments as the above trends and drivers may have raised the probability of an adverse impact of large and self-reinforcing order imbalances on liquidity conditions – particularly in the current environment of low policy rates and compressed term premia.

Policy implications. Policy responses to these developments can be categorised in terms of (i) *supporting initiatives* to raise the probability of achieving more appropriately priced and robust liquidity conditions; and (ii) *possible backstops* to address vulnerabilities that may arise under adverse scenarios.

On the subject of supporting initiatives, first, market participants and relevant authorities should help mitigate the risks associated with liquidity illusion by strengthening liquidity risk management as well as by improving market transparency and monitoring. With the cumulative effects of the newly emerging regulatory environment and other structural changes still uncertain, policymakers may also want to keep track of their combined impact on the effectiveness and robustness of market-making arrangements.

Second, market-making institutions and their supervisors should ensure that improvements to shock absorption capacities brought about by ongoing regulatory reforms are effective in stressed liquidity conditions, for example via dedicated liquidity stress tests devised for that purpose.

Third, where appropriate, sovereign issuers may want to establish new or review and expand existing incentive schemes for market-makers to enhance secondary market liquidity, while private debt issuers should assess and exploit any potential for greater standardisation of their issuance practices.

In terms of possible backstops, regular liquidity-providing activities are likely to remain central banks' main line of defence. Establishing or expanding securities lending facilities could be considered as an additional option to improve, as needed, market liquidity in key markets during times of stress and to support the robustness of the associated repo markets. Considering other, more direct measures to support market functioning involves several difficult cost-benefit trade-offs (eg due to the risk of distorting economic incentives for market participants). These would need to be taken into account by policymakers if they were to consider whether and under what conditions they might be prepared to adjust existing backstops in the future.

1. Introduction

Market liquidity – the ability to rapidly execute large financial transactions with a limited price impact – is a key feature of financial market efficiency and functioning.¹ Monitoring and ensuring liquidity in fixed income markets is of particular interest to central banks and other authorities, given the relevance of these markets to monetary policy and financial stability.²

As witnessed during past episodes of financial market turmoil, however, market liquidity can evaporate quickly. Assessing the robustness of financial markets thus requires an analysis of the factors that determine the behaviour of liquidity providers and seekers. For sovereign and, to an even greater degree, corporate bond markets, liquidity hinges in large part on the capacity and willingness of market-makers and, to some extent, proprietary traders to absorb temporary demand-supply imbalances by taking on inventory risk. Post-crisis, several developments suggest that the behaviour of these liquidity providers may be subject to change, which is why the Committee on the Global Financial System (CGFS) decided to establish a Study Group to investigate these developments and assess their implications for policymakers.³

This report lays out the Group's findings, starting with a conceptual framework of the economics of market-making (Section 2) that is used to structure the analysis of trends (Section 3) and drivers (Section 4) in market-making and proprietary trading in sovereign and corporate bond markets. Based on the findings of this analysis, the report highlights key implications for market functioning and robustness (Section 5) before going on to discuss a number of policy implications (Section 6).

The views expressed in this report rest on, and are constrained by, an analysis of the data that is currently available to central banks and a review of the literature. The Group's views have also been informed by an informal survey and a series of interviews with private sector experts representing market-making institutions as well as institutional investors in the Group members' home jurisdictions.

2. The economics of market-making

This section presents a stylised framework of the economics of market-making to help structure the discussion of trends and drivers in market-making and proprietary trading that is presented in the following sections. It starts with an assessment of the role of market-makers in sovereign and corporate bond markets. This is followed by a discussion of how market-makers provide immediacy services and of how market-making differs from proprietary trading.

¹ See CGFS (1999) for a discussion of the definition of market liquidity and its different dimensions (eg tightness, depth and resiliency).

² A discussion of the link between financial stability and bond markets is presented in CGFS (2007).

³ A list of the Study Group members is attached at the end of this report; Appendix 1 states the Study Group's mandate.

2.1 The role of market-makers in bond markets

The vast majority of bonds are traded over the counter (OTC) rather than on the central limit order books of exchanges. The dominance of the OTC market structure reflects a number of bond market characteristics, such as: (i) the large number of issued bonds, which reduces the probability of finding matches in investor supply and demand for any given bond;⁴ (ii) the fixed maturity of bonds, allowing buy and hold investors to recoup their invested funds without trading in secondary markets, often resulting in ever fewer trades towards the bond's date of maturity; and (iii) the prevalence of institutional investors who require execution of large-volume transactions that could potentially have a strong price impact when trading on a fully disclosed central limit order book.⁵

In the absence of continuous two-way markets for buyers and sellers, broker-dealers, such as banks and securities trading firms, facilitate bond transactions. They either fulfil client orders by finding matches in existing supply and demand (brokerage or agency trading) or step in as the counterparty of their clients' trades by committing their own balance sheet capacity (market-making or principal trading; see discussion below). Therefore, market-makers:

- (i) provide immediacy services to clients and other market participants, ensuring market liquidity and supporting price discovery;⁶
- (ii) contribute to the robustness of market liquidity by absorbing temporary supply and demand imbalances, dampening the impact of shocks on market volatility and quoting prices to support investors in valuing assets.⁷

Primary and secondary bond markets are closely related, with many market-making firms active in both. Bond issuers generally have an incentive to improve the liquidity of their issues in secondary markets to reduce the premium that investors demand.⁸ Many jurisdictions have thus adopted primary dealer (PD) systems for central government bonds that often combine incentive schemes with market-making obligations (Box 1).

Other frequent issuers, such as regional governments, government-sponsored enterprises or supranational institutions, have similar (but usually less formal) setups. This contrasts with infrequent issuers, such as the majority of corporates, where dealers are more likely to support secondary market liquidity for a fee on a deal by deal basis or in return for underwriting deals and other related business with the corporate issuer.

⁴ According to the International Capital Market Association (ICMA), 6,810 shares were admitted to trading on regulated markets in the EU in July 2009 as compared with the more than 150,000 debt securities contained in Xtrakter's Computer Updated International Database (CUPID).

⁵ Biais and Green (2007), for example, document how the rising importance of institutional investors coincided with a shift in trading of US municipal and corporate bonds from the New York Stock Exchange (NYSE) to OTC markets in the late 1920s and mid-1940s, respectively.

⁶ In general terms, immediacy services include all services provided by intermediaries (eg dealers, brokers) that support market participants in executing their trades on an immediate basis.

⁷ For the purpose of this report, market liquidity is considered robust if it proves sufficiently insensitive to adverse shocks on the underlying financial market.

⁸ Sovereign bond issuers may also want to promote the liquidity of their bonds as part of a broader effort to develop domestic financial markets.

Market-making by primary dealers in sovereign bond markets

In many jurisdictions, access to the primary central government debt market is restricted to primary (or “authorised”) dealers (PDs). PDs are appointed by the sovereign issuer or its agent to buy, promote and distribute sovereign debt securities. In addition (typically) to preferential access to sovereign debt auctions, they often benefit from other privileges such as (i) eligibility to participate in non-competitive auctions; (ii) access to the fiscal agent’s or central bank’s securities lending facilities; or (iii) being considered by the agent as a privileged counterparty for debt management operations (eg syndicated issuance, buybacks, swaps).

In turn, PDs in many countries are obliged to meet specific requirements in the primary market, often including quantitative thresholds for auction participation, as well as market-making obligations in secondary markets. These obligations differ across jurisdictions, with some requiring PDs to continuously quote firm two-way prices, including limits on bid-ask spreads and minimum amounts of quoted volumes, whereas others provide more leeway to PDs in adjusting their quotes.

Large banking groups tend to have many PD mandates, reinforcing the close ties between primary and secondary sovereign bond markets.^① Yet, interviews with market participants suggest that many dealers have been concentrating their efforts on a reduced number of core market segments, even though the incentives offered to PDs tend to be more generous for smaller, less liquid sovereign bond markets.^② This could affect secondary market liquidity in those markets where the remaining PDs lack the capacity to take up the market share.

^① According, for example, to the Association for Financial Markets in Europe (AFME), 10 banks had 10 or more PD mandates in national European bond markets in September 2013.

^② One example is Sweden, where the debt management office pays commissions to PDs for participating in primary and secondary sovereign bond markets.

2.2 The provision of market-making services

While the business models of market-makers differ depending on, for example, the market segments in which they operate, they broadly share a number of common features. These include: a sufficiently large client base to ensure access to sizeable order flow information; the balance sheet capacity to take on large principal positions; continuous access to multiple markets, including those for funding and hedging instruments; the capacity to manage inventory and other risks; and market expertise to provide competitive quotes, including during times of elevated financial market volatility. Graph 1 provides a stylised overview of the resulting interlinkages based on the example of a bank’s bond market-making desk.⁹

A simplified market-maker’s profit and loss (P&L) account highlights how these interlinkages map into revenues and costs (Graph 2). Two broad categories of (net) revenues can be defined: first, *facilitation revenues*, which reflect the realised spread on the bid and ask prices, net of the cost of trading. Second, unless trades can be immediately offset by opposing trades (ie the market-maker matches existing orders so that inventories remain unaffected) the P&L account is complemented by *inventory revenues*. These comprise changes in the value of the warehoused asset, carry of the position (eg accrued interest), the cost of funding as well as hedging

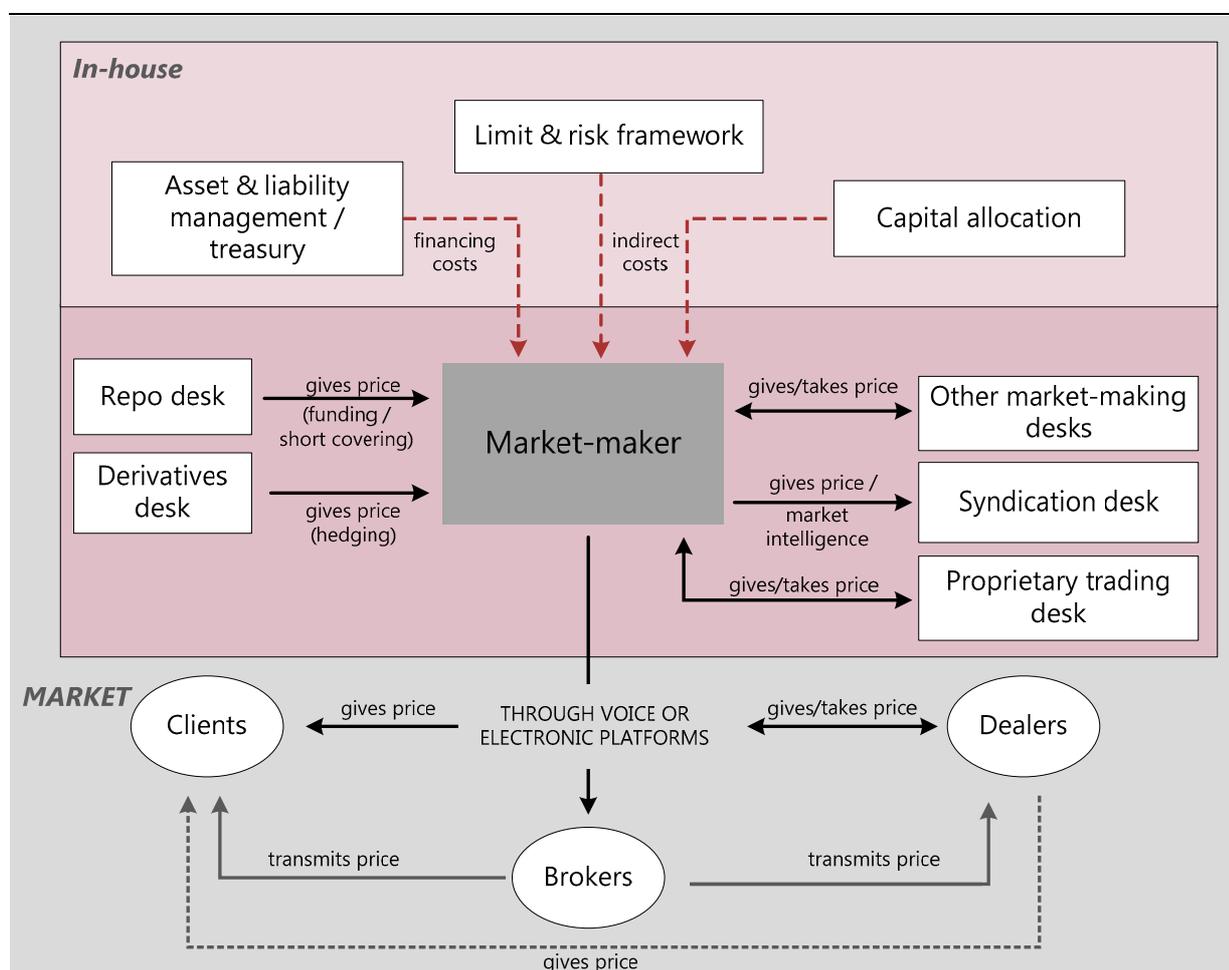
⁹ Some papers in the literature also link market-making activities to dealers’ research coverage, suggesting that dealers make markets in securities where they have built up an informational advantage. For studies on US equities see, for example, Madureira and Underwood (2008) or Schultz (2003).

costs. Regulatory requirements and similar constraints are another important factor. They affect market-makers' P&L along various dimensions, including via their impact on capital, funding and hedging costs, and central clearing incentives as well as other costs (eg compliance).

Quoted bid-ask spreads thus incorporate market-makers' expectations of the cost and risk associated with a change in inventory.¹⁰ Therefore, bid-ask spreads will tend to be narrow (and quoted quantities high) if trading positions can be offset quickly and at low cost or if the cost of funding inventory is low. The liquidity of a given market hence also depends on the functioning and liquidity of related markets that facilitate the management of risks (eg derivatives markets for hedging, inter-dealer markets for redistribution of inventory) as well as those that are used for funding (eg repo).

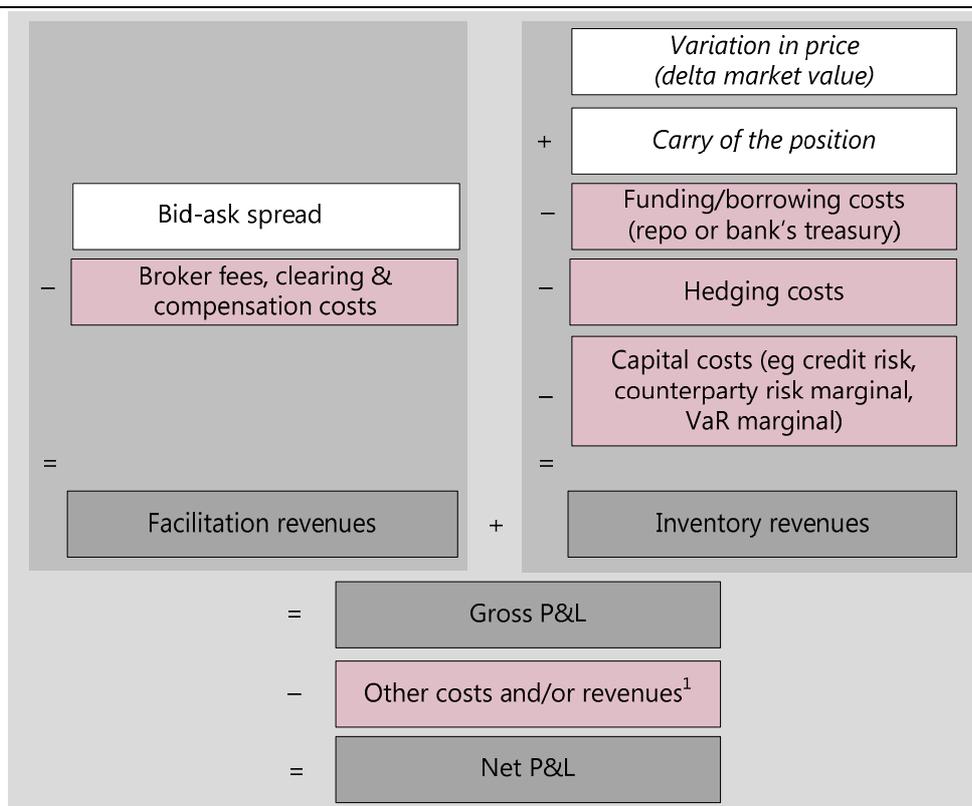
Market-making – in-house and market-related interlinkages

Graph 1



Source: CGFS Study Group.

¹⁰ For an overview of theoretical and empirical studies on market-makers' quoting strategies see Madhavan (2000).



¹ Other costs include, for example, trading desk and support staff, compliance, IT and administrative costs as well as central counterparty membership fees. Other revenues may include income from other business lines (eg syndication) that is attributed to the market-making desk.

Source: CGFS Study Group.

Another factor affecting quotes at the individual dealer level is the difference between the current and the desired inventory. The latter reflects current and expected customer order flows as well as limits imposed by the dealer's risk management framework (Graph 1), eg those based on value-at-risk (VaR) and other metrics.¹¹ Dealers whose positions approach the limits set by their institution's risk management framework are thus incentivised to adjust their quotes to realign their inventory. Reduced tolerance for risk at the firm level will impact the amount of capital dedicated to market-making activities. This is likely to affect less liquid markets most, as these typically require market-makers to warehouse securities for longer periods of time with fewer hedging options, driving up inventory risks.

The market structure, including the way quotes are provided, may also have a bearing on and be indicative of a market's liquidity. The prevailing structure in bond

¹¹ Interviews with market participants suggest that risk metrics have been refined in recent years to better reflect the specific risks of the underlying financial instrument. VaR limits remain the most commonly used tool, followed by metrics such as delta risk and limits on the exposure to yield changes (eg based on duration measures, such as DV01). Stressed VaR and limits on issuer exposures have also gained importance. Likewise, stress testing of portfolios and internal capital charges that incentivise higher inventory turnover have become increasingly popular as well.

markets features competing dealers. Quotes are transmitted to clients or other dealers (eg on inter-dealer markets) either directly (eg by voice or displayed on the screen of electronic platforms) or via brokers who facilitate trades for a commission (Graph 1). In the most liquid markets, such as those for sovereign bonds, two-way prices are continuously provided (ie quote-driven markets). Bid-ask spreads in these markets are typically tight. Profit margins for market-making are thus thin, requiring market-makers to seek high inventory turnover. Given that continuous access to firm (ie readily executable) two-way prices facilitates trading and promotes market liquidity, a number of sovereign issuers (Box 1) and trading venues offer incentives for market participants to take on market-making obligations.¹² Less liquid markets, in contrast, will tend to be order-driven. In these markets, clients request quotes from market-makers and thus do not have access to firm prices on an ongoing basis (see also Box 2 in Section 3.4).

Changes in the market environment and sentiment affect the provision of liquidity. Market-makers can respond to such changes by adjusting their bid-ask spreads, the quantities they are willing to trade at these prices, or their quoting behaviour. Rising market volatility, for example, can weigh on dealers' willingness to hold inventory as the associated VaR rises and the cost of hedging exposures increases. Markets could then witness a widening of bid-ask spreads and a decline in quoted depth (ie the quantities that can be traded at the best bid and ask price), before market-makers eventually discontinue quoting on an ongoing basis and only passively respond to clients' requests for quotes. These dynamics are likely to be particularly pronounced for securities that are known to be very sensitive to changes in market sentiment and for which limited hedging instruments exist.

2.3 Market-making versus proprietary trading

Market-makers are not the only market participants that contribute to market liquidity. Proprietary traders can, in principle, also contribute to absorbing temporary market imbalances and their activities are often closely tied to those of market-makers within the same institution. These similarities complicate the distinction between the two in practice. Yet, market-making and proprietary trading can be differentiated along several dimensions.¹³

Objectives. One dimension is the objective of the two activities. Market-making serves the customer relationship. An assessment of the profitability of market-making is thus based not only on the P&L of the market-making units – as would be the case for proprietary trading – but also on any associated client business (eg underwriting, origination, asset management, prime brokerage) tied to the provision of market-making services. The importance of the customer franchise, as corroborated by interview results, can help explain why banks continue to provide market-making services even in less profitable markets and, to some extent, during times of elevated financial market volatility or stress. One inference from this observation is that proprietary traders, who do not need to protect a client

¹² For example, only registered market-makers are allowed to quote prices on the MTS system, one of the largest bond trading platforms in Europe. NYSE Euronext, in turn, exempts designated liquidity providers from charges on bond orders and transactions related to their market-making mandate.

¹³ Other dimensions, not discussed here, include differences in the remuneration of traders or in the constraints imposed by risk management frameworks.

relationship, are almost certain to pull back from providing liquidity in stressed market environments unless they seek to profit from what they expect to be a temporary market correction. Market-makers, in contrast, are bound to keep serving at least parts of their customer base.

Asymmetric information. Another dimension of differentiation between the two activities is informational advantages. Given their primary objective to facilitate trades rather than taking directional (ie long or short) positions, market-makers are typically considered not to trade on any specific informational advantages. Proprietary traders, by contrast, often seek to gain such advantages (eg through market research) to profit from informed trading decisions. This suggests that market-makers will adjust their spreads to account for the probability of quotes being hit by more informed traders.¹⁴ This also implies that proprietary traders, in theory, will tend to be better positioned to identify situations in which market prices depart from fundamental values, prompting them to “lean against the wind” by taking on risk. That said, proprietary trading may also amplify price movements by building up large speculative positions that may need to be unwound quickly once market conditions change.

Risk profiles. Despite these differences, the risk profiles associated with market-making and proprietary trading can be very similar. One reason is that market-making activities can vary widely, depending on the characteristics of the market. In highly liquid markets, risk-taking can be limited, with market-making profits mainly arising from facilitation revenues (Graph 2). Less liquid markets, by contrast, often require market-makers to hold positions over extended periods of time or to progressively build up inventory in expectation of future client demand. Direct hedges for these illiquid positions are typically unavailable or costly. The risk characteristics of the positions taken in the context of this type of market-making can thus strongly resemble positions that are taken for proprietary purposes.

Regulatory definitions. Given these similarities, regulations that aim to prevent a repetition of the large losses accrued – and knock-on effects created – by proprietary trading desks during the global financial crisis face significant challenges in differentiating market-making from proprietary trading. Regulatory definitions of these activities exist in many jurisdictions and are often used in banking laws, financial market regulations and PD mandates, even though mostly in fairly general terms (Appendix 2). One core element of market-making definitions is the quoting of firm two-way prices on a regular and ongoing basis. Proprietary trading, in turn, is typically defined as trading activities with the sole purpose of making profits for traders’ own accounts (and those of related financial entities) and with no involvement in client business. That said, some regulatory definitions explicitly mention that market-makers may deal on their own account as well,¹⁵ in part (as mentioned above) because increases in warehoused assets in preparation for anticipated client demands are hard to disentangle from the build-up of long trading positions.

¹⁴ See, for example, Kyle (1985) as well as Glosten and Milgrom (1985) for related theoretical models and Madhavan (2000) for an overview of the literature on asymmetric information and dealer behaviour.

¹⁵ One example is the definition of market-makers in the European Union’s Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments (MiFID 2) and amending Directive 2002/92/EC and Directive 2011/61/EU, *Official Journal of the European Union*, L 173, 12 June 2014, pp 349–496.

3. Trends in market-making and proprietary trading

This section lays out trends in market-making and proprietary trading to inform the analysis of potential system-wide implications in the remainder of the report. Focusing primarily on sovereign and corporate bond markets, the section starts with a discussion of a variety of liquidity metrics to then study developments in the supply of and demand for immediacy services. Insights gained from interviews with market participants complement the analysis.¹⁶ The section concludes by illustrating the move towards electronic trading in some market segments.

3.1 Assessing trends in bond market liquidity

The previous section suggests that a variety of empirical measures relate to both market-making and proprietary trading activities, with no individual measure likely to comprehensively reflect either activity (see also Appendix 3). Focusing primarily on trends in sovereign and corporate bond markets, the analysis in this section thus builds on a discussion of developments in a variety of selected liquidity and dealer-focused metrics.

Taken together, these (as well as qualitative measures) suggest that market liquidity in most sovereign bond markets improved greatly after the global financial crisis, returning to levels comparable with those before the crisis. That said, additional episodes of sharply deteriorating liquidity are apparent in some markets, such as those affected by the sovereign debt crisis in the euro area. Furthermore, conjunctural factors – such as the current low-yield environment amid unusually accommodative monetary policies – may be masking the full impact of underlying trends in market-making supply and demand. As a result, liquidity conditions could prove susceptible to abrupt changes in these factors (see also Section 5.2).

Spreads. Bid-ask spreads widened sharply across all major sovereign bond markets after the failure of Lehman Brothers in late 2008 and have generally narrowed since (Graph 3). Sovereign bond markets in the euro area witnessed an additional spike in spreads in late 2011, reflecting heightened volatility as the euro area sovereign debt crisis deepened.

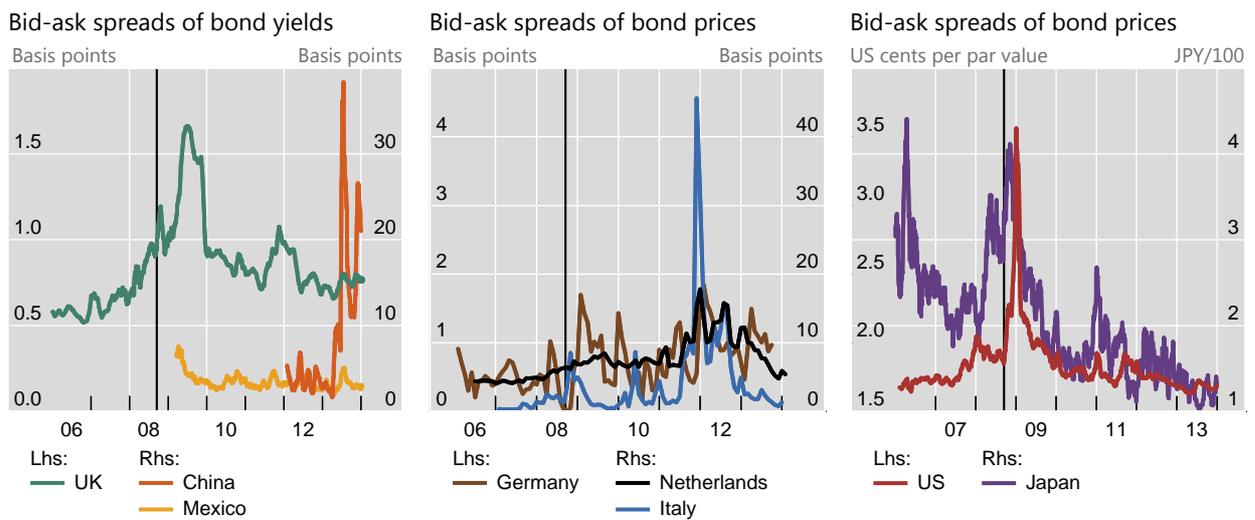
Quoted depth and transaction size. The available data on quoted depth are consistent with a general recovery of liquidity from its trough in late 2008, with an additional setback in the euro area during the second half of 2011 (Graph 4, upper left-hand panel). Notably, quoted depth in US Treasury securities contracted markedly during the mid-2013 bond market sell-off amid tight bid-ask spreads. This observation underscores that reliance on spread-based information only may misguide the assessment of liquidity conditions. Data on trade size mimic the pattern for quoted depth, with transaction sizes declining in 2008 and recovering thereafter in the United States, while exhibiting an additional decline in jurisdictions affected by the euro area sovereign debt crisis (Graph 4, upper centre panel).

¹⁶ Study Group members conducted interviews with representatives from eg major banks, securities dealers and asset managers as well as pension and hedge funds.

Price impact. Estimated price impact coefficients¹⁷ – arguably the most comprehensive measure of the cost of executing large trades – point to similar developments in market liquidity. For US Treasury securities, they rise sharply in late 2008, highlighting the difficulty of executing large trades in stressed markets (Graph 4, upper right-hand panel). Since then, these coefficients have been returning to pre-crisis levels, notwithstanding some smaller spikes during times of heightened market volatility. Similar developments can be shown for other sovereign bond markets (eg Italy, Japan).

Sovereign bond bid-ask spreads¹

Graph 3



The black vertical lines correspond to 15 September 2008 (Lehman Brothers bankruptcy).

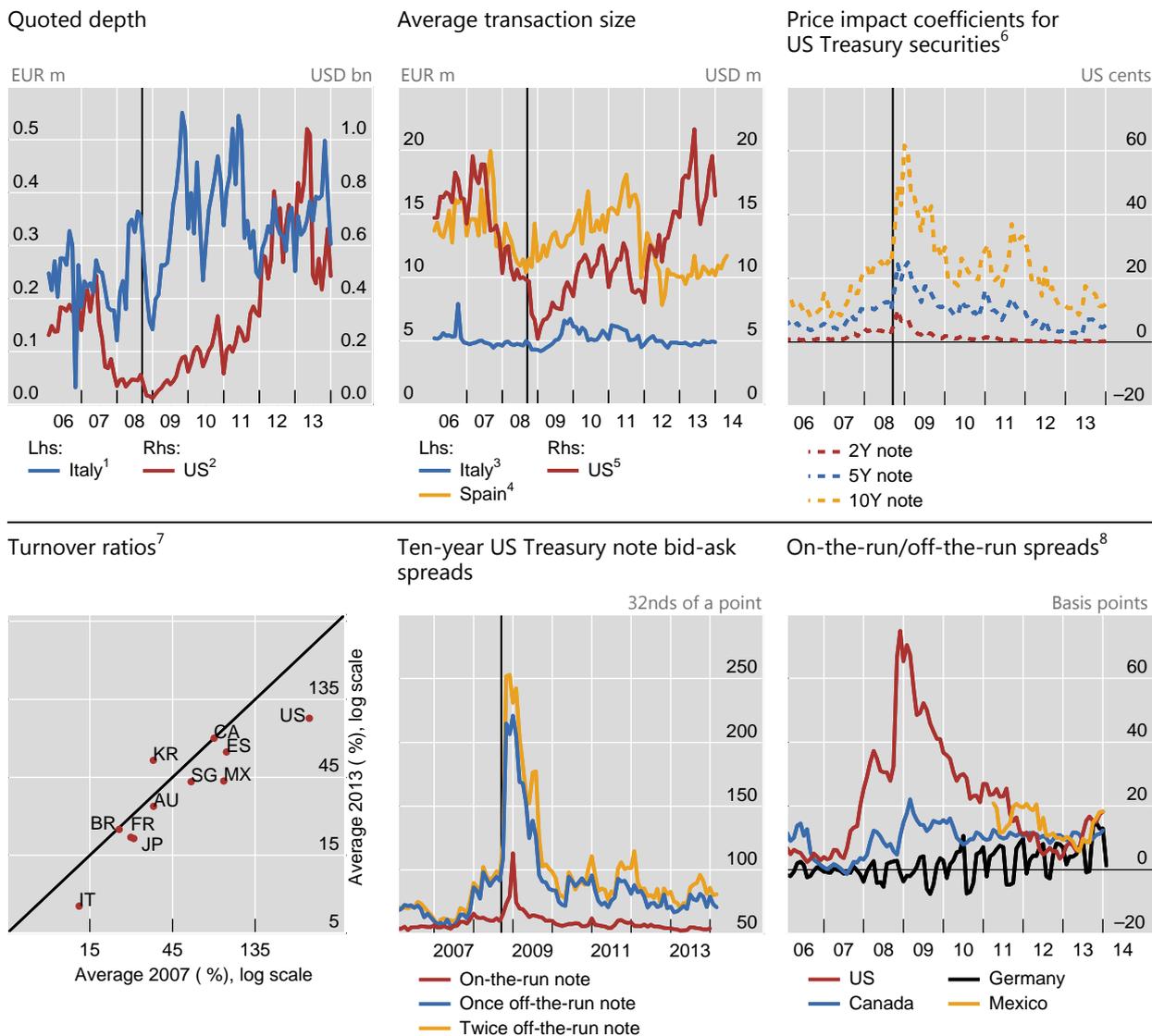
¹ Bid-ask spreads for German and Italian government bonds are based on monthly data; for all other countries, they are based on four-week rolling averages of daily observations. Bid-ask spreads for Japan refer to government bond futures.

Sources: Study Group member contributions based on national data; BIS calculations.

Turnover. Finally, trading volumes have broadly recovered in sovereign bond markets since the global financial crisis, with a sizeable increase observed in several emerging markets (eg Brazil, China, Korea, Mexico). Yet, secondary market volumes have often not kept pace with robust primary market issuance, resulting in lower turnover ratios, ie trading volume divided by outstanding amounts (Graph 4, lower left-hand panel).

Signs of liquidity bifurcation? The analysis so far has largely focused on benchmark securities in major sovereign bond markets that may not be representative for market liquidity in bond markets more generally. In fact, a significant share of the interviewed market participants raised concerns about a bifurcation of liquidity, with liquidity concentrating in the most liquid instruments and deteriorating in the less liquid ones.

¹⁷ For more information on the estimation of price impact coefficients see Fleming (2003).



The black vertical lines correspond to 15 September 2008 (Lehman Brothers bankruptcy).

AU = Australia; BR = Brazil; CA = Canada; ES = Spain; FR = France; IT = Italy; JP = Japan; KR = Korea; MX = Mexico; SG = Singapore; US = United States.

¹ Quoted depth for the five best quotes exhibited in MTS Cash for medium- and long-term Italian government bonds; monthly sum of the average daily depth. MTS Cash is an inter-dealer market and the most important wholesale secondary market for Italian government bonds. ² Quoted depth for the best bid and ask price (ie first tier); monthly averages of daily series for two-year US Treasury notes. ³ Average transaction size on MTS Cash. ⁴ Average transaction size for Spanish public debt. ⁵ Average transaction size for 10-year US Treasury note. ⁶ Price change per \$1 billion net order flow; monthly averages. ⁷ Turnover ratios are calculated by dividing the monthly aggregate trading volume by the amount of outstanding issues; yearly average of monthly ratios. The diagonal black line represents the bisecting line. ⁸ Ten-year central government securities for Canada, Mexico and the United States. Five-year central government securities for Germany.

Sources: Study Group member contributions based on national data; BIS calculations.

One related question is whether liquidity is increasingly concentrated in only a few sovereign bonds. Bid-ask spreads of less actively traded securities, for example in the United States (Graph 4, lower centre panel), are generally wider than those for more liquid securities. Moreover, spreads of the less liquid securities have widened more sharply than those of the more liquid securities at times, such as in the United States during the mid-2013 bond market sell-off. That said, there is no clear trend evident of spreads diverging more over time.

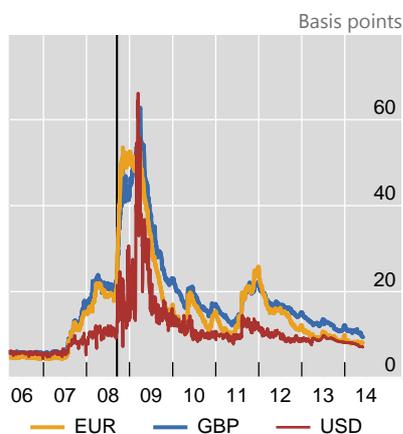
On-the-run/off-the-run spreads provide another gauge of the relative liquidity of more and less liquid sovereign bonds. Such spreads illustrate varied patterns across sovereign bond markets. In US and Canadian markets, spreads spiked up around late 2008, but have generally been trending back to pre-crisis levels since then (Graph 4, lower right-hand panel). In other markets, spreads are seen to have widened somewhat in recent years (eg Mexico) or show no clear trend (eg Germany).

Corporate bonds. Another question is whether trends differ for corporate bonds. Indeed, bid-ask spreads have remained somewhat wider than before the crisis in major corporate bond markets (Graph 5, left-hand panel). While trading volumes have increased significantly in many jurisdictions, turnover ratios have often declined due to the strong primary bond issuance (Graph 5, centre panel).

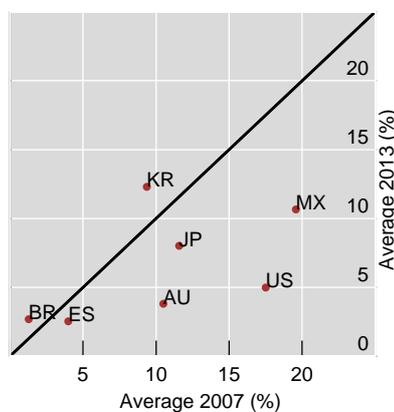
Corporate bond markets

Graph 5

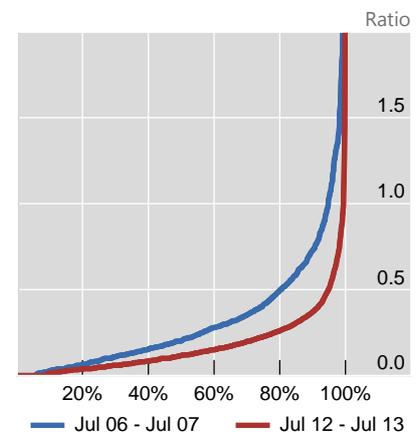
Bid-ask spreads by currency



Monthly turnover ratios¹



Distribution of 12-month turnover ratios for US corporate bonds²



The black vertical line in the left-hand panel corresponds to 15 September 2008 (Lehman Brothers bankruptcy).

AU = Australia; BR = Brazil; ES = Spain; JP = Japan; KR = Korea; MX = Mexico; US = United States.

¹ Turnover ratios are calculated by dividing the monthly aggregate trading volume by the amount of outstanding issues; yearly average of monthly ratios. The diagonal black line represents the bisecting line. ² Turnover ratios are calculated by dividing the sum of block trading volumes (from July to the subsequent July) by the amount of outstanding issues; x-axis as a percentage of the share of bonds traded.

Sources: Study Group member contributions based on national data; Citi Research; FINRA TRACE; iBoxx; BIS calculations.

Many market participants have considered trading large amounts of corporate bonds increasingly difficult (eg with block trade sizes of US investment grade corporate bonds declining continuously in recent years). Furthermore, even though reliable data are often unavailable, trading appears to remain highly concentrated in just a few liquid issues in most corporate bond markets, with signs of further

concentration evident in some markets. One example is US corporate bond markets, where the share of securities with a 12-month turnover ratio of at least 50% (ie the sum of traded volumes accounting for at least half of the securities' outstanding amount) has declined from 20% to less than 5% (Graph 5, right-hand panel).

Funding markets. Developments in repo markets provide information on changes in market-makers' funding conditions and are often closely tied to developments in trading volumes of the underlying securities (Graph 6, left-hand panel). In both the United States and Europe, repo volumes surged in the run-up to the global financial crisis, before contracting markedly during the crisis (Graph 6, left-hand panels).¹⁸ They have since stabilised at somewhat lower levels than before the crisis, with the spread between the general collateral (GC) repo rate and the overnight index swap (OIS) rate, a broad gauge of the scarcity of sovereign bonds, remaining fairly tight in most advanced economies. One exception is the euro area, where spreads widened markedly around late 2011 amid elevated bond market volatility (see CGFS (2013)).

Despite this overall benign assessment of repo market developments, some market participants have raised concerns about reduced availability of specific securities for use in repos, pointing to spikes in repo fails (eg around regulatory reporting deadlines) and an increased frequency of securities trading "on special". Some have linked these developments to the impact of large-scale purchases by central banks which have reduced the amount of available issues in specific market segments. Others, by contrast, underscore that market liquidity tends to benefit from these purchases given direct flow effects and the implicit funding backstop provided to banks trading in these securities.¹⁹

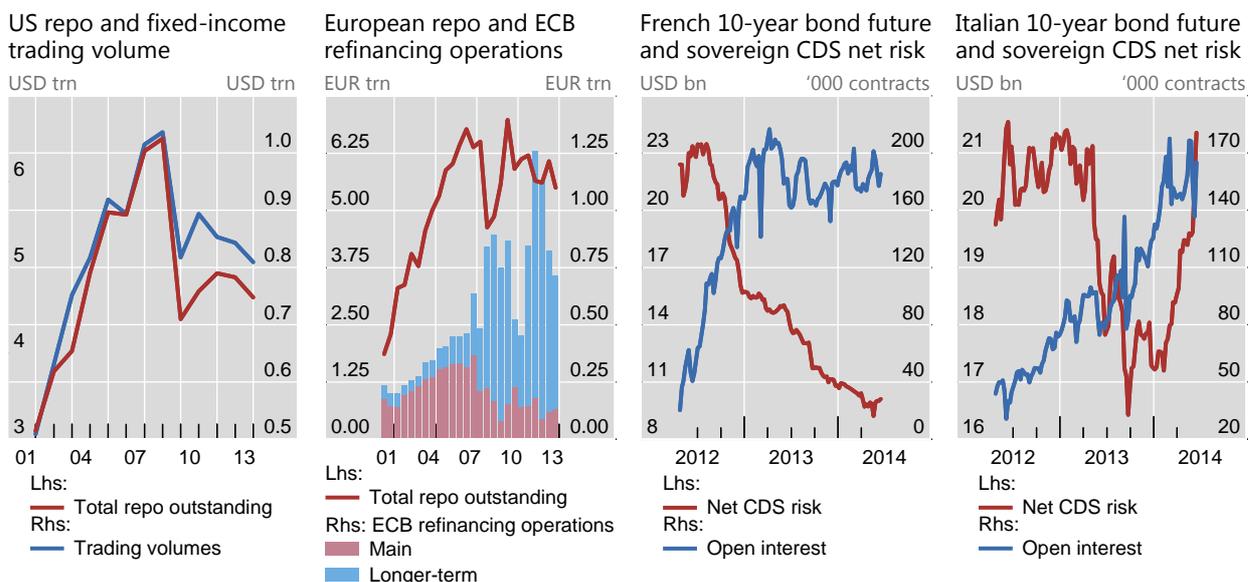
Hedging markets. Market-makers use a variety of hedging instruments to manage inventory risks. Market- and regulatory-driven trends that result in a decline in market liquidity for some instruments may thus trigger a shift in trading activity to closely related markets. One such example is the apparent shift in activity from sovereign CDS markets to bond futures in some euro area jurisdictions, coinciding with the introduction of a new regulation on short selling and credit default swaps in the European Union in November 2012 (Graph 6, right-hand panels).²⁰

By comparison, bond futures markets in other jurisdictions (eg Germany, Japan) have not witnessed a comparable expansion, with volumes declining strongly during the global financial crisis before settling at levels observed before the run-up to these crisis events. Traded volume of the US 10-year futures contract soared up to mid-2007, but contracted significantly up to end-2008. Since then, volume has trended upwards again.

¹⁸ Despite this similar pattern, market conditions in US and European repo markets differed considerably during the financial crisis as discussed by Hördahl and King (2008). For example, spreads between GC repo and OIS rates remained relatively stable in European markets, while they became strongly negative in the United States, pointing to elevated demand for US Treasuries at the time.

¹⁹ The analysis conducted by Christensen and Gillan (2012), for example, concludes that the second round of Federal Reserve large-scale asset purchases reduced liquidity premia in the market for US Treasury inflation protected securities (TIPS) and inflation swaps.

²⁰ Even though the regulation exempts market-makers and PDs, the decline in CDS market liquidity may have induced market-makers to hedge risks using alternative financial instruments.



Sources: ECB; Barclays; Bloomberg; ICMA; SIFMA; BIS calculations.

3.2 Supply of immediacy services

While market-based liquidity metrics provide important indications about past and present developments in market liquidity, they may be less informative about the present and future capacity and willingness of dealers to make markets. To help gauge related trends, developments in dealer inventories and risk-taking behaviour are assessed below against the feedback gathered from the Group's interviews.

Dealer inventories. Starting with a bird's-eye perspective, aggregate data on major banks' gross and net trading securities holdings point to a steep decline in inventories during the global financial crisis for both US and European banks (Graph 7, left-hand and centre panels). Since then, positions at US banks have broadly stabilised, whereas they have continued to fall at their European peers.

These developments contrast with the robust growth in inventory of major emerging market banks (Graph 7, right-hand panel), although starting from much lower levels in both absolute and relative terms (eg as measured by the share of trading securities in total earning assets).

Differentiated adjustment. In addition to these broad differences across jurisdictions, developments seem to differ also by asset class, as suggested by more detailed inventory information. A striking pattern of position changes is evident in the United States, where dealers' net positions in corporate debt securities (which include asset-backed securities) have fallen sharply since 2008, whereas net US Treasury positions rose during the crisis and are now net positive (Graph 8, left-hand panel).

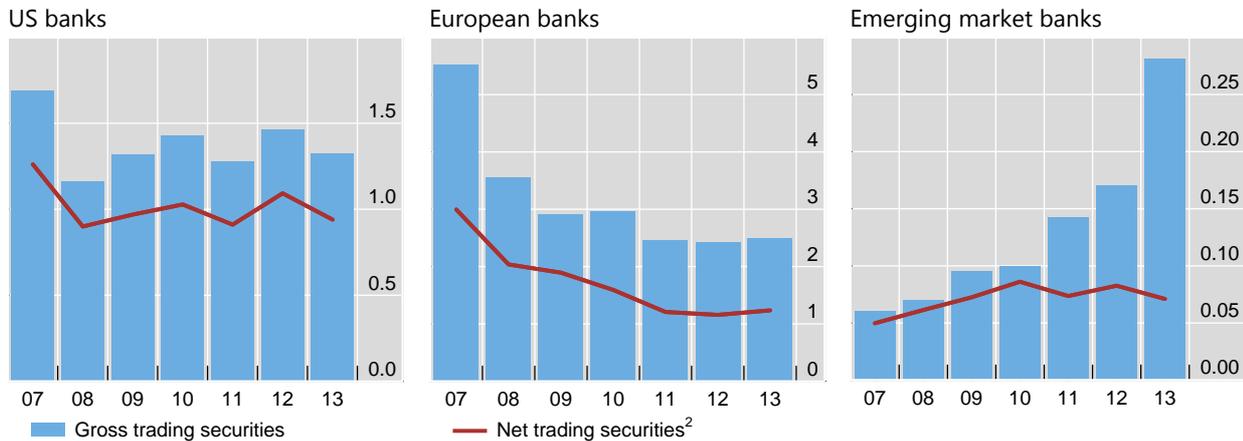
Similar trends are evident among Australian banks, which have been less exposed to the global financial crisis, but have persistently raised their domestic government bond holdings since 2008 and reduced corporate bond inventories since 2010 (Graph 8, centre panel). Primary dealers in India, by contrast, have been

accumulating both corporate and sovereign bond inventories, before selling off their sovereign debt securities during the mid-2013 bond market turmoil (Graph 8, right-hand panel).

Major banks' gross and net trading securities¹

In trillions of US dollars

Graph 7



¹ Based on a sample of seven US banks, 20 European banks and nine banks from emerging market economies (Brazil, China, Hong Kong SAR and Singapore). ² Trading securities net of trading liabilities.

Sources: Bankscope; BIS calculations.

Changes in business models. Inventory levels provide only a rough approximation of dealers' capacity to build up large trading or market-making positions, as they measure actual rather than potential holdings. That said, inventory trends seem to tally with the feedback received from market participants.

Especially in Europe and the United States, many interviewees underscored the view that market-makers' willingness to hold large inventory positions had decreased, particularly in less liquid instruments.²¹ Market-makers are reportedly focusing on activities that require less capital and balance sheet capacity, ie reducing the share of inventory revenues in their P&L accounts (Graph 2), and have been shifting towards more order-driven and/or brokerage models.²² As a result, the execution of large trades tends to require more time, at least in the less liquid markets.

Market concentration and focus on core markets. Other interviewees have highlighted an increasing focus on core, often domestic, markets. Reportedly, some banks have migrated their balance sheets away from fixed income business lines,

²¹ Notably, Bessembinder and Maxwell (2008) already report similar feedback from market participants following the introduction of post-trade reporting requirements for corporate bonds in the United States. They conclude that greater market transparency has reduced the willingness of dealers to build up inventory but has served to substantially reduce bid-ask spreads.

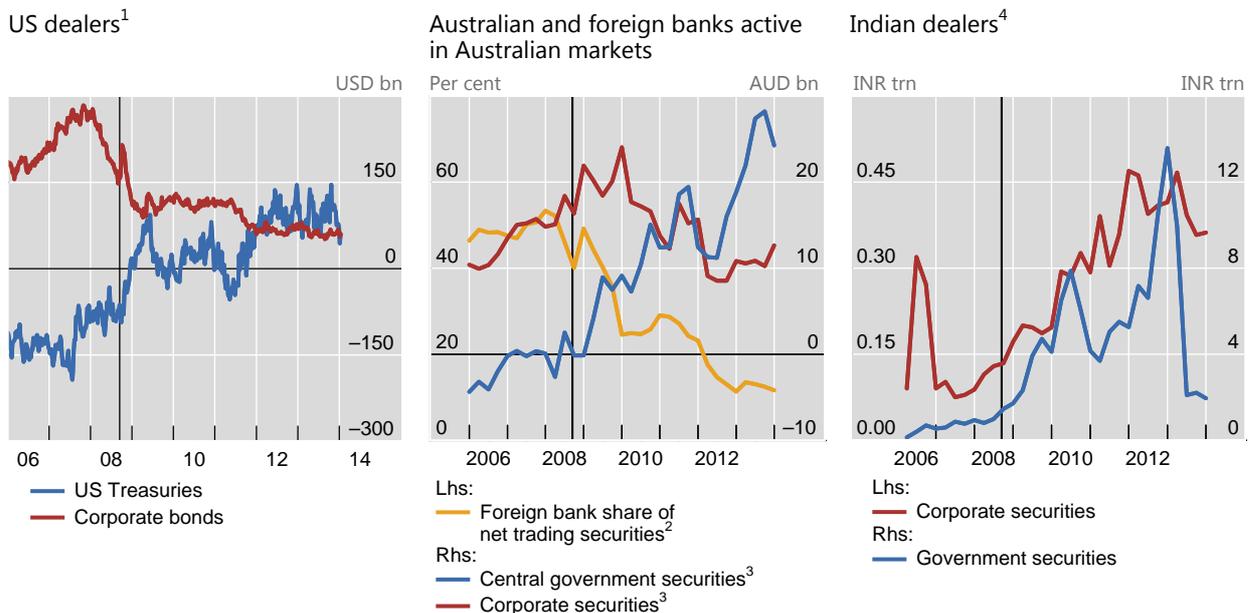
²² According to a recent survey (ECB (2013)), limited availability of balance sheet capacity and capital is the most often cited reason why banks have reduced their market-making in recent years or plan to do so going forward.

including repo, while foreign banks without firmly entrenched franchises are scaling back or exiting these markets altogether.

In Australia, for example, several foreign banks have ceased their market-making in corporate bonds and derivatives markets in recent years and have drawn down their inventories (Graph 8, centre panel). For core markets, such as domestic sovereign bonds, foreign banks' market-making is likely to be, at least partially, substituted by domestic dealers. For less liquid markets, however, reduced foreign participation risks accentuating any impact from a reduction in domestic banks' supply of immediacy services.

Net dealer positions

Graph 8



The black vertical lines correspond to 15 September 2008 (Lehman Brothers bankruptcy).

¹ Includes all US primary dealers. ² Four-quarter rolling averages. ³ Australian banks' net holdings. ⁴ Sample of 10 primary dealers and banks.

Sources: Study Group member contributions based on national data; BIS calculations.

Client tiering. In addition, some market-makers have adopted a more selective approach to offering client services, with the total cost and revenue of client relationships coming under increased scrutiny. For example, in determining the degree and price of immediacy services for a given client, these banks break down the cost of all resources allocated to the client (eg trading, sales coverage, research) and compare them with all direct and expected downstream ancillary revenues.

Likewise, assessment of the value of trades has evolved and become more granular. Rather than return on risk-weighted assets (RWA) being reported at divisional levels, this measure is now calculated per trade per client (pre-execution) by some financial institutions. Funding and capital costs have thus become more important, with gross revenue only one factor in dealers' overall assessment.

Migration to less regulated players? Proprietary trading has reportedly diminished or assumed more marginal importance for banks in most jurisdictions, particularly in the euro area.²³ Market players generally expect banks' proprietary trading to further decline or to be shifted to less regulated entities in response to regulatory reforms targeting these activities.

This development contrasts with trends in some jurisdictions, particularly in Asia, that have been less affected by recent financial crises. One example is China's fixed income markets, where proprietary trading is reported to have been expanding significantly in recent years.

3.3 Demand for immediacy services

The impact of observed trends in the supply of market-making services on financial markets will depend on how these trends compare with changes in the demand for these services. Overall, the private sector's demand for fixed income instruments continues to grow,²⁴ adding to central banks' and other public sector purchases of debt securities. Expanding bond markets amid significant flows of funds to market participants that require immediacy services (such as mutual funds) point to persistent and growing demand for market-making. At the same time, many market participants are adjusting their business models to mitigate the impact from reduced or more costly immediacy services in some markets. Bond issuers, in turn, have the incentive to seek ways to improve the secondary market liquidity of their issues. Key developments in these areas are illustrated below.

Primary bond market expansion. Robust growth in primary bond markets over the past years has pushed the amount of outstanding debt securities to record levels. Several factors have contributed to this development. First, sovereign debt issuance has expanded significantly as governments increased their spending in response to the slowdown in global economic growth and, in some jurisdictions, to provide capital backstops to domestic banking systems in the wake of the financial crisis. In turn, accommodative monetary policies to support the economic recovery have driven down interest rates to unprecedented levels, with unconventional policies directly targeting the medium to long end of the yield curve and contributing to the compression of term premia and credit spreads. Given persistent demand for debt securities (see below), funding conditions in corporate bond markets have improved considerably. Corporate bond issuance has thus surged in many emerging market economies, while also growing rapidly for non-financial corporates in many advanced economies. The outstanding debt of advanced economy financial institutions, by contrast, has contracted in many jurisdictions amid widespread efforts to deleverage balance sheets.

Rising importance of investment funds. Unprecedentedly low bond yields have incentivised risk-taking by some investors. Given the thin secondary market liquidity in most corporate bond markets, particularly for high-yield instruments,

²³ Even though many dedicated proprietary trading desks have been closed, quantifying the residual amount of proprietary trading remains difficult since market-making and proprietary trading positions are hard to disentangle (see the discussion in Section 2 and Duffie (2012)).

²⁴ Several factors may help explain this rise, including a growing global pool of savers and rising global wealth. See Haldane (2014) for a recent discussion.

bond funds that promise daily liquidity on a best endeavours basis – such as the implicit expectation from investors that they can redeem from a mutual fund on a daily basis and sell exchange-traded funds (ETFs) at any point in time – have attracted significant inflows from both institutional and retail investors. In the United States, for example, 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. Bond funds have also increasingly invested in emerging market assets, although starting from much lower levels than those investing in advanced economies. Worldwide, net assets of mutual bond funds are approximated to have risen by \$3.1 trillion since 2008 and now account for some \$7.3 trillion in total.²⁵

Increasing concentration of assets under management. Despite the significant expansion of primary bond markets, there are signs that assets under management by the private sector are increasingly concentrated in a few large market players. Indeed, the total net bond holdings of the 20 largest asset managers alone increased by more than \$4 trillion from 2008 to 2012, accounting for about 40% of their total net assets (\$23.4 trillion). These managers accounted for more than 60% of the assets under management of the 300 largest firms in 2012, up from 50% in 2002.²⁶ One implication of further concentration would be that investment decisions of these market players could have a greater impact on market liquidity conditions going forward (see Section 5.2).

Evolving investment strategies. Asset managers are reportedly adapting their investment strategies to account for reduced market-making capacity, at least in some markets. Some appear to have opted for less portfolio turnover, implying a more medium-term analysis of investment opportunities. Others are becoming more opportunistic in the timing of trades, rebalancing portfolios primarily when bonds are available in secondary markets or are at issuance in primary markets.

Several market participants, in their interviews, pointed to the changing relationship between asset managers and market-makers. Some bigger investors have moved away from dealing all instruments with a core group of counterparties and are now selecting their counterparties depending on the financial instruments they wish to trade. Others are seeking to facilitate trades by leveraging inventory data provided by their market-making counterparties. While this would tend to mitigate the effects of rising demand for immediacy services, the associated costs (eg for IT infrastructure investments) may be difficult to bear for smaller firms, thus reinforcing market concentration.

Feedback from market participants also suggests that some investors, in particular the larger investment fund managers, are becoming increasingly important to market-makers as a regular source of bonds (eg by making available their bond inventories through securities lending arrangements). Yet, there is scant evidence that market participants facing fewer regulatory constraints are seeking to

²⁵ By comparison, money market funds' net assets declined by \$800 billion to \$4.8 trillion during that period (Q1 2008 to Q1 2014). These figures are based on data from the Investment Company Institute (ICI).

²⁶ Based on information from the *Institutional Investor* database and comparing the market share of the 20 largest asset managers in 2002 with that of the 20 largest in 2012.

replace traditional market-makers, as they typically lack the customer franchise and balance sheet capacity to take on more active market-making roles.

Long-term investors. Market participants with medium- or long-term investment horizons, such as pension funds, life insurance companies and reserve managers, tend to be less sensitive to changes in liquidity conditions. In principle, these market players are well positioned to mitigate the impact of reduced market-making supply during times of temporary order imbalances, eg by buying assets at depressed levels or by lending out their inventory to support market-makers.

Yet, once the current environment of monetary accommodation is changing, more prudent investment policies in the aftermath of the global financial crisis may encourage a structural shift towards investing in less risky and more short-term instruments, possibly accentuating the impact of reduced risk-taking by dealers.²⁷ This shift comes in addition to ongoing accounting and regulatory changes to improve transparency and solvency. Greater use of fair value accounting under IFRS, for example, may limit the scope for taking long-term or illiquid assets on balance sheet, particularly during times of elevated market volatility. Likewise, higher risk charges may disincentivise allocations to corporate bonds.

Adjustments by sovereign issuers. Rising funding needs and, at times, volatile market conditions have induced debt management offices and other fiscal agents to adjust their issuance procedures, aiming to align them with the needs of a broad and diverse investor base (OECD (2014)). Measures to more directly improve secondary market liquidity are also gaining importance, creating spillovers also for the ability of market-makers to provide their services in other, related markets. One such measure is the increased reopening of issues ("taps"), raising the outstanding amounts of existing securities rather than issuing new ones. This development has been supported by some electronic trading platforms with minimum requirements for amounts outstanding for bonds to become eligible for trading.

In addition, some debt management offices and fiscal agents are seeking to improve the liquidity of their securities by smoothing temporary supply and demand imbalances. One such example is the provision of securities lending facilities for dealers (see Section 6). Another is issuing off-the-run bonds in response to market demand, or buying back securities in cases where there seems to be an overhang in the market to free up trading capacity for other securities.

3.4 Movement towards electronic trading

With traditional market-makers refocusing their business models to meet risk-adjusted profit targets amid persistent, or even growing, demand for immediacy services by bond market investors, market participants have been seeking ways to reduce trading costs and improve market liquidity. Electronic trading platforms can facilitate trading by improving market transparency, allowing market participants to access pools of liquidity and reducing the need for manual intervention to process trades (Box 2).

²⁷ See CGFS (2011a) for a discussion of the financial system implications of changing investment strategies of pension funds and insurance companies as well as Bank of England and the Procyclicality Working Group (2014) for an assessment of whether these firms are investing in an increasingly procyclical fashion.

Trading platforms in fixed income markets

Electronic trading is a broad term for various methods of conducting trades electronically. To better understand the incentives for switching from voice-brokered trading to electronic trading and the resulting impact on market-making, it is instructive to differentiate trading platforms according to how and which participants provide liquidity.

Order-driven. In an order-driven market, trades are matched on a central limit order book, where market participants can place orders anonymously. While such platforms often rely on designated market-makers, who commit to providing a minimum of quotes, any market participants can contribute to market liquidity by placing limit orders on the central limit order book.

Quote-driven. In a quote-driven market, dealers provide quotes upon request of a client (request for quote – RFQ). This is the prevailing model in bond markets. In contrast to order-driven markets, only dealers can provide liquidity to the market. Clients therefore remain dependent on immediacy services provided by the same market-makers that otherwise provide liquidity off these platforms. Different forms of dealer platforms exist:

Single-dealer platforms represent extensions of traditional voice-brokered trading, allowing clients to access an individual dealer's quotes on screen, where prices may be merely indicative (ie not executable as in order-driven markets). While these platforms can contribute to reducing the cost of transactions by benefiting from lower operational costs than voice-brokered trading, the role of the dealer in providing immediacy services to clients remains essentially unchanged.

Multi-dealer platforms, by comparison, allow clients to simultaneously access or request quotes from several dealers.^① Clients generally benefit from more favourable prices, given increased competition among dealers and enhanced market transparency. In addition, many platforms provide incentive schemes for designated market-makers to enhance liquidity. These additional advantages help explain why the market share of multi-dealer platforms has significantly increased in recent years, whereas single-dealer platforms have often stagnated.

^① Inter-dealer platforms represent a subset of multi-dealer platforms where participation is limited to dealers.

Accordingly, the use of electronic trading platforms in bond markets has been growing in both advanced and emerging markets, although often from relatively low levels compared to electronic trading activity in equity markets. Industry estimates suggest that electronic trading accounted for 37% of dealer-to-client trading volume in US and European government bonds in the year 2013, compared to 13% in (cash) corporate bonds and 75% in (spot) foreign exchange.²⁸

Challenges of current platforms. Existing electronic platforms tend to be used only for a limited range of typically standardised and often smaller size transactions for which a sufficiently large number of orders can be matched on a regular basis. That said, platform providers and central counterparties (CCPs) have started to accommodate instruments previously traded and risk-managed bilaterally, such as the trading of futures on swaps and central clearing of derivatives for a broader range of counterparties. However, for the vast majority of corporate bonds in particular, scattered order flow would tend to work against the use of electronic platforms.

Large trades by institutional investors with a potentially large impact on prices also seem less suitable for trading on platforms and typically require dealer intermediation – similar to the negotiation of block trades in equity markets. Transparency requirements, in addition, may limit the willingness of investors and

²⁸ See Treasury Borrowing Advisory Committee (2013).

dealers alike to execute trades electronically if doing so might reveal their trading strategies and portfolio positions.²⁹ As a result, large investors are reportedly starting to explore trading strategies that split transactions into smaller amounts to optimise trading performance on electronic platforms. Trading platforms that do not disclose the participants' identity may face specific difficulties in supporting market liquidity during periods of financial market stress. As corroborated by the Group's interview results, institutional investors tend to fall back on voice-brokered trading during such periods as dealers may be willing to accommodate clients from which they expect ancillary revenues from future business.

Market participants that could, in principle, provide liquidity in addition to traditional market-makers have, so far, focused their trading activities on the most liquid fixed income instruments.³⁰ These market players currently do not seem willing or able to assume more of a market-making role in less liquid bonds. Traditional market-makers may also be inclined to protect their share of client order flow by preventing key customers from shifting their transactions to electronic platforms or offering their own proprietary solutions. This would imply less market liquidity, on average, on existing platforms.

Against this background, some electronic trading platforms are exploring ways to support market participants, including non-dealers, in providing market-making services. For one, some new platforms have introduced "buy-side-to-buy-side" trading in bonds, allowing investors to trade without the intermediation of dealers. Others allow non-dealers to quote prices (eg "all-to-all" platforms), introducing the opportunity for non-dealers to offer immediacy. Yet, a number of bond market characteristics (eg limited trading per bond, large average trade size – see Section 2) and platform features may limit the potential of these trading venues to compete against traditional market-makers in meeting the demand for immediacy services.³¹

4. Drivers of the observed trends

This section discusses market-driven and regulatory changes that, taken together, help explain the observed trends presented in Section 3. While some of these changes affect both the supply of and demand for market-making services, this section focuses primarily on drivers of adjustments in the supply of market-making services based on the framework developed in Section 2.

²⁹ See, for example, Bessembinder and Maxwell (2008) for an overview of the effects of improved post-trade transparency in the US corporate bond market and Scalia and Vacca (2001) for a discussion of the trade-offs implied in determining the degree of transparency in financial markets.

³⁰ High-frequency trading has focused on markets that generally meet three conditions: (i) significant trading activity, in terms of both trading volume and number of trades; (ii) trading of a highly standardised asset; and (iii) financial infrastructure allowing for fully automated trading with low latency. Since the cash bond market is very fragmented and mainly OTC, the role of high-frequency trading has remained limited. However, bond futures and other highly standardised interest rate derivatives may, at least for some jurisdictions, meet the above conditions.

³¹ "Buy side to buy side" platforms, for example, reportedly lack sufficient variety in investors' trading strategies to support two-sided markets in the absence of market-makers.

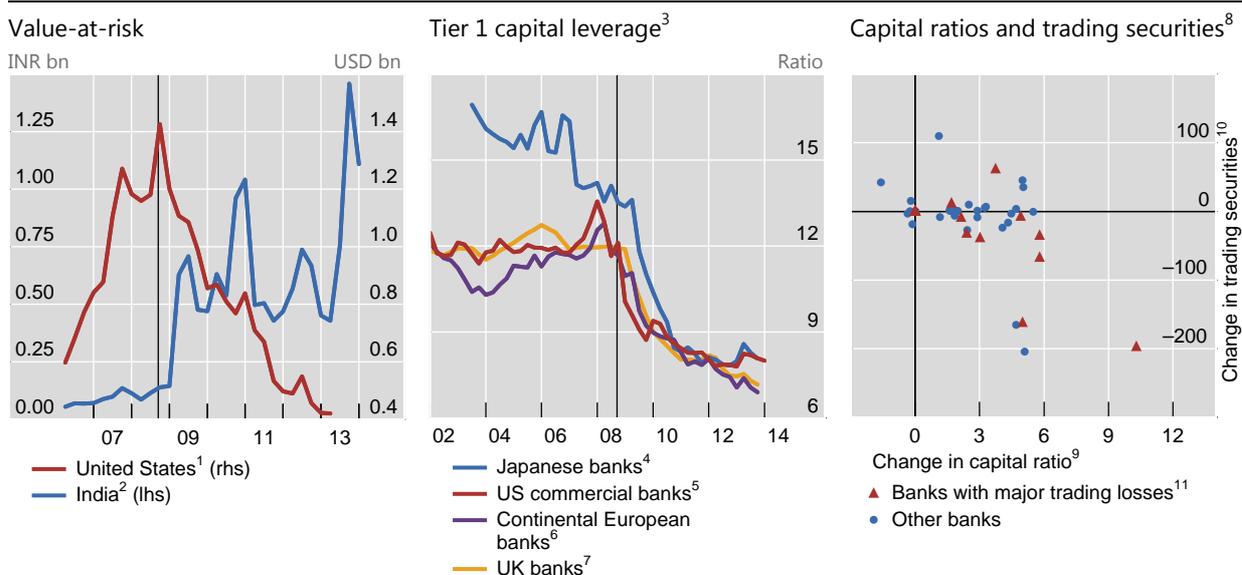
4.1 Market-driven adjustments to market-making services

Principal-based market-making involves risk-taking, as illustrated in Graph 2. In their interviews, market participants in most advanced economies and several emerging markets emphasised that risk tolerance has declined in recent years, either altogether or more selectively for certain financial instruments. Since market liquidity, particularly during times of sizeable supply-demand imbalances, hinges on the willingness and ability of market-makers to take inventory risks, a marked decline in dealer risk tolerance could adversely affect financial market resilience.³²

Indeed, the aggregate VaR of US dealers, for example, declined markedly after the global financial crisis; a trend that is common among many major banks in advanced economies and often closely tied to broader deleveraging efforts (Graph 9, left-hand and centre panels). By contrast, risk-taking by dealers in countries such as India has picked up considerably since the crisis (Graph 9, left-hand panel; see also Graph 8, right-hand panel). A number of factors may help explain the observed trends, even though – at this stage – the relative strength of each individual driver remains difficult to assess.

Dealer risk-taking and leverage

Graph 9



The black vertical lines in the left-hand and centre panels correspond to 15 September 2008 (Lehman Brothers bankruptcy).

¹ Aggregate VaR, based on a sample of eight US dealers. ² Bond portfolio VaR from a sample of 10 primary dealers and banks. ³ Risk-weighted assets divided by Tier 1 capital, weighted by asset size. ⁴ Mitsubishi UFJ Financial Group, Mizuho Financial Group, Sumitomo Mitsui Financial Group. ⁵ Bank of America, Citigroup, JPMorgan Chase, Wachovia Corporation (to Q2 2008), Wells Fargo & Company. ⁶ Banco Santander, BNP Paribas, Commerzbank AG, Credit Suisse, Deutsche Bank, UBS, UniCredit SpA. ⁷ Barclays, HSBC, Lloyds TSB Group. ⁸ Sample of 39 major banks from advanced and emerging market economies. ⁹ Percentage change in Tier 1 regulatory capital ratio from 2008 to 2012. ¹⁰ Change in net trading securities from 2008 to 2012 in billions of US dollars. ¹¹ Banks reporting net trading losses in excess of US\$ 5 billion in the year 2008.

Sources: Study Group member contributions based on national data; Bankscope; Bloomberg; company financial reports; BIS calculations.

³² For the purpose of this report, market resilience is defined as the speed at which market liquidity recovers after a shock.

Reassessment of risk-return trade-off. Following the financial crisis, some market-makers have started to reassess whether the return on trading activities is high and stable enough to justify the level of risk taken. The risk premium required for activities with an uncertain income seems to have been revised up. This reassessment has resulted in a reconsideration of how both capital and funding costs are allocated internally, increasing the cost of taking market risk.

More responsive risk measurement. Risk measures, such as VaR, tend to mechanically rise with rising volatility, pushing estimated risks closer to any given VaR limits or other trading constraints. Dealer feedback indicates that risk measures have become more sensitive to changes in volatility because they now tend to give more weight to recent observations. Risk measures will thus rise more quickly when market volatility picks up, and market-makers may be forced to reduce their exposures more aggressively than in the past.

Even if market-makers' risk tolerance improves when volatility decreases, exposures seem to remain well below their established risk limits. This may reflect greater awareness of how quickly market liquidity may dry up and how severely prices can reverse. Thus, many market-makers seem to refrain from adding incremental risk at the first sign of market strains and tend to keep buffers when volatility abates.

Fewer alternatives for redistributing risks. Market-makers have a number of alternatives for hedging or netting out their positions in sufficiently liquid markets. Yet, since the onset of the global financial crisis, some hedging strategies have become more difficult to implement, as liquidity in the underlying derivatives markets has deteriorated (eg certain CDS markets (Graph 6, right-hand panels), due in part to prohibitions on short selling), or proven less effective.³³ This has further reduced market-makers' risk tolerance as they enter into positions that are difficult to hedge. Furthermore, the wind-down of dealers' in-house proprietary trading desks and reduced risk-taking at the system level are limiting their options for redistributing risks, further reducing their willingness to build up large inventories of less liquid assets.

Greater stakeholder focus on capital adequacy. Dealers' shareholders and creditors have reportedly emphasised their focus on dealers' compliance with upcoming regulatory requirements, rewarding deleveraging strategies and higher capital buffers – due in part to anticipation of future regulatory requirements (see below). The downsizing of proprietary trading desks has been one element of advanced economy banks' deleveraging efforts since the financial crisis. Indeed, reductions in net trading positions are found to be associated with higher regulatory capital ratios, with European banks suffering large trading losses in 2008 being among those adjusting both measures most (Graph 9, right-hand panel). The same pressure has also led some market-makers to enhance their pre-execution due diligence to ensure that the pricing of transactions reflects the internal costs of allocating capital and providing the desired return on equity.

³³ One example is short positions on Libor futures that have become less correlated to long positions on repo or EONIA swaps.

4.2 Regulatory changes and their potential effects

The global financial crisis exposed material weaknesses in the risk management practices of many, including systemically important, market participants and unveiled a number of shortcomings in the existing regulatory framework. With the benefit of hindsight, liquidity risks proved broadly underpriced in the run-up to the crisis in many markets. Similarly, capital requirements for trading activities were often insufficient to absorb losses and funding models proved highly vulnerable to changes in market liquidity conditions.

Based on these lessons from the recent financial crisis, a variety of international and national regulatory reforms have been initiated to improve the robustness of the financial system. While some directly target specific activities, eg by prohibiting banks' proprietary trading, others may seek to drive adjustments in business models, eg by changing inventory costs in both absolute and relative (ie differently across asset classes) terms. In addition, a number of regulations are being designed to strengthen key characteristics of market infrastructures or incentivise the use of central clearing, reducing counterparty risks and addressing adverse feedback loops that have served to magnify the strength of liquidity shocks during past periods of financial stress. As regulations are finalised and implemented over time, market-makers' business models will continue to adjust.

Gauging the impact of regulation. Table 1 provides an overview of the key regulatory reforms that market participants have identified in the Group's interviews (December 2013 to February 2014) as likely to meaningfully affect their provision of market-making services. It also sketches the expected primary impact on market-makers' P&L accounts based on the stylised framework in Graph 2 and the presumed impact on market-making.

The totality of current regulatory changes is likely to affect market-makers' balance sheets and P&L accounts in a rather complex fashion, which implies that their overall effect is hard to assess. Abstracting from the beneficial effects of regulation (eg via the impact of reduced risk-taking on funding costs), many market participants expect the cost of market-making to rise, with less liquid assets (eg those with lumpy trading and/or less developed markets for hedging instruments) expected to be affected most, potentially reinforcing the observed trend towards liquidity bifurcation.

Differentiated impact. In this context, given the typical low-margin/high-volume nature of market-making, the leverage ratio tends to be seen by market participants as the most important possible constraint for market-makers in many jurisdictions and across fixed income instruments – both through its direct impact on capital allocations and inventory revenue as well as any impact on repo market activity and, hence, market-makers' ability to manage inventory risk.

For corporate bonds, many market participants also point to increased regulatory capital charges adding to inventory costs (eg via the incremental risk capital (IRC) charge and the stressed VaR requirements³⁴ for the trading book

³⁴ Based on bank data as of 30 June 2013, the Basel Committee on Banking Supervision (BCBS) estimates that Basel 2.5 market risk standards contributed to an increase in risk-weighted assets of 3.6% (on average) for large and internationally active banks. IRC and stressed VaR capital charges

introduced by the revisions to the Basel II market risk framework (often called Basel 2.5)).³⁵ The additional impact of these requirements on banks' total capital charges may, however, be modest, with many banks having already adjusted their business models to the new regulations (see also Appendix 4). The ineligibility of less liquid corporate bonds for the liquidity coverage ratio, in turn, is expected to further reduce the willingness of banks to warehouse these assets.

The expectation of a differentiated impact across market segments and of a moderate decline in overall market-making is also supported by an informal survey of market-makers conducted by the Study Group, as summarised in Appendix 4.

Importantly, all these effects will have to be set against the targeted benefits of regulatory change, including strengthened balance sheets and funding models as well as reduced systemic risks in the financial system. These benefits should in many cases partially or wholly offset the higher costs of credit intermediation highlighted by market participants. The overall implications of the regulatory reforms on the cost of market-making are thus not straightforward, especially in more volatile market environments when the benefits of regulatory change should be greatest.

Interplay with market-driven trends. It is unclear, at this stage, to what extent ongoing regulatory reforms will accentuate the impact of the market-driven adjustments discussed above. One open question in this respect is whether the observed market trends are considered to be predominantly cyclical or structural in nature. Another consideration is whether reduced market-making in normal times contributes to more robust markets in times of stress, given stronger dealer capital buffers and reduced leverage as well as less scope for a build-up of "liquidity illusion" (see Section 5.2 below).³⁶ Against this background, the perceived shift in liquidity risks to investors, as market-makers reduce their risk-taking, could imply a redistribution of risks towards those market participants that, at least in principle, are better suited to manage these risks.

accounted for 0.7 and 1.6% of these banks' total capital requirements, respectively (see BCBS (2014)).

³⁵ The potential impact of the ongoing review of the trading book (see BCBS (2013)), such as, for example, the proposed move from VaR to expected shortfall measures, has not yet been assessed by the market participants that were interviewed by the Group.

³⁶ "Liquidity illusion" describes market participants' overestimation of market liquidity, resulting in liquidity premia that are too low to compensate for the risks associated with liquidating the underlying asset. For a discussion of the general concept see Nesvetailova (2008).

Market participants' views on the potential impact of regulatory reforms¹

Table 1

Area	Regulation	Impact on P&L²	Potential impact on market-making
Solvency	Basel 2.5 market risk framework (IRC, stressed VaR)	Capital costs	Reduction in banks' inventories, in particular for traded credit instruments (eg corporate bonds, bespoke credit derivatives).
	Basel III & G-SIBs capital regulation	Capital costs	Decline in banks' inventories, particularly for assets with high risk weights and limited hedging/netting options.
	Basel III, leverage ratio (LR)	Capital costs	Reduction in low-margin/high-volume business, such as market-making in highly rated sovereign bonds and repo. Shift towards riskier activities or businesses exempted from LR exposure measure (eg CCP).
Liquidity	Basel III, Liquidity Coverage Ratio (LCR)	Funding costs	Reallocation of inventory in favour of eligible high-quality liquid assets (HQLA) at the expense of non-eligible assets.
	Basel III, Net Stable Funding Ratio	Funding costs	Rise in the relative cost of short-term funding disincentivises trading in securities and derivatives.
OTC derivatives reform	Central clearing of standardised derivatives	Clearing costs, other fixed costs (eg CCP membership fees, compliance)	Shift in market-making activity from non- to centrally cleared derivatives as well as from OTC to exchange-traded derivatives, reinforcing liquidity bifurcation.
	Margin requirements	Capital and hedging costs	Decline in inventories given higher cost of hedging. Reduced market-making in derivatives, in particular for non-centrally cleared instruments.
	Market transparency (eg US: SEF MAT, EU: MiFID 2)	Pricing, compliance costs	Reduction in market-making in less liquid instruments if firm quotes need to be made available to multiple parties (pre-trade) and large transactions require timely disclosure (post-trade).
Structural reforms	Prohibition of proprietary trading (eg US Volcker rule)	Compliance costs	Adverse impact on desks where banks see risks of failing to prove near-term client demand for market-making activities.
	Separation of banking activities (eg EU, UK, US)	Capital and funding costs	Withdrawal from less profitable market-making activities due to rise in cost of doing business at the unconsolidated entity level.
	Short selling restrictions on govt debt and CDS (EU)	Hedging costs	Decline in inventory as hedging costs rise; potentially mitigated by exemptions for market-makers.
Taxation	Financial transaction tax (eg part of EU)	Facilitation revenue	Cascading effect of taxation risks depressing trading volumes in low-margin market-making transactions.

¹ Summary of feedback from interviews conducted with the private sector. ² Only lists the regulation's expected primary impact on market-makers' P&L (Graph 2), ie not accounting for changes in general cost factors (eg compliance, IT infrastructure investment) or feedback effects (eg reduced leverage could lower banks' funding costs by reducing the risk of default).

5. Market implications

The market implications of current trends in market-making and proprietary trading are likely to differ across jurisdictions and asset classes. As highlighted above, for a number of jurisdictions, the observed adjustments in market-makers' business models point to a reassessment of the risk-return trade-off, suggesting a reduced and more differentiated provision of market-making services across clients and asset classes. At the same time, rising net issuance of debt securities and increased holdings by market participants that require immediacy services indicate persistent or even growing demand for market-making in debt markets.

While there is little indication of an overall increase in the cost of trading so far, as gauged from a variety of standard market liquidity measures (Section 3), market participants have, at least selectively, started to adjust their trading strategies to perceived structural supply and demand side forces. Advancements in fixed-income market infrastructures, in turn, are increasingly focusing on pooling liquidity to facilitate trading amid reduced liquidity provision by traditional market-makers.

This section discusses some of the implications of these trends, differentiating between the impact on markets during tranquil times and risks for market liquidity and robustness under adverse market conditions.³⁷

5.1 Cost of trading and issuing debt

Diverging trends for market-making supply and demand imply, all else being equal, upward pressure on trading costs, reduced market liquidity on average and, ultimately, higher costs of financing in primary bond markets. Although it is inherently difficult, if not impossible, to quantify the socially optimal level of market liquidity,³⁸ feedback from market participants suggests that, in many markets, the compressed liquidity premia observed before the global financial crisis may not have been sustainable. In these cases, the pricing of immediacy services may effectively be returning to more desirable levels. That said, there is no conclusive evidence of a widespread rise in trading costs so far. Several factors may help explain these observations.

Cost of trading. First, competition limits the extent to which market-makers can pass through costs to clients. Bid-ask spreads, for example, have generally returned to the levels observed before the global financial crisis in most sovereign bond markets where liquidity is typically supported by several competing dealers, including via PD schemes with market-making arrangements. Yet, to the extent that banks continue exiting non-core and foreign markets, some segments could exhibit a widening of spreads in the future unless other liquidity providers fill the void. Spreads have, for example, tended to be somewhat higher than before the crisis in corporate bond and derivatives markets.

³⁷ One set of implications, not covered here, is the possible impact of changes in the behaviour of market-makers on the transmission of monetary policy. Reduced dealer willingness to take positions on balance sheet, for example, could lengthen the time required or even constrain the ability of investors to rebalance their portfolios in response to monetary policy decisions.

³⁸ Technically, this would require equating the marginal cost of providing immediacy (taking account of externalities arising for financial stability) and the marginal value of market liquidity.

Second, interview results underscore that market-makers have become more cost efficient in providing immediacy services, leveraging on advancements in electronic trading and in the processing of trades. The associated fixed cost of maintaining the required IT infrastructure and staff expertise could, however, accentuate the shift in market-making capacity towards the largest dealers. This could make liquidity conditions more dependent on the ability and willingness of these dealers to provide immediacy services (see discussion below).

Finally, changes in the cost of trading are inherently difficult to track. As discussed in Section 3 (see also Appendix 3), market-based liquidity indicators typically provide a gauge only of the cost of trading limited amounts and are usually available only for the more liquid markets. In addition, rising implicit costs (eg more time required to trade large amounts) or differences in the cost of trading for different groups of investors (eg due to client tiering), which have both been highlighted by market participants during the Group's interviews, can generally not be observed based on market data. Another complicating factor is conjunctural developments, since some of the liquidity indicators may be affected by the current low-yield environment. As a result, current market conditions may mask the full impact of the underlying trends in the supply of and demand for market-making.

Bond issuance. Corporate bond issuers have benefited from the favourable funding conditions across many jurisdictions in recent years. Yet, as conditions change, supporting secondary market liquidity to limit liquidity premia at issuance could regain importance – particularly in economies where bank lending is likely to decline. One open question in this regard is how changes in the cost of issuing debt will compare to changes in bank-intermediated funding, given that many of the market- and regulatory-driven factors (see Section 4) affect bank lending as well.

While there is scope for – at least the larger and more frequent – bond issuers to emulate some of the strategies applied by sovereign bond issuers (see Section 3) several practical obstacles remain. Greater standardisation of bonds is one such potential liquidity enhancer. By reopening existing issues instead of creating new bespoke securities, issuers can limit the number of distinct bonds. A concurrent step would be to standardise maturity dates and to align them with exchange-traded bond futures and credit derivatives, facilitating hedging. Furthermore, issuers could tap existing bonds in auctions to avoid the underwriting fees of syndicated offerings, allowing them to reduce funding costs.

At this stage, however, there is scant evidence that issuers are embracing the idea of bond standardisation. By contrast, large corporates in many jurisdictions have used ample funding conditions in primary bond markets during recent years to extend their maturity profiles, often increasing the number of securities issued. Others have reportedly intensified their dialogue with institutional investors that require limited secondary market liquidity to issue bonds designed primarily for “buy and hold” purposes. This suggests that, so far, corporate issuers are tending to value flexibility in accessing debt markets more than a potential reduction of liquidity premia at issuance.

5.2 Market liquidity and robustness

While market-makers can support the robustness of market liquidity by absorbing temporary supply and demand imbalances, an important notion is that one cannot expect them to deliberately expose themselves to losses when market valuations

change. Moreover, market-makers may themselves represent a source of contagion and risk to financial stability if their risk-taking is not adequately managed. Indeed, several of the regulatory initiatives discussed above intend to reduce the risk of systemic market stress by limiting bank leverage and risk-taking.

Against the background of the market-making trends and drivers discussed above, two broad questions arise: (i) have observed trends and drivers raised the probability of major and possibly self-reinforcing order imbalances in bond markets; and (ii) have they reduced the threshold for such imbalances to have a significantly adverse impact on financial markets?

Order imbalances

Mismatches in market supply and demand are a precondition for inventory-based market-making to exist. Clearly, changes in market participants' perception of an asset's fundamental value will naturally induce changes in demand and supply with market prices adjusting accordingly.

Apart from that, a number of factors may contribute to raising the probability of an adverse impact of large and self-reinforcing order imbalances on liquidity conditions. These include, but are not limited to: (i) an overestimation of liquidity by market participants ("liquidity illusion"); (ii) the order flow being concentrated within only a few market participants; (iii) market participants following similar investment strategies; and (iv) market players relying on funding strategies that are vulnerable to changes in market conditions. These factors will tend to reflect structural elements of the market in question, but may be accentuated by conjunctural developments, as described below.

Liquidity illusion. Liquidity premia may have been compressed to artificially low levels in those bond markets where growth in demand has significantly outpaced net issuance over the past years, potentially masking the impact of reduced market-making supply. The compensation that investors receive for bearing liquidity risks, for example, has fallen below its long-term average in major corporate bond markets, although remaining above the levels observed before the global financial crisis (Bank of England (2014a)). Indeed, several market participants have argued that, in the current environment, liquidity premia in some bond markets may have been driven down to levels that are no longer commensurate with the immediacy services that market-makers are effectively willing to provide.

Liquidity premia could thus rise to persistently higher levels if demand in these markets abates in response to higher global interest rates and as unconventional monetary policies are withdrawn. This transition, while positive, could be accompanied by periods of strained market liquidity, as suggested by recent episodes of elevated bond market volatility (see Box 3).

One issue is that a larger share of liquidity risks has been shifted to investors, as market-makers appear less willing to take on these risks. This requires investors to adjust their risk management to adequately reflect higher liquidity risks. One particular challenge in this regard is to account for the dependence of liquidity on market conditions. Reaction functions that mechanically apply risk limits and other thresholds, particularly if widely used by market participants, risk aggravating market liquidity conditions and setting off adverse feedback loops.

While some asset managers and other institutional investors are reportedly responding to these developments by intensifying their credit analysis as they

anticipate holding assets for longer periods of time, there is little evidence so far that asset managers are raising their funds' liquidity buffers or altering the redemption terms of their funds to better reflect the liquidity risks associated with their bond holdings.

Box 3

Dealer positioning and market liquidity during times of stress – a case study

The sharp rise in sovereign bond yields in mid-2013 provides a useful case study of market-making during times of stress. In the United States, primary dealers' net and gross fixed income positions declined sharply during the May–July 2013 episode, and similar retrenchments also occurred in other markets. Moreover, market liquidity deteriorated in many markets, albeit to a lesser extent than seen during the financial crisis.

The sell-off. The yield on the most recently issued 10-year US Treasury note rose from 1.63% on 2 May to 2.74% on 5 July 2013, reaching its highest level since July 2011. Sovereign yields in other advanced economies also rose sharply, albeit to a lesser extent than in the United States. In contrast, some emerging markets saw even sharper spikes in rates. For example, the benchmark 10-year government yield in India rose from 7.11% on 24 May to 9.48% on 24 August 2013.

Dealer positions decline. Evidence from the United States shows that primary dealers' net positions in various fixed income securities declined during the sell-off, particularly for agency debt and agency MBS, consistent with dealers deciding to limit their outright exposures rather than absorb inventory from customers looking to sell. Dealers' gross positions in fixed income securities, which gauge dealer market-making more broadly, also declined sharply during the sell-off, at a pace comparable with that seen during past episodes of market stress.

The sell-off evolved differently in India, but resulted in a similar de-risking by many market participants. The Reserve Bank of India increased the short-term interest rate by 200 basis points on 15 July to counter currency depreciation spurred by foreign institutional investor outflows. These developments triggered a spike in risk aversion and a retrenchment of dealer positions (Graph 8, right-hand panel).

Market liquidity deteriorates. The retrenchment in dealer positions was accompanied by a deterioration of market liquidity. In the United States, market depth declined and the price impact of trades increased (Graph 4), while sovereign bid-ask spreads remained fairly stable in other markets (eg Germany and Italy). In emerging markets, bid-ask spreads also widened out in India, especially for less liquid government securities, and in China. The decline in liquidity, however, was not unusual when viewed from a historical perspective. Liquidity measures remained well within ranges experienced in recent years and showed significantly less strain than during the 2007–09 financial crisis

The role of dealers. Have drivers of market-making supply (Section 4) accentuated the sell-off? Adrian et al (2013) analyse the behaviour of dealers in the United States during the sell-off, providing evidence that dealers with greater ability to take on risk prior to the sell-off sold off more.^① This relationship suggests that dealer behaviour during the sell-off was driven more by differences in risk appetite than by regulatory constraints.

Moreover, some investors may have viewed bond valuations as stretched (eg given negative term premia in the United States and historically low fixed income market volatility) and may have been waiting for a trigger for the market to reverse. Events in May and June 2013 may thus have provided the signal to start unwinding risk positions. This supports the view that dealer unwillingness (rather than inability) to supply liquidity amplified the sharp rise in rates and volatility, as market valuations were seen as being subject to a general reassessment.

^① The authors show that US dealers with a higher VaR gap (which measures the difference between a dealer's VaR and its VaR limit), a higher Basel 3 Tier 1 common ratio buffer (which measures the difference between a dealer's measured ratio and proposed ratio requirement), and higher Tier 1 capital and Tier 1 leverage ratios before the sell-off tended to reduce their net positions more during the sell-off.

More concentrated demand and supply. Market shares of large asset managers have increased in recent years, with many market participants pointing to a continuing trend towards market concentration (see Section 3.3). One implication of such a trend is that market liquidity could become more dependent on the portfolio allocation decisions of only a few market participants. Large asset managers, in turn, might find it increasingly difficult to reallocate their funds if market-makers were seeking to match orders with existing demand rather than taking on large principal positions and offloading them gradually in the market.

Increasing market concentration on the sell side (see Section 3.2), spurred by banks focusing on core markets and economies of scale associated with the use of new trading technologies, suggests that fewer market-makers will need to handle larger shares of the order flow. While this will tend to facilitate the matching of supply and demand in less liquid markets under normal market conditions, although potentially at the cost of less price competition, it may reduce market-making capacity at times of largely one-directional order flow, as inventory risks become more difficult to redistribute among other dealers.

More similar investment strategies. A number of trends in the asset management industry may have contributed to greater correlation among managers' investment strategies. First, increasing market concentration, as noted above, mechanically raises correlation in flows. Second, a more widespread use of benchmarks increases the commonality of investment decisions, eg as portfolios are rebalanced in line with the benchmark. Such effects are likely to be particularly pronounced in markets with relatively few available benchmark indices, such as for emerging market bonds. Relatedly, greater focus on performance relative to industry peers and reliance on similar risk management tools can result in highly correlated investment decisions. These trends could imply a coordination problem for asset managers and other institutional investors, where small adverse shocks may set off a "run for liquidity".³⁹

Commitment to provide "daily" liquidity. By its nature, the liquidity transformation performed by mutual bond funds – providing daily liquidity while investing in less liquid securities – relies on dealers' provision of immediacy services in the underlying bond markets. To the extent that low yields and compressed credit spreads in the current environment have induced fund managers to increase their holdings of less liquid bonds, these market participants (and ultimately their investors) have become more exposed to changes in the availability of market-making services.

Bond ETFs improve price discovery in illiquid markets by providing a market price on a portfolio whose underlying holdings are often thinly traded. ETFs allow market-makers to hedge inventory risks when liquidity in the underlying bond and related derivatives markets is insufficient and ETFs are also commonly used for rebalancing flows by investors with passive or index-linked strategies. The liquidity of ETF bond funds, however, builds on the willingness and capacity of authorised participants – typically the same dealers that provide immediacy services in bond

³⁹ See Morris and Shin (2014) for a formal characterisation of this coordination problem and its implications for market robustness.

markets – to make markets for ETF shares.⁴⁰ Liquidity shocks may thus spread across different segments of the bond market via their impact on the risk-taking capacity of key market-makers.

At the current juncture, with mutual funds and ETFs having attracted significant inflows from both institutional and retail investors, a reversal in global bond markets could trigger redemptions that, as funds sell assets to meet cash demands, could amplify the decline in bond valuations. Notably, bond mutual funds have managed significant outflows in the past (eg during previous episodes of monetary policy tightening) that have generally not disrupted financial markets. Yet, past episodes of large redemptions occurred at times when fund holdings were much smaller, both in absolute terms and relative to trading volumes and dealer inventories. Current market-making trends, however, suggest that redemptions could have a larger impact on bond market liquidity than in the past.

Market robustness

The second question – ie whether it now takes less of a supply-demand imbalance to adversely affect markets in a significant manner than in the past – touches upon several issues: (i) how market-makers' robustness, ie their ability to absorb market liquidity shocks has changed; (ii) how their willingness to provide immediacy services has changed; and (iii) whether other market participants can fill any perceived gap in market-making capacity and willingness.

More robust market-makers. The trends and drivers discussed in Sections 3 and 4 underscore the observation that market-makers in many jurisdictions have reduced the amount of capital and balance sheet dedicated to providing immediacy services, notwithstanding notable differences across jurisdictions, asset classes and clients. At the same time, regulatory reforms are seeking to improve the loss absorption capacity of banks, limit their leverage and incentivise more stable funding strategies. Current market drivers of market-making supply (see Section 4.1), such as greater focus on the level of available capital buffers, are likely to reinforce the impact of regulation.

Having more resilient banks with sufficient capital and liquidity buffers at the outset will reduce the probability of banks becoming a source of illiquidity contagion⁴¹ and can contribute to more robust, although arguably reduced, market-making.⁴² In addition, better capitalisation and more limited leverage can help prevent the build-up of extended positions in financial markets,⁴³ reducing the risks of sudden reversals with large order imbalances.

⁴⁰ Although mutual funds and ETFs share several common features, one important difference is the limited redeemability of ETFs. ETFs redeem creation units only to authorised participants, such as dealers who make markets for ETF shares in the secondary market, and typically by payment in kind.

⁴¹ Several notions of illiquidity contagion have been studied in the literature. See, for example, Huberman and Halka (2001), Praet and Herzberg (2008), and Comerton-Forde et al (2010).

⁴² See European Banking Authority (2013) for a discussion of the benefits of liquidity regulation and an overview of the literature.

⁴³ Although, as argued in Feroli et al (2014), the absence of leverage may not be sufficient to ensure that monetary policy can disregard concerns for financial stability.

More prudent market-makers. Dealers' risk tolerance has declined since the global financial crisis in many countries, while at the same time regulation is intentionally making banks' risk-taking more capital intensive (Section 4). For given (risk-adjusted) profitability targets, this implies that in the short-term – with the price of immediacy services largely unchanged in many markets – dealers will be less willing to take on inventory risks and are likely to reduce their exposures more decisively during periods of elevated market volatility. In this sense, they may provide less of a buffer in the system to cushion shocks even if regulatory constraints are not binding (see Box 3).

Alternative liquidity suppliers. Reduced supply of immediacy services by traditional market-makers provides opportunities for other market participants to step in as liquidity providers, mitigating the impact on overall supply. For one, trading of standardised fixed income instruments such as futures on exchanges where market liquidity can be supported by a multitude of different market participants has increased recently, counterbalancing declining trading volumes in more bespoke instruments.

An open question, however, is how sensitive the supply of immediacy services in these markets will prove to adverse shocks going forward. On the one hand, new liquidity providers may have fewer incentives to support market liquidity under more stressed conditions (eg in the absence of any ancillary revenues to be expected from clients). Furthermore, a shift in market-making to less regulated market participants may warrant monitoring of their risk management capacity and/or the establishment of best practice standards for liquidity provision. On the other hand, greater variety of liquidity providers could make the supply of immediacy services more reliable. In addition, central clearing can contribute to supporting liquidity in these markets by limiting counterparty risks that have loomed large in non-centrally cleared OTC markets during past periods of market turmoil (see Borio (2000)).

While industry efforts to enhance trading in less standardised fixed income instruments, such as corporate bonds, are ongoing, the associated challenges (see Section 3.4) suggest that dealers are likely to remain the key providers of immediacy services in these markets for the foreseeable future. Given the expansion of primary bond markets and the growing relative importance of market-based funding for corporates, periods of stressed liquidity conditions could have a greater impact on the real economy than in the past. This may raise expectations about the need for public sector support of market liquidity during times of stress (see Section 6).

6. Policy implications

Given the variety and complex interactions of the different factors presented above, the net impact of current trends in market-making and proprietary trading is difficult to foresee and likely to differ across jurisdictions and asset classes. Yet, market-making practices are clearly evolving, not least because of ongoing regulatory change. Hence, a key question to consider is how these developments will affect the robustness of core financial markets. Based on Section 5 above, one possible scenario could imply a general reduction in market liquidity, with potentially more market volatility (or market-moving events) on average, but with reduced sensitivity of liquidity conditions to shocks (eg because liquidity risk is

more appropriately priced and managed at the outset). A more adverse scenario, by contrast, would suggest more fragile markets with less capital committed to absorbing temporary imbalances in supply and demand and a reduced ability of market-makers to smooth reactions to shocks.

Based on these two scenarios, policy implications can be categorised in terms of (i) **supporting initiatives** to raise the probability of achieving more robust liquidity conditions; and (ii) **possible backstops** to address deteriorating liquidity conditions and market vulnerabilities arising under adverse scenarios. Accordingly, this section illustrates a number of structural measures aimed at supporting the assessment of liquidity risks and enhancing market robustness before going on to discuss the broader considerations guiding any decisions on possible backstops.

6.1 Assessing liquidity risks and enhancing market robustness

A feature of the financial crisis was that liquidity risk and premia rose sharply, with stress spreading quickly across asset classes.⁴⁴ In many markets, this reflected the fact that liquidity risks and needs were not well understood and, since then, greater efforts have been made by market participants and authorities to assess these. However, the time-varying nature of liquidity premia is a widely documented feature of markets. More needs to be done to understand these liquidity dynamics and support market participants in pricing liquidity risks more appropriately.

Better transparency and monitoring. Promoting transparency on the degree of market-making capacity in individual financial markets can help reduce the risk of liquidity illusion by supporting market participants in pricing liquidity risks. Accordingly, industry bodies and relevant authorities could consider collecting and disseminating more detailed information on market-makers' inventories and risk-taking to monitor risks and support other market participants in assessing liquidity conditions.⁴⁵ While, as discussed in Section 3 and Appendix 3, no individual measure directly tracks market-making capacity, gathering consistent information on gross and net inventory positions by asset class of major market-makers as well as proxies of their risk-taking (eg in terms of aggregate VaR and risk limits) could help improve the assessment of market robustness.

While such data should be sufficiently granular for monitoring purposes (eg to assess the degree of concentration of market-making capacity), policymakers will need to balance the trade-off between promoting market transparency by disclosing dealer data and sustaining the willingness of market-makers to take on large positions in less liquid markets where inventory can only be run down over an extended period of time. Disseminating lagged and sufficiently aggregated data provides one option to achieving such a balance.

Another aspect is the need to assess structural developments and how they affect the capacity and willingness of financial intermediaries to make markets. With the cumulative effects of the newly emerging regulatory environment and other

⁴⁴ See, for example, Chordia et al (2005) as well as Goyenko and Ukhov (2009) for studies on liquidity spillovers between US stock and bond markets.

⁴⁵ This could be done, for example, by expanding existing data collections, such as the aggregate bond trading statistics collected in the United States.

structural changes still uncertain, policymakers may want to keep track of their combined impact on the effectiveness and robustness of market-making arrangements (eg as new non-bank entrants become market-makers) to inform future policy decisions.

Improving liquidity risk management. While improved market transparency can generally support the pricing of liquidity risks, market participants (such as managed and pension funds as well as financial and non-financial corporates) need to ensure that their risk management frameworks account for the shift in liquidity risks that may result from a reduction in the supply and an increase in the price of immediacy services by traditional market-makers.

While this is primarily an issue to be followed up by market participants themselves, the relevant authorities can support such measures by monitoring whether institutional investors' liquidity buffers and redemption schemes adequately reflect the liquidity risks of the underlying investments and by addressing any vulnerabilities they identify. In addition, all market participants should be in a position to assess the impact of significant liquidity shocks on their balance sheet and funding position, eg by stress-testing their portfolios, and assess the capability of their operational frameworks to manage risks in times of market turmoil.

Raising the shock absorption capacity of market-making institutions. Ongoing regulatory reforms to raise the loss absorption capacity of banks and to incentivise prudent funding structures (see Section 4.2) will tend to also broadly support more robust market-making, as banks operate with stronger balance sheets and increased resilience in times of stress. Additional efforts to better address the risks posed by varying market liquidity conditions, such as those considered by the review of regulatory requirements for banks' trading books (BCBS (2013)), can further contribute to enhancing the robustness of market-makers.

Forward-looking assessments, such as dedicated liquidity stress tests that take account of the impact of liquidity shocks can be another useful tool in this context. They could be used, for example, to test banks' ability to manage liquidity risks under stressed conditions, such as elevated price uncertainty or unavailability in situations where market-makers pull back from quoting. Rising concentration of market-making capacity within only a few market players, including non-banks, in certain financial markets may also call for increased supervisory scrutiny to assess the systemic impact these players may have on the robustness of market liquidity.

Improved market-making arrangements. Over the past years, debt management offices and fiscal agents have adjusted their issuance procedures and introduced new types of instruments to accommodate both domestic and foreign investors' preferences. Going forward, significant public funding needs and global interest rates returning from their exceptionally low levels provide strong incentives for sovereign issuers to limit the liquidity premia on their debt securities.

One option to consider is establishing or expanding existing incentive schemes for market-makers (eg in the context of designated market-making arrangements) to enhance secondary market liquidity in sovereign bond markets. In jurisdictions where these markets are deemed to lack liquidity, such arrangements could support market activity and robustness and generate positive spillovers into other market segments if they offer sufficient incentives for market-makers to provide immediacy services and have clearly defined market-making mandates.

Other measures, such as greater standardisation of debt securities, may complement issuers' efforts to support secondary market liquidity (eg by reducing the number of outstanding types of securities relative to more bespoke issuance patterns). While, in principle, standardisation could support market liquidity in both sovereign and private debt markets,⁴⁶ the funding requirements of non-sovereign, less frequent issuers will probably imply a less favourable trade-off between reduced liquidity premia and flexibility in accessing capital markets.

Supporting the robustness of hedging and funding markets. As highlighted in Section 2, the provision of immediacy services in bond markets is closely tied to hedging and funding markets. Initiatives aimed at supporting the robustness of these markets thus directly benefit bond market liquidity more broadly, facilitating the management of inventory risks. One set of measures here could focus on reducing counterparty risks, which assume a pivotal role during times of market stress. This would seem to lend general support, for example, to initiatives aimed at improving incentives for central clearing and establishing margin requirements for non-centrally cleared derivatives (as initiated by current OTC derivatives reforms), provided that these do not disincentivise the use of the relevant hedging tools.

Another set of measures could aim at improving the robustness of market infrastructures through, for example, advancements in the settlement of tri-party repo transactions, the promotion of transparency and minimum regulatory standards in securities lending and repo markets (see FSB (2013)), or the establishment of principles for market infrastructures (see CPSS-IOSCO (2012)).

6.2 Possible backstop options

Backstop measures to support market liquidity have been provided to different degrees across jurisdictions during the recent crisis, reflecting the different nature of shocks, demand and supply patterns, and market setups. Overall, possible backstops can be grouped into three broad categories, broadly associated with different "lines of defence" (ie responses posing increasingly complex challenges for policymakers).

The first category includes central bank liquidity provision to underpin bank funding and help market-makers finance their inventories, thus indirectly supporting bond market liquidity. The second is more structural in nature, comprising measures such as securities lending facilities (SLFs) that can help address bouts of excess demand for specific securities (eg sovereign bonds). The third and most controversial category of measures encompasses direct interventions in key markets to address dysfunctionalities or imminent risks of a market freeze.

The following section discusses each of these categories, highlighting the trade-offs to be considered by policymakers when assessing the costs and benefits of possible backstop measures.

Central bank liquidity provision. Central bank operations to strengthen bank funding positions can support the banking sector's market-making capacity by helping market-makers finance their inventory, even though central banks will need

⁴⁶ The standardisation features of Danish mortgage bonds are a case in point. These features are often credited with supporting the secondary market liquidity of these bonds, including in times of stress (see Dick-Nielsen et al (2012)).

to carefully assess the financial stability benefits of any such operations at the time.⁴⁷ Likewise, liquidity insurance facilities, as established by some central banks, can backstop market liquidity by providing banks recourse to central bank funding.

Adjustments to central bank collateral frameworks, such as broadening the scope of eligible collateral assets, can provide further support to market liquidity if market-makers (and other market participants) face imminent funding constraints that could trigger fire sales. Recent examples include targeted measures designed to bolster the liquidity of specific assets by providing banks with the possibility to repo these out to the central bank, while other measures contributed to freeing up more liquid collateral assets more generally.⁴⁸

A key condition for all of these responses is that central banks have the appropriate risk assessment and management capabilities to manage associated risks (eg by setting appropriate haircuts). Legal restrictions on the allowable set of counterparties or assets can be another constraint. Broadly, however, this line of defence can be provided on the basis of central banks' conventional operational frameworks.

Other central bank facilities. The second category of measures is more structural in nature in that it involves backstops that are not necessarily part of central banks' operating frameworks or may not have been designed for the purpose. One example is that of SLFs, which can serve as standing or temporary backstops for eligible dealers to source sovereign bonds (or other assets) with the aim of improving market liquidity or avoiding squeezes and bouts of settlement failures in the underlying repo market. As with all such measures, especially when set up on a permanent basis, the design of lending terms would need to balance two factors: on the one hand, terms should be unattractive under normal market conditions to mitigate any distortion in private sector trading. On the other hand, they should be sufficiently favourable under stressed conditions to be effective.

Experiences gained in a number of jurisdictions suggest that SLFs can reduce the impact of idiosyncratic shocks on market liquidity (eg by balancing excess demand for specific securities). Complemented by broader central bank liquidity provision (see above), SLFs have also proven effective in dampening the impact of systemic liquidity shocks, such as during the recent financial crisis.⁴⁹ Fiscal agents and/or central banks (to the extent that they have significant holdings of domestic securities) could therefore consider the establishment or expansion of SLFs as one option to improve, as needed, the liquidity of domestic bond markets in times of stress and to support the robustness of the associated repo markets.

⁴⁷ See, for example, Brunnermeier and Pedersen (2009) for a theoretical model that links market liquidity and market-makers' funding conditions.

⁴⁸ See Markets Committee (2013) for an overview and discussion of recent adjustments to central banks' collateral frameworks.

⁴⁹ For example, in September 2008, the Bank of Japan temporarily relaxed the conditions for its existing SLF to prevent liquidity conditions in the repo market from deteriorating. The Federal Reserve, for another example, introduced the Term Securities Lending Facility (TSLF) in March 2008 to promote liquidity in US Treasury and other collateral markets during the crisis. The TSLF offered US Treasury securities held by the Federal Reserve for loan over a one-month term against collateral to eligible PDs. See Fleming et al (2010) for an analysis of the TSLF's effectiveness.

Direct interventions. The backstops considered so far rely primarily on supporting market liquidity by facilitating the funding of inventories. Central bank liquidity provision can either directly strengthen the funding positions of market-making banks or indirectly support non-bank dealers by easing market funding conditions. SLFs and similar facilities, in turn, can smooth the impact of excess demand for specific securities or asset classes. Yet, a possible question for policymakers is if they would consider more direct measures – such as outright purchases and sales of securities – to support market functioning as a further line of defence (ie once other measures have been exhausted) for markets that are judged critical to financial stability or when the transmission of monetary policy is severely impeded.⁵⁰

Several adverse scenarios could be considered,⁵¹ potentially suggesting a range of different responses, such as central banks undertaking catalytic measures to revive specific markets (eg by providing live quotes to improve price discovery) and, at the margin, limiting dealer inventory risks. At a minimum, any such intervention would need to be designed to support only those markets viable in the longer term, absent public sector action, and targeted at facilitating the reopening of private market activity.

Considering such more direct measures to support market functioning involves several difficult cost-benefit trade-offs. These would need to be taken into account by policymakers if they were to consider whether and under what conditions they might be prepared to adjust existing backstops in the future. Such measures would not only need to be clearly supported by central banks' policy mandates and legal frameworks, they would also be subject to various constraints – eg in terms of central banks' risk tolerance as well as their risk assessment and management capabilities, and possible conflicts with other policy objectives. Yet another constraining factor is moral hazard and adverse selection. In particular, backstopping market liquidity directly risks structurally distorting economic incentives for market participants and, as a result, could aggravate liquidity illusion. Intervening in markets over an extended period of time could also result in market functioning becoming overly dependent on such backstops, posing significant exit problems.

⁵⁰ Some have referred to these direct central bank interventions in securities markets as “market-making of last resort”. See, for example, Tucker (2009), Buitier (2012) as well as Oganessian (2013).

⁵¹ See, for example, Tucker (2009) and Bank of England (2014b).

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Appendix 1: Study Group mandate

Scope of work

At its September 2013 meeting, the CGFS decided to establish a Study Group on market-making and proprietary trading to facilitate a better understanding of how ongoing changes in these activities may affect the provision of immediacy services and, hence, liquidity in financial markets. Specifically, the Group was asked to explore whether and how the ability and willingness to provide market-making and similar liquidity-enhancing services is changing across market segments, assess regulatory and market drivers of any observed trends, and present views on the broader implications that these developments may have for markets and policy.

Work will proceed in two stages. **Stage 1** will be a fact-finding exercise, where the Group will pull together information on trends in and drivers of market-making activities from central banks and other sources, focusing specifically on sovereign and corporate debt and related derivatives, including those in emerging markets (eg markets for local currency bonds). It will engage in outreach to market participants to establish how their business models and, with them, their ability and willingness to provide market-making services are evolving. As part of this, the Group will seek to develop a working definition of market-making and how it differs from other activities, such as proprietary trading. Based on the Group's assessment of the most relevant trends (given data availability and other considerations), **Stage 2** will then focus on evaluating the system-wide implications for markets and policy from a central bank perspective.

Key questions to be addressed could include:

Stage 1. Trends and drivers

- **Current trends:** How is the supply of market-making services evolving (eg capacity to provide immediacy services, dealer position-taking vs order-driven market-making) and is there any impact or likely impact on market liquidity (ie the ability to execute large transactions with limited price impact)? What are appropriate metrics (eg dealer inventories, bid-ask spreads) to assess such trends and are these metrics available to central banks? Are there particular markets, market segments, financial products or jurisdictions that are or will be more affected than others? How do trends in market-making compare to developments in proprietary trading, and how can the two activities be differentiated?
- **Drivers:** What are the drivers behind current trends in market-making and proprietary trading activities? Are these drivers transient (eg risk tolerance, funding costs) or structural (eg changes to business or funding models, ongoing regulatory change)? How important are domestic drivers and their effects relative to international, cross-border developments?
- **Business models:** How tightly are market-making and proprietary trading activities connected to each other? What factors (eg market structure, asset or product characteristics) determine financial intermediaries' choice to enter or exit these activities? How are these choices affected by structural developments in financial markets (eg expansion of electronic trading, regulation) and other factors?

Stage 2. Implications for markets and policy

- **Market structure and risks:** Are there structural arrangements (such as more widespread use of electronic trading platforms) that would help mitigate any negative effects of a withdrawal of market-makers for both the financial and non-financial sectors (eg in terms of funding or hedging costs)? If the existing players scale down their market-making activities, can new entrants, including non-banks, be expected to fill the void? Under what conditions? How long would such an adjustment take? What are the risks for the functioning and stability of financial markets, during the adjustment and in the new equilibrium?
- **Market resilience:** How would reduced market-making and proprietary trading affect the resilience of financial markets (ie more limited market depth versus reduced “liquidity illusion”)? How would market participants respond (eg by adjusting their trading behaviour and risk management)? How might the combined effects differ in normal times and times of stress? Or domestically versus internationally? Are there historical episodes (such as the bond market sell-off in May and June 2013) that can be used to assess these effects?
- **Policy issues:** Will the costs of smaller balance sheets/reduced proprietary trading be high or low based on what is known to date? Can these costs (and benefits) be evaluated on an ongoing basis? Is there an appropriate level of market-making activity, and are there policy measures that could help achieve and maintain it, both in normal and stressed times? What would be the implications of reduced market-making for central banks (eg in the context of central bank operations)? Is there a risk that central banks may need to directly intervene in markets more frequently in the future? How and under what conditions (eg in cases when provision of central bank liquidity alone may not be sufficient) would central banks be prepared to provide such backstops?

Appendix 2: Overview of regulatory definitions

Definitions of market-making and proprietary trading in financial market regulations

Table A.1

Economy	Regulation	Scope	Definition
Australia	Corporations Act 2001 - SECT 766D	Financial products	[...] a person makes a market for a financial product if: (a) either through a facility, at a place or otherwise, the person regularly states the prices at which they propose to acquire or dispose of financial products on their own behalf; and (b) other persons have a reasonable expectation that they will be able to regularly effect transactions at the stated prices.
Brazil	Joint Normative Act No 28 and 29/2013 - Central Bank and National Treasury	Public debt	Primary dealers are accredited to carry out transactions with the Central Bank and the National Treasury according to their performance as market-makers for federal government securities. [...] Primary dealers are required to meet the following targets during the previous month to be eligible for the National Treasury special operations: a market share of at least 4% in primary auctions, a market share of at least 8% in outright transactions with those securities for which they accepted to act as market-makers and, for the same securities, were able to quote two-way prices (bid and offer) on electronic platform systems.
Canada	Terms of Participation in Auctions for Government Securities Distributors (11 January 2010)	Public debt	A government securities distributor may be designated a primary dealer when [...] it has provided evidence of sufficient resources and the desire to participate actively in the market-making activity of Government of Canada securities to the satisfaction of the Department of Finance and the Bank of Canada. [...] A primary dealer is expected to make two-sided markets (bid and offer) under normal market conditions. The term "two-sided markets" entails the posting of bid and offer prices at a spread not significantly larger than that of other market participants for a typical trade size.
China	Administrative Rules on Market-makers in the Inter-bank Bond Market	Bonds	[...] a market-maker continuously quotes bilateral prices on sale and purchase of cash bonds, and trades with other market participants at these prices in line with relevant requirements.
European Union	Markets in Financial Instruments Directive (MiFID 2) (2014/65/EU)	Various financial instruments	'Market-maker' means a person who holds himself out on the financial markets on a continuous basis as being willing to deal on own account by buying and selling financial instruments against that person's proprietary capital at prices defined by that person.

Economy	Regulation	Scope	Definition
European Union	Regulation (EU) No. 236/2012 of the European Parliament and of the Council of 14 March 2012	Short selling and certain aspects of credit default swaps	<p>'Market-making activities' means the activities of [a bank /investment firm], which is a member of a trading venue or of a market in a third country, [...] where it deals as principal in a financial instrument, whether traded on or outside a trading venue, in any of the following capacities:</p> <ul style="list-style-type: none"> a. by posting firm, simultaneous two-way quotes of comparable size and at competitive prices, with the result of providing liquidity on a regular and ongoing basis to the market; b. as part of its usual business, by fulfilling orders initiated by clients or in response to clients' requests to trade; c. by hedging positions arising from the fulfilment of tasks under points (a) and (b).
	Proposal for a Regulation of the European Parliament and of the Council on Structural Measures Improving the Resilience of EU Credit Institutions ("Barnier Proposal") (29 January 2014)	Various financial instruments	<p>"Proprietary trading" means using own capital or borrowed money to take positions in any type of transaction to purchase, sell or otherwise acquire or dispose of any financial instrument or commodities for the sole purpose of making a profit for own account, and without any connection to actual or anticipated client activity or for the purpose of hedging the entity's risk as result of actual or anticipated client activity, through the use of desks, units, divisions or individual traders specifically dedicated to such position taking and profit making, including through dedicated web-based proprietary trading platforms.</p> <p>"Market-making" means a financial institution's commitment to provide market liquidity on a regular and on-going basis, by posting two-way quotes with regard to a certain financial instrument, or as part of its usual business, by fulfilling orders initiated by clients or in response to clients' requests to trade, but in both cases without being exposed to material market risk.</p>
France	French Banking Law (2013)	Various financial instruments	<p>Market-making is characterized:</p> <ul style="list-style-type: none"> a. by communicating firm, simultaneous two-way quotes of comparable size and at competitive prices, with the result of providing liquidity on a regular and ongoing basis to the market; b. as part of its usual business, by fulfilling bid and ask orders initiated by clients or in response to clients' requests to trade.
	French Financial Transaction Tax (December 2012)	Applicable only to shares and equivalent equities	<p>Market-making is characterized:</p> <ul style="list-style-type: none"> a. by communicating firm, simultaneous two-way quotes of comparable size and at competitive prices, with the result of providing liquidity on a regular and ongoing basis to the market; <p>In this case, the market-maker operates via trading venues (in this case, it should fulfil conditions regarding its presence and pricing) or via OTC transactions.</p> <ul style="list-style-type: none"> b. as part of its usual business, by fulfilling orders initiated by clients or in response to clients' requests to trade; c. by hedging positions arising from the fulfilment of tasks under points (a) and (b)

Economy	Regulation	Scope	Definition
Germany	Securities Trading Act (WpHG) (2011)	Various financial instruments	Investment services within the meaning of this Act are [...] the continuous offer to buy or sell financial instruments on an organised market or in a multilateral trading facility at prices defined by the offerors themselves, the dealing on own account outside an organised market or a multilateral trading facility on a frequent, organised and systematic basis by providing a system accessible to third parties in order to engage in dealings with them, or the purchase or sale of financial instruments for own account as a service for third parties (proprietary trading); [...] The purchase or sale of financial instruments for own account which does not constitute a service for third parties within the meaning of sentence 1 no. 2 shall also be deemed investment services (proprietary business).
Hong Kong SAR	Securities and Futures Commission – glossary	Various financial instruments	Market-maker - A company or an individual that quotes both a buy and a sell price in a financial instrument or security held in inventory, hoping to make a profit on the bid-offer spread. Once an order is received, the market-maker immediately sells from its own inventory or seeks an offsetting order in mere seconds.
India	Master Circular - Operational Guidelines to Primary Dealers (1 July 2013)	Public debt	Market-making in government securities (G-Sec): PDs [primary dealers] should offer two-way prices in G-Sec through the Negotiated Dealing System-Order Matching (NDS-OM), over the counter (OTC) market and recognized Stock Exchanges in India and take principal positions in the secondary market for G-Sec. PDs should not use the constituents' funds or assets for proprietary trading or for financing of another intermediary's operations. (By inference, proprietary trading will mean using the entity's own funds for taking positions.)
Italy	Consolidated Law on Financial Intermediation – Legislative Decree no. 58 of 24 February 1998	Various financial instruments	“Trading on own account” shall mean buy and sell transactions of financial instruments, directly and in relation to customer orders, together with market-maker activities. “Market-maker” shall mean a person offering his services to trade directly on regulated markets and multilateral trading systems on a continuous basis, buying and selling financial instruments at self-established prices.
Japan	Ministry of Finance, Basic Management Guideline for the JGB Market Special Participant System	Public debt	[...] Japanese Government Bond (JGB) Market Special Participants [primary dealers] [...] responsibilities in the secondary market are to provide enough liquidity in the secondary market. Whether each Special Participant provides enough liquidity is assessed by the Ministry of Finance based on the information, such as that provided by each Special Participant and other market participants, taking account of each Special Participant's outright trading volume of JGBs, submission of indicative prices in the secondary market, trading volume of JGB futures, etc.

Economy	Regulation	Scope	Definition
Korea	Ministry of Strategy and Finance (MOSF), Regulation on Korean Treasury bond issuance and primary dealer operations	Public debt	<p>Korean Treasury bond (KTB) primary dealers (PDs) refer to those government bond dealers that are designated by the MOSF to ensure the smooth issuance and trading of KTBs. [...]</p> <p>The MOSF may grant PDs the right to have non-competitive bid options for KTBs, allowing them to additionally acquire KTBs following the auction date, for the purpose of strengthening their market-making function and promoting competition. [...] PDs are to underwrite at least 10% of the monthly issuance volume of each benchmark KTB. PDs are also to submit at least ten bid/ask prices for each benchmark KTB in the KRX Trading System for KTBs during the trading hours of the exchange. [...]</p>
Mexico	Market-Making Program (2000)	Public debt	To become a market-maker it is required to participate in the primary auctions and on the secondary market. [...] Additional requirements are: Provide bid-offer prices on brokerage systems (electronic, voice, etc) for all government securities.
Netherlands	Law on Financial Supervision	Public debt	<p>Market-maker: person in the financial markets who constantly shows a willingness to trade financial instruments for his own account at buy and sell prices defined by him.</p> <p>Proprietary trading: Trading on one's own account with their own capital resulting in the execution of transactions.</p>
Singapore	A Guide to Singapore Government Securities (SGS) Primary Dealer Operations (August 2013)	Public debt	<p>Primary dealers play an important role in the growth and development of the SGS market by undertaking a set of market-making obligations [...]</p> <p>a. provide liquidity in the SGS market by quoting effective two-way prices for SGS sale and repurchase agreements (repo) and outright SGS transactions under all market conditions.</p>
	Rules and Market Practices of the SGS Market (March 2011)		Market-making procedures: (a) All dealers must show a commitment to participate actively as market-makers over the long-term; (b) dealers must quote continuous two-way prices in all market conditions; (c) quotes by a dealer are considered firm, unless otherwise stated.
Spain	Order of the Ministry of Finance and Taxation (10 February 1999) Resolution of the General Directorate of the Treasury (20 July 2012)	Public debt	[...][market-making means] to guarantee the liquidity of the secondary market in Government Bonds and stripped securities in compliance with the obligations specified [...] listing obligations [...] will be fulfilled when the listings, using the maximum differentials and the minimum volumes established by the General Directorate of the Treasury and Financial Policy, are maintained on each one of the working days [...], on the screens of the regulated markets or multilateral trading systems [...], during the periods of time resulting from applying the following [...]. Each market-maker must obligatorily list the benchmarks that are defined as the market benchmark which have been agreed by the General Directorate of the Treasury [...].

Economy	Regulation	Scope	Definition
Switzerland	Final Report of the Commission of Experts for Limiting the Economic Risks Posed by Large Companies (30 September 2010)	Various financial instruments	<p>Market-making is understood to mean the provision of liquidity for clients in non-exchange-traded products, whereby a trader sets firm bid-offer quotes and thereby provides liquidity for a specific product or a particular product class. This is designed to avoid temporary imbalances between supply and demand for certain products.</p> <p>Proprietary trading describes a trading unit which is separate from the rest of an organisation's trading activities and has no involvement in client business. It generates profits exclusively from taking positions. This trading unit has no client contact and is not involved in the broker market.</p>
United Kingdom	FCA/PRA Handbook UK Debt Management Office Guidebook	Various financial instruments Public debt	<p>Market-maker (in relation to an investment) a person who (otherwise than in his capacity as the operator of a regulated collective investment scheme) holds himself out as able and willing to enter into transactions of sale and purchase in investments of that description at prices determined by him generally and continuously rather than in respect of each particular transaction.</p> <p>Proprietary trading [...] dealing in investments as principal as part of a business of trading in specified investments.</p> <p>Gilt-edged Market Makers (GEMMs) are committed to make, on demand and in all conditions, continuous and effective bid and offer prices to their customers in all gilts in which they are recognised as a market-maker. GEMMs must aim to achieve and maintain an individual secondary market share of at least 2.0% on a 6-month rolling average basis in the sectors for which they are a market-maker.</p>
United States	Prohibitions and Restrictions on Proprietary Trading and Certain Interests In, and Relationships With, Hedge Funds and Private Equity Funds ("Volcker Rule") (13 December 2013)	Various financial instruments	<p>[...] permitted market-making-related activities [...] require that:</p> <p>a. The trading desk that establishes and manages a financial exposure routinely stands ready to purchase and sell one or more types of financial instruments related to its financial exposure and is willing and available to quote, buy and sell, or otherwise enter into long and short positions in those types of financial instruments for its own account, in commercially reasonable amounts and throughout market cycles, on a basis appropriate for the liquidity, maturity, and depth of the market for the relevant types of financial instruments;</p> <p>b. The amount, types, and risks of the financial instruments in the trading desk's market-maker inventory are designed not to exceed, on an ongoing basis, the reasonably expected near term demands of clients, customers, or counterparties, as required by the statute and based on certain factors and analysis; [...]</p>

Source: Study Group member contributions based on national regulations.

Appendix 3: Measuring trends in market-making and proprietary trading

Market-making and proprietary trading cannot be measured directly, but manifest themselves in numerous empirical measures. While some of these measures may be more closely associated with one or the other activity, there is no clean separation between the two because of the multi-dimensional and interconnected nature of both activities. Considering a broad list of measures may thus be most helpful in assessing underlying trends. Two groups of metrics appear particularly informative: (i) market-based liquidity metrics that intend to gauge the current cost of trading; and (ii) dealer data that may provide additional insights into developments in market-making capacity.

Market-based liquidity metrics

The bid-ask spread, or difference between bid and offer prices, directly measures the cost of trading and represents one of the key operational instruments of liquidity providers who will adjust the spread on the basis of P&L considerations (see Graph 2). A drawback of the bid-ask spread is that bid and offer quotes are only good for limited quantities, so that the spread only measures the cost of executing a single trade of limited size.

The quantity of securities that can be traded at the bid and ask prices helps account for the depth of the market and complements the bid-ask spread as a measure of market liquidity. A simple estimate of this quantity is the quote size, or the quantity of securities that is bid (or offered) at the posted bid and offer prices.

An alternative measure of market depth is the trade size, which is an ex post measure of the quantity of securities that can be traded at the bid or offer price, reflecting any negotiation over quantity that takes place. Quote size and trade size probably underestimate market depth, however, as the quantity traded is often less than the quantity that could have been traded at a given price, and market-makers often do not reveal the full quantities they are willing to transact at a given price.

Another popular liquidity measure considers the rise (fall) in price that typically occurs with a buyer-initiated (seller-initiated) trade. Such price impact measures are relevant to those executing large trades or a series of trades and, together with the bid-ask spread and depth measures, provide a fairly complete picture of market liquidity. A drawback of this measure is that the data required for estimation, including the side initiating a trade, are often difficult to obtain.

A liquidity measure used in fixed income markets is the spread between the yield of an on-the-run security and that of an off-the-run security with similar cash flows. Since liquidity has value, more liquid securities tend to have higher prices (lower yields) than less liquid securities. The spread hence reflects the price of liquidity as well as differences in liquidity between securities.

Trading volume and securities outstanding are also widely cited measures of market liquidity. Their popularity may reflect the fact that larger and more active markets tend to be more liquid as well as their simplicity and availability. A drawback of trading volume is that it is also positively associated with volatility at times, which itself tends to be negatively related to liquidity, so that the implications of changes in trading activity for market liquidity are not always clear.

While none of these liquidity metrics solely measures market-making or proprietary trading, some, such as the bid-ask spread and market depth, may more closely gauge market-making activities. Since the on-the-run/off-the-run yield spread reflects the price of liquidity, as well as liquidity itself, it may more closely gauge proprietary trading. Measures such as trading volume and price impact, in turn, probably reflect a mix of both market-making and proprietary trading.

Dealer data

A number of dealer-based measures can help track dealer risk-taking behaviour. These include measures of dealer behaviour in particular markets, including dealer positions, trading activity and financing activities, as well as broad-based measures of dealer risk-taking, such as leverage and capital ratios, and financial assets held for trading versus available for sale.

Other metrics, often drawn from supervisory information, concern dealers' internal risk controls and include business line-level information on profits and losses, VaR, VaR limits, and VaR sensitivities to risk factors. While these measures may be particularly valuable for assessing changes in market-making capacity, they are typically not available to researchers and market analysts.

As with the liquidity metrics, some dealer metrics may be more or less associated with market-making or proprietary trading than other metrics. Metrics concerning risk controls are affected by dealers' market-making activities, but are probably more reflective of dealers' proprietary trading activities. Similarly, dealers' net positions in sovereign debt may be reflective of proprietary trading and the dealers' view on the course of interest rates. In contrast, dealers' gross positions may be more reflective of dealers' willingness to make markets, so that a dealer actively making markets may have large gross positions, but at the same time hedge those positions so as to manage interest rate exposure.

Appendix 4: Surveying market-makers on the expected impact of regulation

To better assess the impact of key international regulatory reform efforts on market-making in fixed income markets, the Study Group conducted an informal survey among major market-making institutions from 11 advanced and six emerging market economies (40 and 44 participants, respectively) in July 2014. Survey participants were asked to rank the impact of each of seven reforms on their institution's facilitation activities, inventories, hedging activities and profits for three different business lines (rates trading, high-grade credit, high-yield credit). In addition, respondents were asked to gauge the progress made in adjusting to these regulations thus far. While coloured by the industry's more general views about ongoing regulatory reforms, the results provide some interesting insights into the respondents' expectations regarding the impact of different regulatory initiatives on the economics of market-making as well the progress made in adjusting to the new regulatory environment.

Overall, market-makers expected only a moderate decline in facilitation activities, with those from advanced economies generally anticipating a more pronounced response than those from emerging market economies. Similar results were obtained for the expected change in inventories, hedging activities and profits. A more detailed analysis of the reported impact of individual reforms confirms these overall results, while providing additional insights into the perceived relative strength of individual regulatory drivers.

Leverage ratio. Survey respondents, on average, considered the leverage ratio to have the strongest impact on their fixed income businesses. More than half of the participants attributed at least a moderate decline in their facilitation activities to the introduction of the leverage ratio, and roughly two thirds expected at least a moderate decrease in bond inventories and trading profits. Respondents from banks in the United Kingdom and the United States pointed to a particularly strong impact, with roughly half of them suggesting a significant decrease in facilitation activities and inventories, contrasting with the majority of respondents from emerging market economies who did not expect any decrease. That said, survey participants broadly agreed that, in their view, the impact would be more pronounced for high-yield credit trading than for rates trading (eg sovereign bonds and related markets).

Risk-weighted capital requirements. About half of the respondents suggested that revisions to the Basel II market risk framework and more stringent capital requirements under Basel III as well as for global systemically important banks (G-SIBs) are contributing to at least a moderate decline in facilitation activities for rates trading and high-grade credits, whereas two thirds consider these reforms to at least moderately reduce their activities in high-yield credits. This result is consistent with the feedback gathered from the bilateral interviews, in which many market participants underscored the more pronounced impact of regulatory capital requirements on market-making in more risky assets. The impact on trading profits, by contrast, was not expected to differ across business lines, with two thirds of the respondents expecting at least a moderate decrease, one quarter expecting no change and 7% suggesting a moderate increase in profits.

Liquidity regulations. More than half of the respondents anticipated no change in their institution's facilitation activities in response to the introduction of the LCR and NSFR. Indeed, about 10% of the survey participants, mostly from emerging market economies, expected facilitation activity to increase at least moderately for rates and high-grade credit instruments. This contrasts with expectations for high-yield credits, where roughly 10% of the respondents from both advanced and emerging markets anticipated a significant decrease in facilitation activities and inventories.

OTC derivatives reform. Mandatory central clearing of standardised OTC derivatives was considered to have only a limited impact on market-makers' facilitation activities and profits, with more than half of the respondents expecting no change at all. One third of the survey participants foresaw at least a modest decline in their related credit trading business, whereas the share of respondents expecting a decline in rates trading due to mandatory central clearing broadly matched the number of those expecting an increase (ie 25% each). By contrast, about half of the respondents estimated that regulations on margin requirements for non-centrally cleared OTC derivatives would at least moderately reduce facilitation activities and related market-making profits in these instruments (with most of the other half expecting no change).

Restrictions on proprietary trading. Regulations aimed directly at restricting banks' proprietary trading activities were perceived to at least moderately reduce facilitation activities, inventories and profits by about half of the respondents, with the other half expecting no change. This result is in line with private sector feedback gathered in interviews, suggesting that banks in many jurisdictions had already reduced or ceased their proprietary trading in the direct aftermath of the global financial crisis. Some survey respondents, however, noted that their institutions had not yet assessed the impact of these regulations in detail.

Adjustment needs. Finally, participants were requested to gauge the extent to which business models have already been adjusted to the regulatory initiatives discussed above. Reflecting the progress made by the authorities in finalising the respective regulations across jurisdictions, broadly half of the respondents stated that their institutions had already adjusted to the new risk-weighted capital requirements, proprietary trading restrictions and the LCR, with adjustments having progressed similarly across the different business lines. About one third of the participants also considered their institutions to have at least mostly adjusted to mandatory central clearing requirements as well as the leverage ratio and NSFR. The least progress to-date was reported on adjustment to the upcoming regulation on margin requirements for non-centrally cleared derivatives, where only about one quarter of the respondents considered their institutions to have already mostly adjusted to the expected changes in regulation.

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