

# Liquidity in Core Government Bond Markets

20 October 2022



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## Executive Summary

Changes in core government bond markets<sup>1</sup> over the past decade may have made these markets more prone to liquidity imbalances in times of stress. The growth in outstanding debt combined with the greater use of government bonds by some investors for trading and hedging strategies or liquidity management purposes may have increased sensitivity to shocks. Dealers have lower risk warehousing capacity to support intermediation compared with the size of trade flows especially in stress, while non-bank liquidity providers – such as principal trading firms (PTFs) – do not appear to sufficiently increase market-making in stress.

The severe dislocations experienced in the government bond market during the March 2020 turmoil were the outcome of large spikes in the demand for liquidity by a variety of market participants, especially non-banks. Unlike the typical case of being a ‘safe haven’ in periods of stress, this market experienced a ‘dash for cash’ as investors scrambled to sell highly liquid assets to fulfil their cash needs. This included sales of bonds to meet redemptions and/or margin calls, as well as to unwind leveraged positions. Overall dynamics were fairly similar across cash and futures markets in terms of yield spikes and market liquidity deterioration. By contrast, repo markets behaved differently across relevant jurisdictions, while primary markets proved more resilient. There is limited evidence to suggest that particular market structures significantly and uniformly contributed to better outcomes. A corollary of this finding is that the resilience benefits of changes to structures seem to be context-specific and jurisdiction-dependent.

Information on the behaviour of different market participants is hampered by significant data gaps across jurisdictions with respect to the identity of traders, the amounts of bonds held by different investors, and also on the evolution of key variables such as liquidity indicators.

Bank dealers increased their trading activities to some extent, but this was not enough to counterbalance selling pressures and avoid sharp movements in government bond prices and spreads. Dealers did not add to the selling pressure in a market that was already under considerable stress. Their stronger capital and liquidity positions as a result of the post-crisis reforms were a source of resilience during the stress. Based on available data, it appears that other liquidity providers did not sufficiently increase their intermediation activities.

The behaviour of other market participants varied. Hedge funds contributed to selling pressures in the US and in euro area government bond markets, but were net buyers of bonds in the UK. Open-ended funds (OEFs) were net sellers of government bonds in most jurisdictions due to investor redemptions. Evidence on whether they sold the most liquid securities disproportionately is mixed. Money market funds (MMFs) that invest exclusively in government securities received substantial inflows, while in some jurisdictions MMFs that invest mainly in other types of assets sold a substantial amount of government securities. Insurance companies and pension funds contributed to selling pressure in some jurisdictions (US and UK) but not in others. Foreign entities (both central banks and private investors) were net sellers of government bonds in all relevant jurisdictions, but the magnitude of their sales varied substantially and was particularly

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<sup>1</sup> For the purposes of this report, core government bond markets are defined as markets for government-issued securities denominated in major foreign exchange reserve currencies (i.e. US dollars, Euros, Japanese Yen and Pounds Sterling) and held by investors in multiple jurisdictions. Relevant markets include cash, repurchase agreements (repo), and futures.

large in the US. Central bank interventions were fairly similar across jurisdictions and effective in alleviating market strains, highlighting the key role authorities can play in restoring market functioning in stress. The impact of interventions extended well beyond announcement effects. But these interventions are not without cost and should not substitute for the obligation of market participants to manage their own risks appropriately and self-insure against adverse outcomes. This underscores the need to address factors that can lead to large liquidity imbalances in stress.

The FSB conducted a survey of relevant member authorities to assess the behaviour of different types of participants in core government bond markets during the March 2020 market turmoil. The factor most commonly reported by respondents as “highly relevant” for dealer behaviour in March 2020 was the high level of uncertainty caused by the pandemic. Other “highly relevant” factors were large one-sided flows and the internal risk management of dealers. Operational issues and the breakdown of hedges are most commonly reported as “somewhat relevant” factors. Prudential constraints were not reported to be a primary driver of the behaviour of dealers, but may have had an impact at the margin and in a subset of the markets (i.e. repo).

Factors mentioned as “highly relevant” to explain the demand for liquidity by other market participants included the need to raise cash to meet investor redemptions (especially for OEFs and MMFs) and the need to unwind leveraged positions (especially for hedge funds).

Consistent with the findings of this report and the framework for enhancing NBF1 resilience in the FSB’s November 2021 NBF1 progress report, policies to consider include measures to: mitigate unexpected spikes in liquidity demand; enhance the resilience of liquidity supply in stress; and enhance risk monitoring and the preparedness of authorities and market participants.

Work is already underway by the FSB and standard-setting bodies to assess and mitigate factors that give rise to unexpected and significant spikes in liquidity demand (money market funds, open-ended funds, margining practices). In addition, the FSB will consider the scope for additional work to limit the build-up of leverage by non-bank investors.

To enhance the resilience of liquidity supply in stress, work could involve exploring further potential ways to increase the availability and use of central clearing for government bond cash and especially repo transactions, as well as the use of all-to-all trading platforms. However, as noted in the report, the scope, incentives and modalities of central clearing vary widely across jurisdictions and need to be considered for the specific market in question. In addition, the resilience benefits of expanding the use of all-to-all platforms depend on whether non-banks would be a stable source of liquidity in stress, which is not a given.

To enhance risk monitoring and preparedness, policies to consider include increasing the level of transparency in government bond markets, so that timely and accurate information is available to market participants and authorities. This includes closing some of the substantial data gaps identified in this report such as, for example, the regulatory reporting of all transaction data to authorities and details on the activities of PTFs.

None of these policies is a silver bullet – and many of them take time to implement and need to be tailored for the particular market structure and context. They are also unlikely to be sufficient by themselves to prevent liquidity imbalances in all future stress events, but they could help mitigate the frequency and magnitude of liquidity imbalances in the event of future stress.

## 1. Introduction

Government bond markets, particularly core markets, are crucial from a financial stability perspective given their role: (i) in financing government activities; (ii) as a ‘safe haven’ in periods of stress; (iii) as a benchmark for the pricing of other (risky) financial instruments; (iv) as a key collateral asset (particularly as markets have migrated towards secured lending); and (v) in capital and/or liquidity regulatory requirements for a number of financial institutions, such as banks and money market funds (MMFs).<sup>2</sup> These markets, especially for on-the-run bonds (or bonds most recently issued) and for benchmark tenors that underlie futures contracts, are usually very liquid in normal times and often more liquid than other markets in times of stress.

In March 2020, following the outbreak of the COVID-19 pandemic, many of these markets experienced extreme dislocations and deteriorations in liquidity conditions, notwithstanding their usual high resilience.<sup>3</sup> As part of its work programme to enhance the resilience of non-bank financial intermediation (NBFi),<sup>4</sup> the FSB committed to analyse the liquidity, structure, and resilience of core government bond markets. This work, building on relevant analysis by other international bodies, has: a) taken stock of recent changes in the structure and liquidity of core government bond markets; b) analysed the changes in government bond market liquidity (and related repo and futures markets) in March 2020, including the behaviour of various market participants (particularly dealers); c) examined the drivers of market participants’ behaviours; and d) identified factors that promote the resilience of government bond markets.

This report presents the findings and policy implications of this work. It first provides stylised facts about the evolution of core government bond and other relevant markets in the lead-up to and during the March 2020 turmoil. It then discusses the behaviour of dealers and other market participants in these markets and the drivers of that behaviour. The report concludes and draws some policy implications. Annex 1 includes tables summarising key characteristics of core government bond and related markets; Annex 2 describes the Basel III treatment of government bond exposures; Annex 3 presents detailed maps of the relevant markets; while Annex 4 summarises the main takeaways from stakeholder outreach with Debt Management Offices (DMOs), dealers and other liquidity providers, and investors in government bond markets.

## 2. The evolution of the relevant markets

The size of core government debt increased substantially, both in absolute and relative terms, in recent years (Graph 1, top-left panel). In the US, outstanding government debt grew from about \$13.6 trillion in 2010 to \$25 trillion in 2020 (or from 90% to 131% of GDP). In the euro area over the same period, government debt grew from €8.3tn to €12.9tn (87% to 113% of GDP), in the UK from £1.3tn to £2.9tn (80% to 137% of GDP) and in Japan from ¥882tn to ¥1280tn (174% to 238% of GDP).<sup>5</sup>

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<sup>2</sup> MMFs generally hold government bills as part of their liquid assets, although there is no explicit requirement for them to do so.

<sup>3</sup> See FSB, *Holistic review of the March market turmoil* (November 2020).

<sup>4</sup> See FSB, *Enhancing the Resilience of Non-Bank Financial Intermediation – Progress Report* (November 2021) highlighting current work on NBFi.

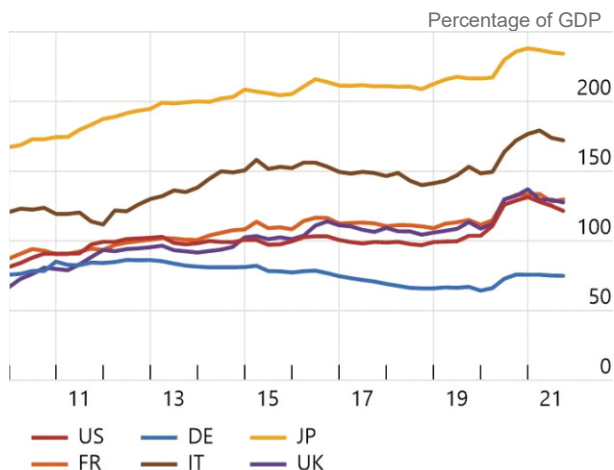
<sup>5</sup> Data refer to central government debt and come from the BIS Statistics Warehouse and national statistical authorities.

The main change in ownership in recent years has been the increased holdings of government debt by domestic central banks (Graph 2). This increase in holdings is tied to large-scale asset purchase programmes to facilitate the smooth transition of monetary policy and to ease funding market strains, especially following the COVID-19 outbreak. While central banks absorbed much of the increase in supply, other investors also increased their holdings.

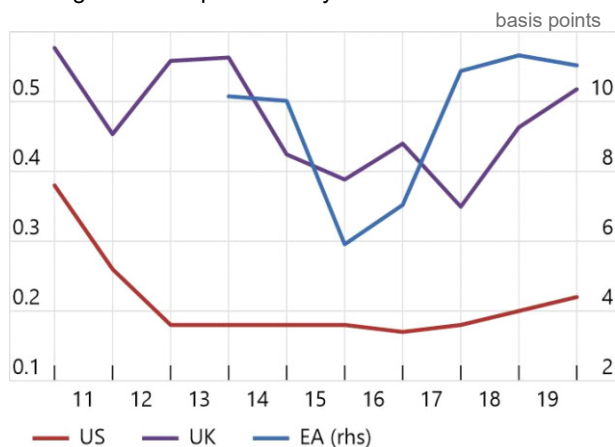
## Developments in core government bond markets

Graph 1

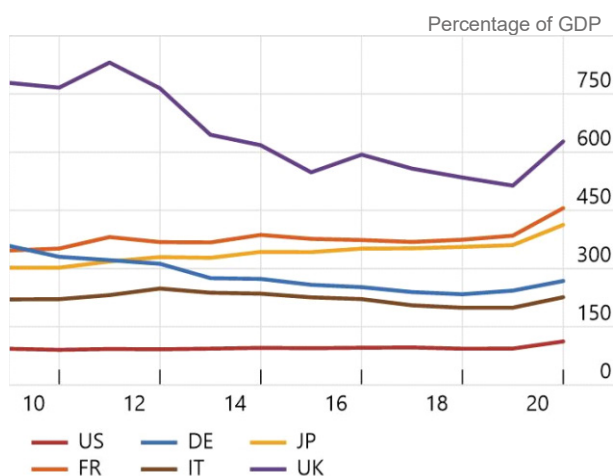
Government debt



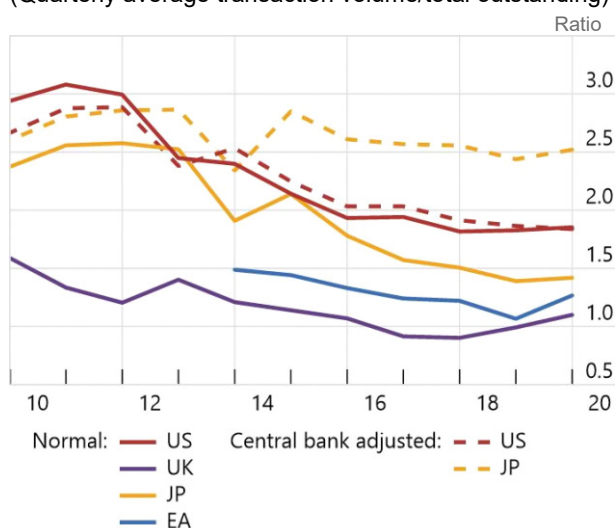
Average bid/ask spread – 10 year benchmark bonds



Size of banking sector<sup>1</sup>



Cash government bond turnover ratio (Quarterly average transaction volume/total outstanding)



<sup>1</sup> Financial assets of deposit taking corporations. UK includes that of the central bank and MMFs.

Sources: BIS; IMF; OECD; national authorities; FSB calculations.

Over time, non-banks have also increased their holdings of government debt across most relevant jurisdictions (Graph 2). In the US, where non-bank data is more granular, MMFs increased their share of US Treasuries from 3.8% in 2011 to 5.4% at year-end 2019, while other open-end funds (OEFs) increased from 3.3% to 6.8% over the same period. Hedge funds' holdings of US Treasuries increased from approximately \$600 billion at year end 2012 to \$1.2



trillion at year end 2019.<sup>6</sup> In other jurisdictions data to determine the drivers of growth in non-bank holdings is not available.

Government bond liquidity in normal market conditions has not deteriorated between 2011 and 2020 (Graph 1, top-right panel). Widely used measures of liquidity, such as bid-ask spreads, have remained broadly stable or slightly improved over this period. Trading volumes have remained static or increased only slightly, leading to a decrease in government bond turnover ratios across all relevant jurisdictions. However, when adjusting for government debt held by local central banks, given their buy-and-hold nature, the turnover ratios remain stable or decline significantly less (Graph 1, bottom-right panel).

Government bond market structures are complex and idiosyncratic across jurisdictions. They are characterised by increased use of electronic trading and presence of non-bank liquidity providers in recent years (see Box 3 and Annex 1 for details).

Primary markets are structured around three main issuance channels: auctions through primary dealers; syndications directly to end investors, and tender offers (most for short-dated bills). Auctions through primary dealers remains the largest funding channel for debt management offices (DMOs), though discussions with DMOs highlighted the use of a range of instruments through multiple channels to ensure a broad and diversified investor base. DMOs also have some tools to contribute to market liquidity, such as repo facilities in certain cases,<sup>7</sup> direct purchases from dealer inventories and buybacks.

Across all jurisdictions, cash government bond markets can be segmented between the 'interdealer' and 'dealer to customer' markets:

- Interdealer markets are predominately electronic, using request for quote (RFQ) or central limit order book (CLOB) protocols, although some jurisdictions (e.g. France and Germany) remain primarily or partly voice brokered. Within the interdealer market, traditional bank dealers remain the primary liquidity providers, except for the US where principal trading firms (PTFs) intermediate approximately 60% of the electronic interdealer market. Central clearing within the interdealer market is highest in Italy and Japan; it is lower in the US as PTFs are generally not members of the CCP; and it is limited or non-existent in Germany, France, and the UK.
- Within the dealer to customer cash market, dealer intermediation remains predominant. PTFs have a limited presence in the US dealer to customer market. Across all relevant jurisdictions, electronic RFQ platforms and voice trading within the dealer to customer cash market are predominant, while central clearing is limited.

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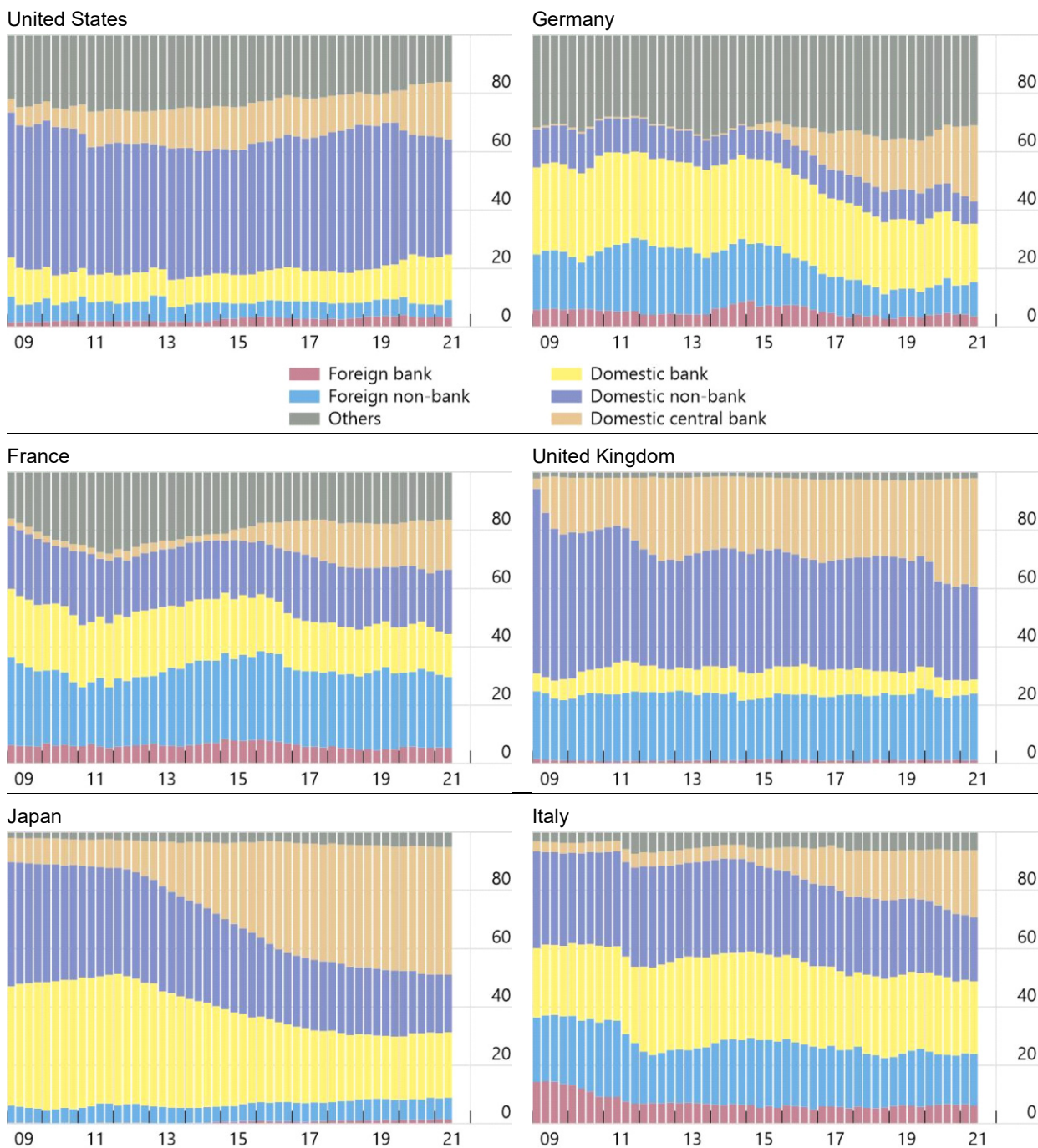
<sup>6</sup> See Federal Reserve, *Enhanced Financial Accounts – Hedge Funds*.

<sup>7</sup> For example, the UK and German DMO standing repo facilities.

## Government debt by type of holder

% of government debt

Graph 2



Sources: IMF, FSB calculations.

Repo market structures tend to be more similar across jurisdictions. Interdealer markets are primarily electronic (mostly RFQ with some CLOB) and centrally cleared, while dealer to customer markets are a mixture of electronic (RFQ) and voice and mainly clear bilaterally, although sponsored repo models in the US (and, to a much lesser extent, the UK) have opened up access to central clearing in this segment.

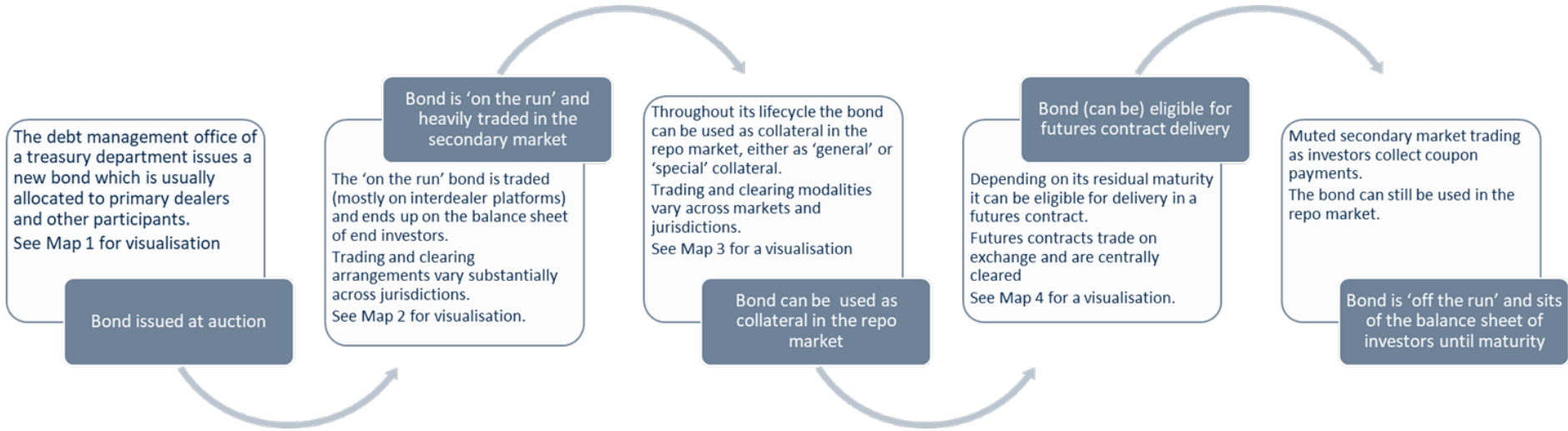
Futures markets are most homogeneous across jurisdictions, as they are all exchange traded and centrally cleared. PTFs are material liquidity providers in futures markets.

There are strong linkages between government bond (both primary and secondary), repo and futures markets. Secondary markets for government bonds are closely linked with activity in the repo and futures markets, as different participants fund their activities in repo markets using government bonds as collateral, or arbitrage differences in the prices of the futures and cash markets. Repo markets also play a key role in facilitating the flow of cash and securities around the financial system, with benefits to both financial and non-financial firms. A well-functioning repo market also supports liquidity in other markets thus contributing to the efficient allocation of capital in the real economy. Figure 1 represents visually a stylised lifecycle of a government bond and how the various markets are linked to each other. More detailed maps of the linkages between the various markets and their participants are available in Annex 3.

Most government bond dealers are part of a banking group (see Box 1) and subject to Basel III requirements (see Annex 2 for the Basel III treatment of government bond exposures). Non-bank dealers include broker dealers not affiliated with a banking group (including inter-dealer brokers) in the US or in the euro area and some securities companies in Japan.

The stylised lifecycle of a government bond and associated markets

Figure 1



### Box 1: Dealers in government bond markets

Most dealers active in the markets covered by this report are bank-affiliated, and most often those banks are global systemically important banks (G-SIBs). These dealers offer a range of products and services to institutional clients, including fixed income, equities, and derivatives, while affiliated banks often provide clearing and settlement services to those same clients. Bank-affiliated dealers may engage in less profitable trades or carry larger inventories to accommodate clients important to the banking group's franchise (e.g. bank lending, cash management, prime brokerage, asset management).

Dealers not affiliated with banks are present in most jurisdictions but comprise a much smaller market share. These dealers often specialize in certain products or market segments and may provide a similar range of products and services to bank-affiliated dealers, but without the opportunity to cross sell banking products to clients.

Dealers are active across government bond cash, repo, and futures markets. Within each of these markets, they intermediate between buyers and sellers. Within cash government bond markets, dealers also participate in the primary market where they bid at government bond auctions most often through a regulated primary dealer system. In the repo market, dealers primarily intermediate by borrowing cash from money market funds and other investors and lending these funds to other institutions. They also provide leverage to clients through repo, lending cash against their client's government bond collateral. Dealers can also source inventory, either to lend to a client or cover a short position, through the repo market. Dealers generally fund both their government bond inventory and reverse repo positions in the repo market. In the futures market, dealers hedge their own inventory positions as well as intermediate client demand. Since futures markets are traded and centrally cleared on a CCP and many clients are not members of the exchange, dealers facilitate client access to the exchange. From a dealer's perspective, these three markets are tightly linked: dealers finance inventory positions in the repo market and hedge the market risk in the futures market. Therefore, any change in a dealer's inventory would necessarily require changes to its repo funding and futures hedging positions.

In most markets, dealers that are registered with the relevant debt management office (DMO) have certain privileges and obligations (these dealers are often called "primary dealers"). In the UK, only dealers recognised by the DMO as Gilt Edged Market Makers (GEMM) have access to the primary market. In exchange for this access, GEMMs are expected to participate in every operation for which they are a designated market maker, provide two-way pricing on demand to clients, and providing the DMO with data on their positions and turnover. In Japan, although there is a special scheme for some primary dealers (responsibilities to participate in auctions and provide secondary market liquidity, in exchange for certain entitlements),<sup>8</sup> it is possible for any dealer to bid for JGBs at auction. In the US, primary dealers registered with the Federal Reserve Bank of New York (FRBNY) serve as a trading counterparty of FRBNY but any dealer, institution, or individual can participate directly in US treasury auctions. In Italy, primary dealers are banks or investment firms that meet the requirements defined by the Italian Treasury, as stated in several ministerial decrees.<sup>9</sup> France and Germany also utilise a primary dealer scheme.<sup>10</sup>

For all jurisdictions, dealers affiliated with G-SIBs are subject to the full Basel III regulatory requirements. The existing Basel "Pillar 1" treatment of government bond exposures (see Annex 2) includes a national discretion in the risk-weighted framework for jurisdictions to apply a lower risk weight

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<sup>8</sup> Entitlements include meeting with the Ministry of Finance to discuss JGB management policies, participation in buy-back auctions and non-price competitive auctions, among other privileges.

<sup>9</sup> These include: primary dealers' participation to auctions on the primary market; their activity on the secondary market (where they should put efforts to promote sound liquidity conditions on a continuous time basis); their organizational structure; and their capital base. The Italian Treasury also conducts an overall assessment of specialists' performance on an annual basis, which is based on an ongoing monitoring of individual performances; the Bank of Italy also takes part to the evaluation process.

<sup>10</sup> The German primary dealer scheme has the notable exception that no particular obligations are linked to primary dealer status.

– typically 0% – for government bond exposures denominated and funded in domestic currency. In addition, government bond exposures are currently not included in the large exposures framework. Finally, no limits or haircuts are applied to domestic government bond exposures that are eligible as high-quality liquid assets (HQLA) as part of the liquidity standards. However, government bond exposures are included as part of the leverage ratio framework.

Other dealers (not affiliated with G-SIBs) are subject to similar Basel III regulatory requirements (e.g. EU, UK) or to different prudential requirements (e.g. Japan, US).

Most G-SIBs apply prudential risk management requirements to manage capital requirements down to the business or desk level (by rule or by their own volition). In practice, this means while G-SIB dealers may have significant headroom against leverage ratio or other capital requirements, that buffer is tightly controlled through governance and limit frameworks that business or trading desks cannot override without going through formal governance channels. In addition, dealers may establish other internal risk management limits that constrain activity related to government bonds. These may include limits on trading book size, value-at-risk (VaR) and duration, balance sheet and funding utilization, and counterparty concentration.

### 3. Market dynamics in March 2020

In March 2020 the financial system had to cope with large shifts in liquidity.<sup>11</sup> The interaction of the COVID-19 shock with financial vulnerabilities – including liquidity and maturity mismatches, as well as high leverage – led to sudden and large shifts in the demand for liquidity. Notwithstanding high trading volumes, the resulting liquidity imbalances became sufficiently pervasive to create dysfunction even in core government bond markets.

Overall dynamics in March 2020 were fairly similar across government cash and futures markets in terms of rapid changes in yields and market liquidity deterioration. There was initially a ‘flight to quality’, as investors sold risky assets and bought safe assets due to the elevated uncertainty. During this period, yields on government bonds initially declined across all jurisdictions in response to the evolving trajectory of policy (Graph 3). However, this gave way to a ‘dash for cash’ in mid-March. Yields suddenly spiked, indicating that a broad range of investors were selling government bonds to raise cash. This was most pronounced in the off-the-run segment, in part due to the need for dealer intermediation of these trades. Liquidity measures deteriorated across cash and futures markets, and to a lesser extent repo markets. Bid-ask spreads widened, order book depth fell, while trading volumes continued to increase.

Data for the US show that depth at the top of the order book in the futures market collapsed during the middle of March 2020, with as few as 10% of the contracts available compared to the beginning of February.<sup>12</sup> Data from other jurisdictions show substantial deterioration of liquidity in futures markets as well; for instance, bid-ask spreads in the UK, French and Japanese futures markets increased sharply and open interest in the French futures contracts decreased by 70%.

The selloff and higher volatility in core government bonds stemmed from, and in turn contributed to, increases in margin calls, deleveraging, and redemptions from various market participants. In the US market, for example, dislocations between the cash and futures market led to mark-

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<sup>11</sup> For an in-depth discussion of the March 2020 turmoil, see FSB (November 2020, op. cit.).

<sup>12</sup> See Schimpf et al, *Leverage and margin spirals in fixed income markets during the Covid-19 crisis* (April 2020).

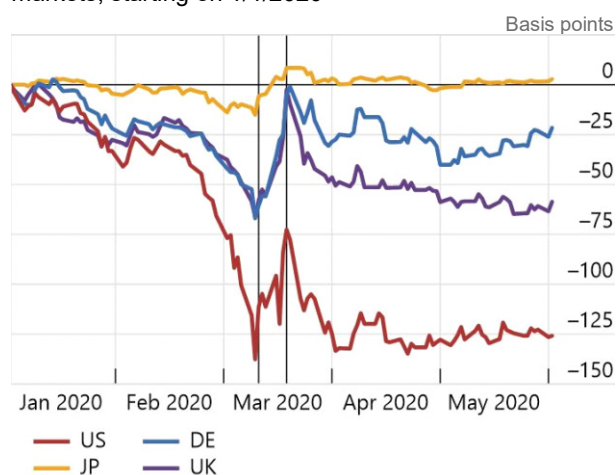
to-market losses for non-bank leveraged investors such as hedge funds engaging in the basis trade, thereby adding to the selling pressures. The increased volatility also led to margin calls across other markets (e.g. interest rate and foreign exchange (FX) derivatives),<sup>13</sup> increasing market participants' liquidity needs and leading to further sales of safe government bonds and increased demand for cash in repo markets. The demand for US dollars abroad led foreign central banks to sell a portion of their reserves, primarily US Treasuries, adding further pressures on the US Treasury market.<sup>14</sup> Redemptions from open-ended funds (OEFs) and other institutional investors that needed to raise cash or wanted to de-risk also contributed to the stress, as these investors sold bonds to meet redemptions (see section 4).

Reflecting the US dollar's role as the dominant global investment and funding currency, investors' selling pressures were more pronounced and broad-based in the US Treasury market. Differences in leverage dynamics also played a major role in explaining disruptions in the Treasury market.

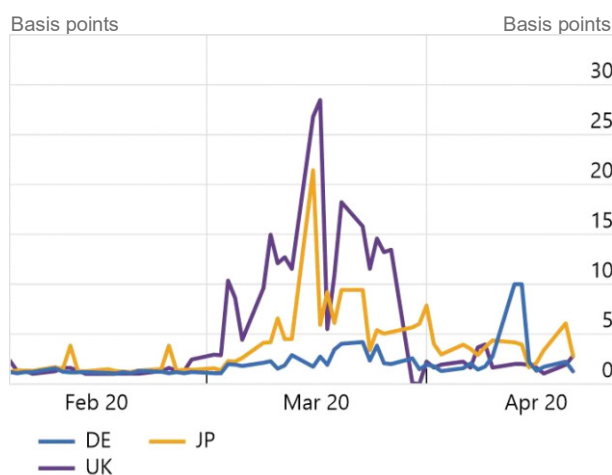
### Market dynamics in March 2020

Graph 3

Cumulative yield changes across sovereign bond markets, starting on 1/1/2020



Government bond futures bid-ask spreads



The vertical lines indicate 10 March 2020 and 18 March 2020 respectively.

Sources: FRB; Refinitiv Tick History; FSB calculations.

Repo markets behaved differently in the US compared to the euro area and Japan. The latter jurisdictions experienced more of a 'dash for collateral' than a 'dash for cash', in an attempt to raise USD funding. The need to raise cash – in particular, US dollars – manifested differently in the repo markets of different jurisdictions. In the US, market participants could sell or repo their assets to dealers (which led to increasing dealers' demand to finance incoming inventory in the repo markets); in the euro area and Japan they needed to acquire high quality collateral that could be pledged in exchange for US dollars (increasing dealers' demand for collateral); while the UK repo market behaved more similarly to the US.

<sup>13</sup> See BCBS, CPMI and IOSCO, *Review of Margining Practices Consultative Report* (October 2021).

<sup>14</sup> See FSB, *US Dollar Funding and Emerging Market Economy Vulnerabilities* (April 2022).

The different behaviour of repo markets in the euro area and Japan is reflected in negative repo spread rates, and higher demand for special collateral over general collateral.<sup>15</sup> In Japan, this was largely due to banks and dealers sourcing collateral to obtain US dollars from central bank facilities, given that asset managers and other investors were unwilling to lend their high-quality collateral ahead of the March fiscal year-end. German and French repo rates reflect a similar demand for collateral, which can partially be attributed to European banks' desire to secure US dollars through central bank swap lines (Graph 4).<sup>16</sup>

The significant widening of the FX swap basis during March 2020 provides further evidence of a spike in demand for US dollars, with offshore US dollar funding needs alleviated by central bank swap lines.<sup>17</sup> The repo market in the US experienced rapid upward pressure on rates, which reflects the increased demand to borrow cash. However, these pressures abated when the Federal Reserve increased financing to primary dealers through an expansion of its daily repo operations. Repo markets in the EU proved to be generally resilient during the turmoil, while repo funding availability does not appear to have been a key driver of selling pressure.<sup>18</sup>

The primary market proved more resilient in all relevant jurisdictions. In the UK, the amount of gilts issued was in the region of £13.5bn per week, while in France more than EUR 20bn of bonds and EUR 29bn of T-Bills were issued in March 2020. In Italy the issuance of government securities continued at a steady pace, despite tensions in the secondary market.<sup>19</sup> Stakeholder outreach confirmed that issuance was not severely impaired in the US, Japanese and German markets either, and in some cases exceeded that of the previous months.

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<sup>15</sup> Higher demand for special collateral indicates cash lenders need specific collateral for liquidity or funding purposes which cannot be satisfied with a general collateral pool (e.g. the pool may include collateral not accepted at central bank facilities).

<sup>16</sup> See Moench et al, *'Dash for cash' versus 'dash for collateral': Market liquidity of European sovereign bonds during the Covid-19 crisis* (March 2021) .

<sup>17</sup> See Avdjiev et al, *Dollar funding costs during the Covid-19 crisis through the lens of the FX swap market* (April 2020).

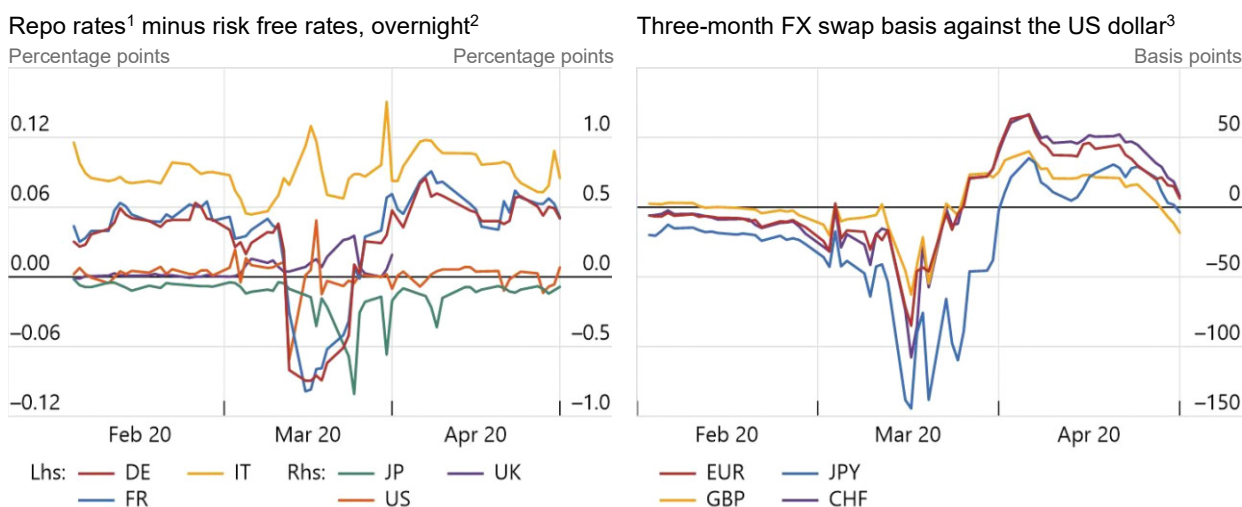
<sup>18</sup> The resilience of repo market in the euro area was also highlighted by stakeholders during the outreach meetings.

<sup>19</sup> The bid-to-cover ratio in auctions stayed on average at levels close to those recorded at the start of the year. The increase did not affect the average cost of the debt, which held stable. See also Bank of Italy, *Financial Stability Report, No. 1 - 2020*.



## Dash for cash versus dash for collateral

Graph 4



<sup>1</sup> Treasury GC repo rates for DE, FR, IT, JP, US, and for UK Overnight DBV Repo. <sup>2</sup> For DE, FR and IT the overnight interbank rate is €-STR, for JP it is TONAR, for US it is OBFR and for UK it is Bank Rate. <sup>3</sup> Calculated exploiting the covered interest parity condition as the spread between three-month US dollar Libor and three-month FX swap-implied US dollar rates.

Sources: Bloomberg; national authorities; JPMorgan Chase; FSB calculations.

Public interventions were fairly similar across relevant jurisdictions and effective in alleviating market strains. Unlike in other markets, the impact of central bank interventions in government bond markets extended well beyond announcement effects. Such interventions involved significant asset purchases and liquidity support (e.g. reverse repo operations), which led to a US\$7 trillion increase in G7 central bank assets in just eight months. Specifically in the US, the Federal Reserve alleviated strains in the offshore US dollar market by expanding FX swap lines and establishing a foreign central bank repo facility and in onshore markets by offering a significant amount of repo financing to primary dealers. In the euro area, the pandemic-related monetary policy measures included (i) the pandemic emergency (asset) purchase programme (PEPP); (ii) targeted longer-term refinancing operations (TLTRO III) at more favourable terms and conditions; (iii) non-targeted pandemic emergency longer-term refinancing operations (PELTROs); and (iv) easing of collateral rules. In some cases, these measures were also followed by targeted and temporary relaxation of prudential regulations (e.g. exempting banks' government bond and central bank exposures from the leverage ratio requirements).<sup>20</sup> DMOs also deployed various tools to address the turmoil in government bond markets.<sup>21</sup> Feedback from stakeholder outreach confirms that central bank interventions were crucial to address the challenges in government bond market functioning during March 2020.

## 4. The behaviour of different types of market participants

Dealers increased their trading activities during the turmoil. Trading volumes across cash, repo and futures markets increased significantly in March 2020. Data for the US and UK show that the amount of government bonds on dealers' balance sheets increased markedly during the

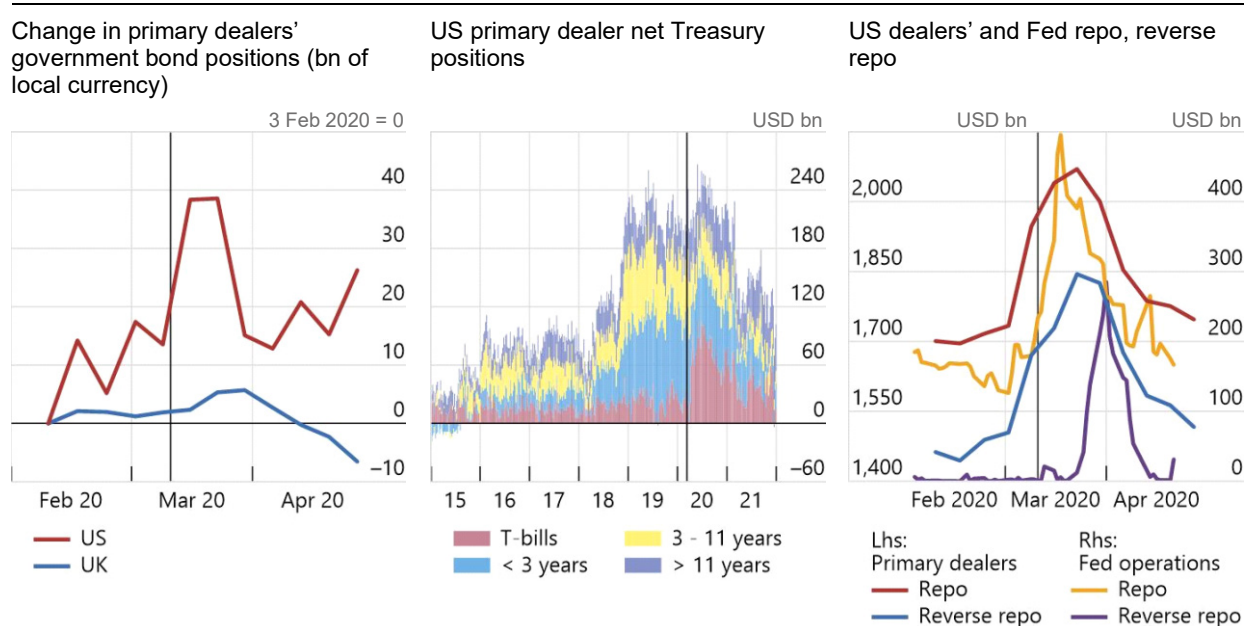
<sup>20</sup> See section 5 and Table 13 of the BCBS report on [Early lessons from the Covid-19 pandemic on the Basel reforms](#) (July 2021).

<sup>21</sup> These included using relatively more syndications or other operations to reach end investors directly and reduce reliance on primary dealers; increasing their purchases and buybacks to expand dealers' balance sheet capacity or repo operations to deliver specific bonds to the market; increasing the number of scheduled debt auctions or syndications; and increasing the issuance of bills as opposed to longer dated bonds to meet investor demand for cash-like securities and act as a shock absorber.

dash for cash (see Graph 5). US authorities report a substantial rise in trading volumes and that dealer reverse repo lending of Treasuries increased by \$400bn, while inventories increased by \$50bn (i.e. around 25% of pre-turmoil dealer inventories). Similarly, UK authorities report that primary dealers had almost £6bn worth of additional gilts on their books (a figure comparable to the US one in terms of size) on March 16 compared to the beginning of February; that dealers' weekly trading was 60% higher than in normal times; and that they expanded their reverse repo positions. Euro area authorities report a broadly similar pattern, with some differences across individual markets. In France, trading of French OATs reached EUR 92 billion in March 2020, while the volumes on inflation-linked bonds and BTFs peaked at EUR 19 and 8 billion respectively. Market intelligence for Japan suggests that a similar pattern was present: both foreign and domestic banks are reported to have bought bonds of different maturities. Overall dealers made significant profits from their activities during the March turmoil.<sup>22</sup>

### Dealer inventories in March 2020

Graph 5



Solid vertical lines correspond to 10 March 2020.

Sources: Federal Reserve Bank of New York; national authorities; FSB calculations.

While dealers did not add to the selling pressure, they were not able to meet the much higher liquidity demands and focused their market-making activities on a subset of government securities. Notwithstanding their increased intermediation, dealers were unable to prevent market dislocations and overall liquidity conditions from deteriorating given the very large amounts of selling by different market participants. Overall, dealers tended to focus on the more liquid on-the-run and shorter maturity securities. There is also evidence in the US that bank dealers expanded their intermediation capacity over this period relatively more than other liquidity providers, such as PTFs.

Dealers continued to provide intermediation services in the repo market, but not uniformly. In the US, dealers increased intermediation in repo markets amidst the demand for cash. More cash flowed into government MMFs, while more cash was being demanded by hedge funds and asset

<sup>22</sup> See, for instance, Financial Times, [Goldman Sachs profits bolstered by bond trading boom](#) (15 July 2020).

managers. Dealers intermediated by borrowing money from the former and lending it on to the latter. They also did repo borrowing to finance their own holdings, which were growing. Similarly, in the euro area dealers continued their involvement in the repo market, but focused their activities on short term repo. For instance, in France a number of dealers did not enter into repos for periods longer than a month. A similar pattern emerged in the UK where dealers increased their stock of repo lending in response to client demand. Dealers increased their participation in the cleared segment of the repo markets in some jurisdictions (e.g. UK, US) in order to free balance sheet capacity to continue intermediating flows.

Available evidence suggests that the behaviour of dealers since March 2020 has returned to normal, with little difference compared to their behaviour before the turmoil.

While there is considerable commonality in the behaviour of dealers in March 2020, the behaviour of other types of market participants appears to have differed across jurisdictions. Information on the behaviour of different market participants (even about dealers themselves) is hampered by significant data gaps with respect to the identity of traders, the amounts of bonds held by different investors, and the evolution of key market liquidity metrics.

There is limited information on the behaviour of PTFs, but available evidence suggests they did not sufficiently increase their interdealer intermediation activities during the turmoil to meet increased demand for intermediation. In the US, PTFs initially increased their trading volumes significantly, but then pulled back. As a result of this pullback and elevated dealer trading volumes in the electronic interdealer market, PTFs' share declined from 60% to 45% during the dash for cash.<sup>23</sup> In the UK futures market, however, there is some evidence that PTFs continued to provide liquidity intraday. Their gross volume was large compared to the volume of other non-bank market participants, while their net volume was close to zero most of the time (Graph 6). This is aligned with their business model, which generally does not entail taking inventory positions overnight (see Box 2).

Hedge funds contributed to the selling pressures in the US and in some euro area government bond markets, but were net buyers of bonds in the UK. No information is available on the behaviour of hedge funds in Japan, but it appears that they are much less active than in other jurisdictions.

In the US, hedge funds were heavily involved in the cash-futures basis trade.<sup>24</sup> To be sufficiently profitable, given the small difference in prices between the cash and futures markets, hedge funds tend to lever up substantially to increase the profit from this trade. In March 2020 the large swings in interest rates reduced the availability and increased the cost of repo funding and increases in variation and initial margins on their futures positions, which led to increased costs of maintaining the trade. Because of the substantial increase in the spread between futures and cash bond prices, hedge funds experienced large mark-to-market losses on their positions, while higher volatility led to increased margin requirements. Overall, hedge funds sold substantial

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<sup>23</sup> See IAWG, [Recent Disruptions and Potential Reforms in the U.S. Treasury Market: A Staff Progress Report](#) (November 2021).

<sup>24</sup> Prices in the cash, repo, and futures markets are linked because it is possible to purchase a Treasury security in the cash market, finance the purchase in the repo market, sell the corresponding futures contract short, and then deliver the security in satisfaction of the futures contract when the futures contract expires. The cash-futures net basis is the return on such a sequence of transactions. See also Barth and Kahn, [Basis Trades and Treasury Market Illiquidity](#) (July 2020).

amounts of US Treasuries in March 2020 by historical standards. Estimates put this figure at around \$173bn, or 16% of their February holdings.<sup>25</sup>

### **Box 2: Principal trading firms in government bond markets**

PTFs are not formally defined in law but generally consist of non-bank trading firms that specialize in electronic, high frequency, and automated strategies across a range of asset classes. PTFs typically trade on their own account and do not raise money from outside investors. In most cases, PTFs trading strategies require highly liquid electronic markets with central limit order books (CLOB).

A key feature of many PTF strategies is the generation of large amounts of orders, holding positions in most cases for less than one second, and ending the day flat. Some PTF strategies result in overnight positions. As a result, PTFs are active in some cash and most futures markets but not present to a large extent in repo markets since they have little need to finance overnight but may rely on intraday liquidity from prime brokers and clearing banks.

PTFs are most active in the most liquid electronic markets. Across all jurisdictions, PTFs are active in the futures market given the electronic CLOB trading structure and limited barriers to become members of futures exchanges. For cash markets, however, PTFs are most active in the US, where barriers to enter the interdealer market are lower than other jurisdictions and CLOB trading exists. In jurisdictions like the UK, Japan and the euro area, PTFs appear to have a very small presence in the cash market.

In the US, many of the PTFs that transact primarily in Treasury securities market have not registered with the SEC as dealers of government securities. Recently, the SEC proposed rule changes which it expects will result in more PTFs registering as dealers or government securities dealers.<sup>26</sup> PTFs are generally not members of the CCP for Treasury market transactions (FICC)<sup>27</sup> and, as a result, clear their Treasury activity in the interdealer market bilaterally with their prime broker. In the futures market, PTFs are not required to register with the CFTC if they only trade for their own account. PTF activities in the futures market are generally governed by the customer account agreements with their brokers.

The basis trade is not as prevalent in the UK and euro area, where hedge funds tend to be more active in other types of relative value trades such as the on-the-run/off-the-run arbitrage (US hedge funds also use similar strategies). Information from stakeholders suggests that in the euro area, and especially for bunds, futures are relatively cheaper than the underlying bonds, which is the opposite of what happens in the US. This means that hedge funds engaging in the basis trade in Europe buy the futures and sell the bond until their prices converge, and therefore that the unwinding of these positions in stress results in hedge funds buying the bond rather than selling. In the UK<sup>28</sup> hedge funds were net buyers of UK gilts both in the initial phase of the stress and during the dash for cash. This behaviour is different from some euro area jurisdictions, where hedge funds were net sellers of government bonds until the ECB announced the PEPP. In France, risk parity funds were particularly active sellers when volatility increased and before the ECB intervention.

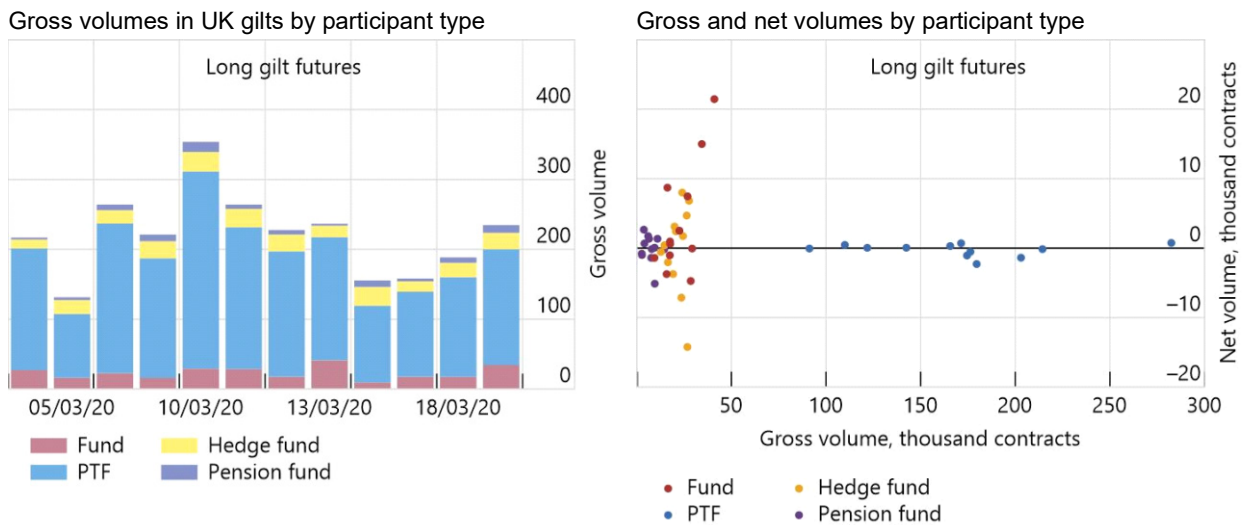
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<sup>25</sup> See IAWG (2021, op. cit.) and Federal Reserve Board, Enhanced Financial Accounts – Hedge Funds.

<sup>26</sup> See proposed SEC rule on Further Definition of “As a Part of a Regular Business” in the Definition of Dealer and Government Securities Dealer (April 2022).

<sup>27</sup> To become a member of FICC, PTFs must be SEC-registered broker dealers, meet minimum capital requirements, incur increased operational and compliance costs, and satisfy FICC’s margin requirements.

<sup>28</sup> See Czech et al, The role of non-bank financial intermediaries in the ‘dash for cash’ in sterling markets (June 2021).



Sources: FRB, Bank of England

OEFs were net sellers of government bonds in most jurisdictions. These sales were motivated by investor redemption requests, precautionary factors (e.g. anticipation of future redemptions), and the need to rebalance their portfolios. In the US, OEFs’ sales of Treasuries totalled approximately \$266bn in the first quarter of 2020. In the UK, OEFs bought gilts during the flight to safety phase but then sold gilts during the dash for cash. In Italy, based on data provided by dealers, there were sizeable sales by asset managers. Analysis by ESMA shows that European OEFs tended to sell holdings proportionally (i.e. using a vertical slicing approach) to meet redemptions.<sup>29</sup> On the other hand, evidence from the US<sup>30</sup> shows that corporate bond funds disproportionately sold Treasuries to meet redemptions.

The behaviour of MMFs differed across jurisdictions and depended on the type of fund. US government MMFs that invest predominantly in government securities received substantial inflows. On the other hand, money market funds in other jurisdictions that invest mainly in other types of short-term assets sold government securities. For example, French MMFs reduced their holdings of government bonds from end-February to end-March 2020 in the wake of increased redemptions. In the UK, MMFs withdrew a substantial amount of repo funding to dealers in response to large redemptions.

The behaviour of insurance companies and pension funds (ICPFs) also varied across jurisdictions. The long-term perspective of these investors and lack of short-term liquidity pressures (given the profile of their liabilities) has often been cited as a factor for dampening – rather than exacerbating – market stress. However, this did not happen uniformly across jurisdictions in March 2020. In the US ICPFs rotated their portfolios out of Treasuries and into stocks to rebalance towards their target allocation, thereby contributing to selling pressures in the Treasury market.<sup>31</sup> Similarly, ICPFs in the UK sold approximately 1% of their gilt holdings

<sup>29</sup> See ESMA, [Recommendation of the European Systemic Risk Board \(ESRB\) on liquidity risk in investment funds](#) (November 2020).

<sup>30</sup> See Ma et al, [Mutual Fund Liquidity Transformation and Reverse Flight to Liquidity](#) (April 2021).

<sup>31</sup> See IAWG (2021, op. cit.).

during the dash for cash and partly attribute this behaviour to their need to raise cash to pay margin calls which exceeded their expectations.<sup>32</sup> On the other hand, ICPFs in Japan and the euro area did not contribute to the selling of government bonds. In Japan they focussed their purchases on long-dated bonds, while in the euro area they were not particularly active during this period.<sup>33</sup>

Foreign entities were net sellers of government bonds in all relevant jurisdictions, but especially the US. Foreign sellers included both reserve managers and private investors. Their behaviour was relatively similar across jurisdictions, but the magnitude of their sales varied substantially. In the US foreign official Treasury outflows reached almost \$178 billion (4% of their 2020Q1 holdings), while foreign private holdings declined by \$72 billion (3%). In the UK, foreign official entities bought gilts initially but then sold approximately £1bn of gilts during the dash for cash. In a similar vein, foreign investors in the euro area and Japan sold their holdings of government bonds to reallocate their investments in their domestic markets.

The role of the US dollar as the pre-eminent global reserve currency may explain the much larger sales of US Treasuries compared to other core government bonds. This may have led to the “dash-for-cash” versus “dash-for-collateral” considerations described in the previous section. While US investors could raise dollars by selling liquid assets such as Treasuries, domestic government bonds were valuable to non-US investors (particularly banks) as collateral that they could pledge at the central bank to access dollars using FX swap lines.

## 5. The drivers of behaviour during March 2020

The FSB conducted a survey of relevant member authorities to assess the behaviour of different types of participants in core government bond markets during the March 2020 market turmoil. Respondents were asked to rank various factors that could explain dealer behaviour in government bond markets during March 2020. The objective of this ranking was to ascertain the relative importance of these factors (described below).<sup>34</sup> The responses need to be interpreted with caution as different factors interact in complex ways and it is not generally possible to single out individual drivers.

The factor most commonly reported as being ‘highly relevant’ for dealer behaviour is the high level of uncertainty caused by the pandemic. Other highly relevant factors that were mentioned are large one-sided flows and the internal risk management of dealers.

- Dealers were reluctant to expand their inventories further until there was clarity on the evolution of the pandemic and hence more information on how long the positions needed to be held on their balance sheet. Some dealers may have also wanted to

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<sup>32</sup> Czech et al (2021, op. cit.) argue that some of these margin calls were the results of the appreciation of the dollar against other currencies, given that ICPFs invest a large portion of their capital in dollar assets and hedge these exposures through FX derivatives. In addition, margin calls on UK ICPFs were triggered by sharply rising long-term yields.

<sup>33</sup> Italian insurance companies adopted countercyclical strategies, thereby mitigating market volatility. See Apicella et al, [Insurers' investments before and after the Covid-19 outbreak](#) (February 2022).

<sup>34</sup> Respondents were asked to classify the various factors into one of three categories based on their relative importance: “highly relevant”, “somewhat relevant” or “not relevant”.

maintain capacity to intermediate in the future should it be required by the evolution of the market.

- The large one-sided flows associated with the most severe part of the turmoil both in the cash and repo markets made it difficult for dealers to expand their liquidity provision further. For instance, econometric analysis in the UK35 suggests that, for the term repo market, the increase in spreads was more due to demand for liquidity rather than supply of liquidity factors.
- Value-at-risk (VaR) limits were increased by many dealers during the turmoil to reflect the heightened levels of uncertainty. However, aggregate risk limits (e.g. notional balance sheet or position size limits) may not have changed significantly for some desks and might have limited the expansion in dealers' market-making activity in government bond markets.

These responses appear well aligned with the available literature in this area. In particular, a number of academic papers show that disruptions in March 2020 in the US were exacerbated by the fact that dealers became inundated by – and were not able to cope with – the large-scale sales of Treasuries from foreign official accounts, mutual funds, and hedge funds.<sup>36</sup>

Operational issues and the breakdown of hedges are most commonly reported as 'somewhat relevant' factors.

- Operational issues and working from home (WFH) arrangements had, in most cases, a short-lived impact on dealers. However, in some cases inexperienced traders, as a result of the "juniorisation" of trading desks in recent years, were cautious taking on and managing large risk books. For those markets (e.g. dealer-to-customer) that mainly rely on voice broking, the WFH environment initially proved more challenging.
- The difficulty in hedging might have impacted dealers' incentives to intermediate in cash and futures markets as well as PTF activity in the futures market (and in the US cash market).<sup>37</sup> Hedging positions in long-dated government bonds is difficult in many jurisdictions and may partially explain why liquidity was more impacted for longer maturities.

Prudential regulations were not seen as a primary driver of dealer behaviour, but some of them (e.g. the leverage ratio) have had an impact at the margin for some jurisdictions.

- Overall, the respondents noted that prudential regulations were not a primary driver of the behaviour of dealers. A similar viewpoint was provided in the FSB's stakeholder outreach and in the literature. For example, Kruttli et al (2021)<sup>38</sup> find that G-SIBs – the

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<sup>35</sup> See Patel, *Decomposing changes in the functioning of the sterling repo market from 2014 to 2018* (April 2021) .

<sup>36</sup> See Vissing-Jorgensen, *The Treasury market in spring 2020 and the response of the Federal Reserve* (April 2021) and the references therein.

<sup>37</sup> See Harkrader and Puglia, *Principal Trading Firm Activity in Treasury Cash Markets* (August 2020), who show that PTFs are usually more skilled at managing their inventory risk.

<sup>38</sup> See Kruttli et al, *Hedge Fund Treasury Trading and Funding Fragility: Evidence from the COVID-19 Crisis*, Federal Reserve Board of Governors Finance and Economics Discussion Series 2021-038 (June 2021).

set of dealers most constrained by regulations – provided disproportionately better access to funding to their hedge fund counterparties during this period of market stress, suggesting that prudential regulations may not have been the binding constraint.<sup>39</sup>

- A limited number of respondents highlighted that the leverage ratio may have had an impact at the margin and in a subset of the markets (e.g. repo).

The greatest discrepancy in responses related to market structure as a driver of dealer behaviour.

- Some respondents highlighted market structure as a relevant driver of behaviour (see Box 3). They stressed how the size of government bond markets has grown significantly relative to dealer balance sheets (see section 2), suggesting that the capacity of dealers to intermediate in stress may be more constrained. They also noted that market functioning issues were only somewhat relevant and cited expanded use of central clearing and of trading platforms as areas to explore. Some other respondents indicated that market structure and functioning were not relevant drivers during the sell-off in March 2020, though they agreed that issues such as central clearing could potentially improve market resilience.
- Similar views were aired during the outreach sessions. Some participants noted that changes to the structure of cash and repo markets could help in increasing resilience. In particular, they noted that central clearing may result in non-trivial netting efficiencies in the repo market, especially in jurisdictions where sponsored repo is less developed.

Other factors, such as liquidity constraints due to demand on other parts of the business, are generally reported as ‘not relevant’.

### **Box 3: Structure of core government bond and related markets**

The structure of core government bond and related markets is complex and idiosyncratic across jurisdictions, reflecting policy choices and market driven evolution over time. This Box provides an overview of the main features – in terms of market participants and trading and clearing arrangements – of the main segments of cash and repo markets. More detailed information can be found in Annex 1.

#### **Interdealer cash markets**

In the interdealer market, dealers<sup>40</sup> (and in the US, non-bank intermediaries such as PTFs) trade mostly on-the-run bonds with each other on electronic platforms, often on an anonymous basis through a broker (referred to as inter-dealer-brokers, or IDBs). In addition, a significant share of off-the-run bonds are traded through IDBs that generally utilise voice-based and other manual methods, or electronic matching platforms. PTFs are not present in other jurisdictions’ cash government bond markets, mainly due to regulations (e.g. primary dealer obligations), private membership requirements (e.g. trading platform access), or lack of central limit order book trading platforms.

There are various interdealer trading platforms across jurisdictions. Brokertec, Tradeweb (Dealerweb) and MTS are present across several jurisdictions with varying degrees of market share (Fenics and MarketAxess are also present but their market share is limited). In Italy, the UK and the US, interdealer trading is almost entirely on electronic central limit order book platforms, with growth in direct streams

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<sup>39</sup> Relevant analysis is included in BCBS (July 2021, op. cit.).

<sup>40</sup> See Box 1 for more detail regarding the types of entities that are dealers in each jurisdiction.



in recent years. In France, Germany, and UK, most of the trading occurs on voice based IDB platforms. MTS and Brokertec's central limit order books are available for most Euro area cash government bond markets, but in some jurisdictions their market share remains relatively low.

Clearing arrangements in the interdealer market also vary across jurisdictions (see Box 4). Central clearing is predominant in Italy (CC&G, LCH) and Japan (Japan Securities Clearing Corp) and almost non-existent in France (LCH), Germany (Eurex), and UK (LCH). In the US, a quarter of the interdealer market is fully centrally cleared. The share of non-centrally cleared activity has risen over time due to the presence of non-dealers (e.g. PTFs) that are not clearing members of the Fixed Income Clearing Corporation (FICC).<sup>41</sup> While IDBs are themselves members of FICC and are therefore able to clear their trades with other FICC members through the CCP, they may incur credit, liquidity, and operational risks from their trades with non-members of FICC. Additionally, these risks may not be supervised or regulated similar to a CCP's risks.<sup>42</sup>

### **Dealer-to-customer cash markets**

In the dealer-to-customer market, dealers buy and sell government bonds directly with their clients. Clients include the full range of investors in government bonds that in most cases do not trade in the interdealer market, including asset managers, pension funds, insurance companies, money market funds and OEFs, other banks that are not dealers, hedge funds, and foreign sovereign entities. Dealers play a central role in the dealer-to-client market by matching buyers and sellers and (to the extent they act as principals) holding positions for several days or longer to be able to intermediate these trades.

The segmentation between the interdealer and dealer-to-customer market tends to be clear given the distinct trading platforms and access limitations to each platform. Despite that, the two market segments are closely interlinked through price formation mechanisms.<sup>43</sup> Dealer-to-customer platforms are open to a broad range of clients and include a range of protocols from electronic RFQ to entirely voice based. The different trading protocols reflect the preferences and trading strategies of clients, and many dealers offer most of these protocols for their clients. For example, hedge funds that utilise high-frequency trading strategies may utilise an electronic streaming protocol, an OEF may use RFQ to ensure a fair price, and an asset manager may use voice for large block trades. Clients often have relationships with many dealers or use multiple platforms to meet compliance requirements or obtain the best price available. In the US, trading volumes in the dealer-to-client market are roughly comparable in gross terms with trading volumes in the interdealer market, though there is a larger share of off-the-run trading in the dealer-to-client market than in the interdealer market.<sup>44</sup>

Across all jurisdictions, dealer-to-client trades are overwhelmingly not centrally cleared, as these clients either do not have access to the CCP or prefer not to use the CCP for various reasons, such as the costs and operational requirements of being a CCP member.

### **Repo markets**

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<sup>41</sup> IDBs are distinct from CCPs. Activity on IDBs that is not centrally cleared is still subject to clearing through the clearing banks. IDBs are not able to net non-CCP member exposures against CCP member exposures.

<sup>42</sup> In the US, the SEC has proposed a change to the definition of "exchange" under the Exchange Act. These proposed amendments would expand the definition of exchange to include systems that offer the use of non-firm trading interest and provide protocols to bring together buyers and sellers for trading any type of security. Communication Protocols Systems would include, among others, request for quote systems, which are prevalent for trading US Treasuries. Because these systems do not fall within the current definition of "exchange" and are thus not required to register as exchanges, they are not required to comply with the same federal securities laws and regulations applicable to registered exchanges or ATSS. As a result, market participants who use these systems are not afforded the same investor protection and fair and orderly market principles that apply to today's registered exchanges and ATSS. The proposal is designed to address this regulatory gap and the current disparities that affect competitive balances among like market places for securities, including US government securities.

<sup>43</sup> See, for instance, Girardi and Impenna, *Price discovery in the Italian sovereign bonds market: the role of order flow*, Bank of Italy Working Paper No. 906 (April 2013).

<sup>44</sup> See, for example, the data for the on-the-run and off-the-run volumes in the dealer-to-client market in the US (<https://www.finra.org/filing-reporting/trace/data/trace-treasury-aggregates>).

Repo market structure reflects the different needs of cash and collateral borrowers and lenders. The two main segments of the repo market are the funding (general collateral) and collateral (specific issues) markets. Each segment is important to the overall repo market and provides different economic benefits to its participants. Across all segments of the repo market, dealer intermediation is crucial to warehouse the credit and maturity mismatch risks.

- In the funding or general collateral market, dealers borrow cash to lend to other parties while investors (such as MMFs and asset managers) generate a return on their cash.
- In the collateral or specific issues market, investors (such as hedge funds and asset managers) lend to and borrow from dealers to source a specific security, e.g. to cover a short position or deliver into a futures contract. When these investors, especially hedge funds, are borrowing cash, they are borrowing against specific securities to obtain leverage in their trading strategies or raise temporary liquidity. Dealers borrow or lend specific securities to manage their portfolio risk, in some cases on an anonymous brokered basis

Trading platforms tend to vary across segments. Direct trade agreement between the dealer and the client remains dominant in the dealer-to-client markets (e.g. voice or Bloomberg chat but without a broker). Broker assisted voice, CLOB and RFQ platforms (Brokertec, Eurex, MTS, Tradeweb) also exist though their share appears lower than in the cash market.<sup>45</sup>

Clearing in the repo market is distinct from the trading platform, as trades in any segment can clear centrally or not depending on whether the counterparties are members of the CCP. In most jurisdictions, the interdealer market is centrally cleared, while the other segments depend on whether a sponsored program exists to facilitate clearing for counterparties that are not CCP members (see Box 4). The majority of the centrally cleared repo market is specific issue. However, a significant portion of the specific issue repo is not centrally cleared and is opaque given data reporting gaps.

### **Futures markets**

Across all jurisdictions, government bond futures are exchange traded and centrally cleared. In the US, these futures are traded on the Chicago Mercantile Exchange, in the UK on the Intercontinental Exchange, in the Euro area on Eurex, and in Japan on the Osaka Securities Exchange. In most jurisdictions, exchanges and exchange clearing houses have specific requirements to become a direct member, otherwise participants can access the market through a member of the exchange.

Respondents were also asked to rank various factors that motivated the demand for liquidity by other market participants. Factors mentioned as 'highly relevant' include the need to raise cash to meet investor redemptions and the need to unwind leveraged positions.

- Some types of MMFs and OEFs experienced substantial redemptions in March 2020 and had to sell assets. In part due to the high liquidity of government bonds (in addition to price impact and duration considerations), some OEFs decided to sell them first to meet redemption requests, especially in the US, while ESMA research<sup>46</sup> shows that funds in the EU mainly liquidated a vertical slice of their portfolios (see section 5).

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<sup>45</sup> Trade execution can occur less often in the repo market, especially in the tri-party market where dealers negotiate repo "shells" which determine the collateral schedule and evergreen term structure, and the "shell" exists until either the dealer or client call the loan and the evergreen structure turns into a bullet repo. These evergreen repo "shells" can persist without needing to renegotiate the trade.

<sup>46</sup> See ESMA (November 2020, op. cit.).

- The need of hedge funds to unwind their positions, for instance in the basis trade or other relative value trades, was another factor judged as highly relevant by most authorities.

The literature reviewed by the FSB as well as stakeholder feedback during the outreach sessions support these findings. For instance, academic studies highlight the role played by OEFs in the US<sup>47</sup> and the fact that investors in the UK sold securities and redeemed shares from OEFs.<sup>48</sup> Similarly, funds facing large redemptions sold assets or withdrew cash from short-term funding markets to meet them. Outreach participants highlighted that funds were trying to raise cash both to meet redemption requests and in anticipation of potential future redemptions, and that as trading conditions became more difficult funds sold more than they needed in case the situation deteriorated further.

#### **Box 4: Characteristics of central clearing and its costs and benefits**

Central clearing involves a central counterparty (CCP) stepping in as the buyer to every seller and the seller to every buyer right after a trade has been agreed upon. Compared to clearing a trade bilaterally, central clearing reduces counterparty credit risk and allows members of the CCP to net their overall exposures. Thanks to netting, CCP members are only required to pay their net rather than gross position vis-à-vis the CCP, thereby resulting in a more efficient use of their balance sheet and reducing gross settlement flows in the market, which provides financial stability benefits.

##### ***Characteristics of central clearing in cash and repo markets***

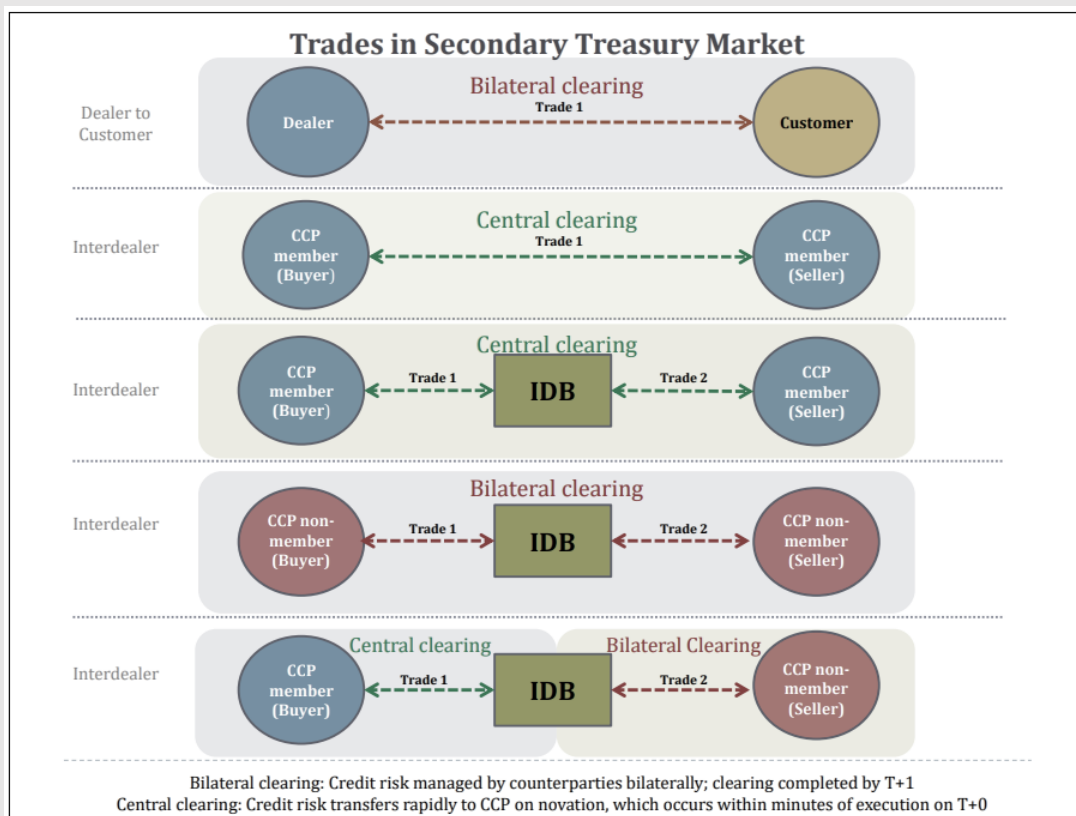
The use of central clearing varies considerably across asset classes and jurisdictions. Traditionally, central clearing is particularly common in equity markets. The anonymous nature of trading in such markets, where participants do not know who their counterparty is, requires a CCP to stand between buyers and sellers. Post-2008 financial crisis reforms introduced central clearing requirements for a number of standardised over-the-counter derivatives contracts. By contrast, given that fixed income markets rely on dealer intermediation to a much larger extent, central clearing is less common.

In particular, central clearing is the default option for futures contracts as they trade on organised exchanges, but the picture is more complex for cash government bond and repo markets (see Annex 1 for details on the share of trades cleared).

In cash markets, French, German and UK government bonds are overwhelmingly not centrally cleared; in Italy and Japan inter-dealer trades are mostly centrally cleared, while dealer-to-client trades are not centrally cleared. In the US the Treasury cash market is predominantly not centrally cleared. About 10% of the market is fully centrally cleared (in the interdealer market), another 20% has one transaction leg that is centrally cleared (also in the interdealer market), while the remainder of the market is not centrally cleared (including trades between PTFs in the interdealer market, and the entirety of the dealer-to-customer segment). These differences relate to the type of counterparties in a transaction. PTFs that trade in the US interdealer market generally are not members of the CCP and hence their trades cannot be cleared directly with the CCP; however, they benefit from the fact that trades that go through an inter-dealer broker (IDB) can be netted via clearing banks. As a result, IDBs provide similar netting benefits as CCPs. A similar setup is also present in some euro area markets (e.g. France) where IDBs allow participants to net trades. A schematic representation of how trades can be cleared in US Treasury markets is in the figure below; other government bond markets usually have a similar structure.

<sup>47</sup> See, for example, Vissing-Jorgensen (April 2021, op. cit.).

<sup>48</sup> See, for example, Czech et al (June 2021, op. cit.).



Source: Treasury Market Practices Group, *White Paper on Clearing and Settlement in the Secondary Market for U.S. Treasury Securities* (2019).

Detailed information on the repo market is less widely available, especially on the bilateral specific issue segment of the market. However, levels of central clearing appear to be higher overall than in the cash market. The share of repo transactions that is centrally cleared is higher in the interdealer segment in the relevant jurisdictions. In Italy the recourse to the CCP on the MTS repo market has been historically high (over 94% of total trading activity).<sup>49</sup> In some cases, trades executed on different platforms can be cleared in a CCP if both parties have access to a CCP and agree to clear centrally. In the US, roughly a quarter of the repo market is centrally cleared.

The reasons for the lower levels of central clearing in the cash market appear to be related to how this market developed historically and the fact that most market participants view the costs of additional central clearing as outweighing the benefits. For instance, in the US most of the interdealer cash markets used to be centrally cleared as bank dealers were all members of the CCP (FICC). The share of centrally cleared trades declined since PTFs became the largest participants in the interdealer markets, and are unable or prefer not to become FICC members. In Italy, the large percentage of central clearing in the cash market reflects the important role played by the trading platform MTS, which requires trades to be cleared through CCPs.<sup>50</sup>

The fact that central clearing in repo markets is more common is likely due to several reasons. First, the centrally cleared portion of this market gained importance more recently and hence developed similarly in different jurisdictions. Second, the incentive to clear repo transactions is larger than cash ones, as the benefits from a risk-management perspective and for balance sheet netting efficiencies (also given the regulatory capital treatment of these transactions) are larger. Finally, there are

<sup>49</sup> See, for instance, the box on 'The role of central counterparties in reducing systemic risk on the repo market', Bank of Italy, *Financial Stability Report, No. 1 - 2016*.

<sup>50</sup> Central counterparty services are provided by two CCPs: Cassa di compensazione e Garanzia SpA and LCH.Clearnet SA.

'sponsored' models of access to CCPs that have opened access to central clearing in this market, with particularly meaningful take up in the US. Sponsored models in the US and UK have material differences,<sup>51</sup> but in both cases certain clients are either unwilling or unable to become sponsored members. However, there are also limits to the appeal of central clearing in these markets. Stakeholder feedback suggests that given the very low level of margins required to finance government bond repo transactions that are not centrally cleared, there is limited incentive for some participants to use these services or become CCP members. This is particularly the case for hedge funds engaged in the basis and other trades, where market intelligence suggests some may receive zero or near zero haircuts on their repo trades – from a risk management perspective, repos are secured by the underlying security but without a haircut they are subject to changes in the market value of those securities.

### **Benefits of central clearing**

A number of commentators, especially in the US, suggested that more central clearing for cash and repo markets would enhance the resilience of government bond markets because of greater transparency of counterparty risks and risk reduction through netting of exposures.<sup>52</sup> On the other hand, some stakeholders during the outreach sessions indicated that central clearing would not have made a material difference on their capacity to intermediate in cash securities markets given the one-sided nature of flows and because it would not give rise to large netting efficiencies. These efficiencies would be somewhat larger in the repo market given its regulatory treatment (leverage ratio), but large-scale repo operations by the Federal Reserve and the increase in sponsored repo in the US had already improved the situation significantly.

Central clearing would also result in greater transparency and lower levels of credit risk and its management for CCPs, through the netting of counterparty exposures and application of haircut or margin requirements and other risk mitigants. Central clearing also reduces gross settlement flows, reducing financial stability risks in the event of default or fails. Furthermore, the existence of a CCP may facilitate more all-to-all trading, which could reduce the need for dealer intermediation by allowing participants to trade with each other directly. This in turn could encourage competition by favouring the entry of smaller dealers and a more diversified set of liquidity providers. However, widening the set of market participants does not by itself guarantee enhanced resilience, as there are a number of factors that affect the willingness and ability of different participants to trade in periods of stress.

### **Costs of central clearing**

Central clearing, however, also comes with challenges. A CCP for government bonds would concentrate more transactions in a single node, making it even more systemically important and requiring compliance with stringent regulations for its functioning, recovery and resolution. In addition, allowing a wider set of entities such as PTFs and buy-side firms to access the CCP would require changes to a number of practices and regulations or the development of new access models. For instance, industry representatives highlighted during the outreach that some pension funds and MMFs are not allowed to contribute to the default fund of CCPs and hence would not be able to be direct members. The need to pay margins to the CCP on a daily (or even intraday) basis would require new members to incur costs to set up the relevant infrastructure to pay these margins. As current bilateral margin requirements on government bond repos are typically low, and CCP margin requirements would likely be larger, the cost of trading would increase under central clearing. Nevertheless, the rationale

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<sup>51</sup> Under the US sponsored repo model, the dealer (sponsor) guarantees the full trade for the client and is responsible for performance of the trade. Some clients in the US are unwilling to become sponsored members because the dealers may impose certain restrictions or see client trading strategies. In the UK sponsored model, the dealer (sponsor) is only responsible for the CCP default fund contribution, while the sponsored client is responsible for the performance of the trade. In the UK, sponsorship is strictly limited by the CCP to pension funds, insurance companies, foreign sovereigns and investment funds.

<sup>52</sup> See Duffie, *Still the World's Safe Haven? – Redesigning the U.S. Treasury Market After the COVID-19 Crisis*, Hutchins Center Working Paper Number 62, Brookings Institution (May 2020); G30 Working Group on Treasury Market Liquidity, *U.S. Treasury Markets: Steps Toward Increased Liquidity* (July 2021); and Liang and Parkinson, *Enhancing Liquidity of the U.S. Treasury Market Under Stress*, Hutchins Center Working Paper Number 72, Brookings Institution (December 2020).

for margins and default management is that they require market participants to set aside capital in normal times in order to protect against risks in stress (which should also be considered as a benefit). A key question is whether that trade-off is desirable.

An alternative model would be to rely on existing clearing members to act as ‘sponsors’ for the new participants to access the CCP. This model would require existing members to extend credit to those participants, potentially reducing the need for direct central clearing but requiring members to manage their exposures to these counterparties. In the US, where a sponsored model is available, industry representatives highlighted some shortcomings<sup>53</sup> related to the fact that it can limit a client’s executing counterparties, risk leaking trading information and provides no benefit in terms of cross-margining arrangements.

The benefits and costs of central clearing therefore depend on factors that impact market participants in different ways.<sup>54</sup> Given that CCPs are already present in most relevant jurisdictions for both cash and repo markets, it is unlikely that a substantial increase in the amounts of transactions cleared can be achieved without changes to sponsored programs or significant regulatory efforts, potentially including a clearing mandate. Market participants indicated sponsored models of central clearing have been successful so far, but changes to the sponsor model may be needed to encourage further adoption or avoid disruptive market changes under a mandate. Overall, the net benefits for resilience depend on at least two key factors: (1) the reduction in risk and increase in potential intermediation capacity brought about by greater use of a CCP when compared to the current situation; and (2) how much market activity would be disincentivised by the potentially higher cost of central clearing in normal times versus how much the provision of liquidity would increase in periods of stress, either because of higher balance sheet capacity of dealers or because other liquidity providers (such as hedge funds and PTFs) are able and willing to increase their intermediation activity.

Some other factors were reported as ‘highly relevant’ by individual respondents:

- the importance of margin calls faced by a number of non-bank financial institutions (in particular ICPFs) and the fact that they may have been ill-prepared for them.
- the role of portfolio reallocations by some investors that rotated from bonds into equities to take advantage of depressed valuations.
- the cash needs of non-financial firms and the role of foreign central banks. Regarding the former, the fact that non-financial corporates drew down corporate credit lines across multiple sectors reduced large dealers’ willingness to intermediate in the repo market. Regarding the latter, foreign monetary authorities liquidated a substantial amount of US Treasuries.

## 6. Conclusions and policy implications

Changes in core government bond markets over the past decade may have made these markets more prone to liquidity imbalances in times of stress. The growth in outstanding debt combined with the greater use of government bonds by some investors for trading and hedging strategies

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<sup>53</sup> See FIA PTG, *Clearing a Path to a More Resilient Treasury Market* (July 2021).

<sup>54</sup> A recent survey by the International Swaps and Derivatives Association (ISDA) confirms that there is a wide variety of views on whether increased clearing would materially improve the resilience and efficiency of cash and repo markets in the US. See *ISDA US Treasury Clearing Survey Results* (August 2022).

or liquidity management purposes may have increased sensitivity to shocks. Dealers have lower risk warehousing capacity to support intermediation compared with the size of trade flows especially in stress, while other non-bank liquidity providers do not appear to materially increase market-making in stress.

The strong linkages of government bond markets with the rest of the financial system – given their key role and their use by a broad range of entities – means that stress can get propagated quickly between these markets and other parts of the system as well as across jurisdictions. This is particularly the case for the US Treasury market, given the USD’s role in global trade and finance.

The severe dislocations experienced in the government bond market during the March 2020 turmoil were the outcome of large spikes in the demand for liquidity by a variety of market participants, especially non-banks. Unlike the typical case of government bonds being a ‘safe haven’ in periods of stress, this market experienced a ‘dash for cash’ as investors scrambled to sell highly liquid assets to fulfil their cash needs. Many investors used their liquidity buffers, by monetising safe assets in private markets. In addition, the dash for cash reflected the need to raise cash to meet investor redemptions (for example, for OEFs and MMFs in some jurisdictions), to raise USD funding (especially for foreign official sector authorities), and to unwind leveraged positions (especially for hedge funds).

Bank dealers increased their trading activities to some extent, but this was not enough to counterbalance one-way selling pressures and avoid sharp movements in government bond prices and spreads. Dealers did not add to the selling pressure in a market that was already under considerable stress. Had dealers been forced to retract from the market, for instance because they were undercapitalised like during the 2008 financial crisis, the consequences could have been much more severe – so their stronger capital and liquidity positions as a result of the post-crisis reforms were a source of resilience during the stress. At the same time, dealers’ actions were insufficient to absorb the shock. Based on the available data, it appears that other liquidity providers, such as PTFs, did not materially increase their liquidity provision under stressed circumstances.

The impact of the pandemic in March 2020 on government bond markets was broad-based. There is limited evidence to suggest that particular market structures significantly and uniformly contributed to better outcomes. For instance, fully cleared all-to-all electronic futures market were also subject to dislocations that were in some cases (such as in France, Japan and the UK) more severe than the cash market where clearing is less common and intermediation relies largely on dealers. Similarly, the US interdealer cash market, where PTFs have a substantial footprint, also experienced severe dislocations. Italian bonds, which are to a large extent traded electronically and mostly centrally cleared in the interdealer market, were also negatively impacted. A corollary of this finding is that the resilience benefits of changes to the underlying market structure seem to be context-specific and jurisdiction-dependent.

Central bank interventions were effective in alleviating market strains, highlighting the key role authorities can play in restoring market functioning in stress. But these interventions are not without cost and should not substitute for the obligation of market participants to manage their

own risks appropriately and self-insure against adverse outcomes.<sup>55</sup> This underscores the need to address factors that can lead to large liquidity imbalances in stress.

Consistent with the findings of this report and the framework for enhancing NBF1 resilience in the FSB's NBF1 progress report,<sup>56</sup> policies to consider include measures to:

1. mitigate unexpected and significant spikes in liquidity demand, which may involve selling (or repo) near-cash instruments such as government bonds;
2. enhance the resilience of liquidity supply in stress; and
3. enhance markets' oversight, risk monitoring and the preparedness of authorities and market participants.

Reducing potential demand for liquidity in stress is crucial for enhancing the resilience of government bond markets. Work is already underway by the FSB and standard-setting bodies to assess and mitigate unexpected and significant spikes in liquidity demand. Insights from this report can provide input to the work of these groups, e.g. on the extent to which different market participants rely on government bond and repo markets to manage their liquidity and its potential effects in stress:

- the FSB published policy proposals to enhance MMF resilience<sup>57</sup> and will review, working with IOSCO, the progress made by member jurisdictions by the end of 2023.
- the FSB, with input from IOSCO, is assessing the effectiveness of the FSB recommendations on liquidity mismatch in OEFs from a financial stability perspective, which includes consideration of first-mover advantages that may exacerbate redemption pressures and asset sales, liquidity management strategies and operational preparedness of OEFs to monetise their liquidity buffers during periods of stress.
- the BCBS-CPMI-IOSCO are conducting work on margining practices.<sup>58</sup> This work aims to review the predictability and magnitude of margin requirements in both centrally and non-centrally cleared derivatives and securities markets and to enhance the ex-ante liquidity management preparedness of market participants to meet margin calls.

In addition, the FSB will consider the scope for additional work to limit the build-up of leverage by non-bank investors. As the March 2020 experience indicates, such investors tend to respond more strongly to adverse shocks because they need to unwind their positions quickly to mitigate potential losses or raise cash, which may add to market volatility and result in a negative feedback loop. Examples of measures to consider include the use of prudent margin and haircut practices for bilateral transactions and enhanced risk management practices by the providers of

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<sup>55</sup> See the BIS Markets Committee insights on [Market dysfunction and central bank tools](#) (May 2022).

<sup>56</sup> See Chapter 2 in FSB [Enhancing the Resilience of Non-Bank Financial Intermediation – Progress Report](#) (November 2021, op. cit.).

<sup>57</sup> See FSB, [Policy proposals to enhance money market fund resilience](#) (October 2021).

<sup>58</sup> See BCBS, CPMI and IOSCO, [Review of margining practices – consultative report](#) (October 2021).



financing to those investors. Leverage-related work is already underway across a number of FSB workstreams, so there is a need to consider this issue from a holistic perspective.

To enhance the resilience of liquidity supply in stress, additional work could involve exploring further through analysis and data gathering:

- **potential ways to increase the availability and use of central clearing for government bond cash and repo transactions.** This may be particularly relevant in the repo market, given the more intense balance sheet usage. However, as noted in the report, central clearing can increase costs for market participants so they are not incentivised to use it even when it is available – so its scope, incentives and modalities vary across jurisdictions and need to be considered for the specific market in question.
- **the use of all-to-all trading platforms.** All-to-all trading could encourage a more diverse set of participants, including new players that can potentially complement traditional dealers in their liquidity provision activities. It could also provide investors with more options to access market liquidity without solely relying on dealer intermediation. However, the resilience benefits of expanding the use of all-to-all platforms depend on whether non-banks would be a stable source of liquidity in stress, which is not a given.

In addition, the BCBS is evaluating the effectiveness of Basel III reforms, and will consider, if necessary, any additional measures relating to the prudential treatment of banks' exposures with a view to safeguarding the resilience and agreed prudential standards of the global banking system.<sup>59</sup>

To enhance risk monitoring and preparedness, policies to consider include increasing the level of transparency in government bond markets, so that timely and accurate information is available to market participants and authorities. This includes closing some of the substantial data gaps identified in the report such as, for example, the regulatory reporting of all transaction data to authorities, including the identity of participants in the bilateral repo market and the activities of PTFs. Enhancing public transparency may also help increase liquidity provision by a broader set of market intermediaries and improve financial institutions' counterparty risk management.

None of these policies is a silver bullet – and many of them take time to implement and need to be tailored for the particular market structure and context. They are also unlikely to be sufficient by themselves to prevent liquidity imbalances in all future stress events, but they could help mitigate the frequency and magnitude of those imbalances. Authorities may want to consider how these policy options could potentially be combined to increase the resilience of their government bond markets, including possible trade-offs, impacts and complementarities.

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<sup>59</sup> Any further potential adjustments to Basel III will be limited in nature and consistent with the Committee's evaluation work.

## Annex 1: Tables with main characteristics of the relevant markets

**Table 1: Characteristics and structure of the cash government bond market**

Jurisdiction	Key characteristics	Main types of investors	Liquidity providers	Trading venues	Clearing arrangements
Euro area	Largely dealer intermediated, mostly electronic but voice still important (interdealer) and voice with growing electronic (dealer to customer), limited central clearing (Italy notable exception)	Euro System largest holder, followed by insurance companies, pension funds, and banks	Germany: banks and brokers (including members of German Bund Issues Auction Group)	Germany: mostly OTC electronic (Tradeweb and Bloomberg), voice still important, MTS minority of volumes	Germany: Mostly bilateral, CCP clearing available but volumes are minor
			Italy: bank dealers	Italy: MTS Cash for interdealer (CLOB), other electronic venues used (BondVision, Bloomberg, Tradeweb, Brokertec)	Italy: MTS cash is CCP cleared
			France: bank dealers	France: Interdealer is mostly voice (Bloomberg Chat), MTS minority of volumes. Increased electronification (Tradeweb) of dealer to client market	France: secondary market mostly bilateral, CCP clearing available but volumes minor
Japan	Primarily dealer intermediated, electronic (interdealer) and voice (dealer to customer), central clearing for large domestic participants	BOJ, banks, insurance companies, foreign investors	Securities companies	Interdealer: electronic and voice Dealer to customer: mainly voice	Interdealer is almost all centrally cleared at Japan Securities Clearing Corp (JSCC)  Dealer to client mostly bilateral for foreign investors and non-dealer domestic investors

UK	Primarily dealer intermediated, electronic primarily CLOB (interdealer) and electronic RFQ/voice (dealer to customer), no central clearing	Foreign investors, ICPFs, BoE	Market largely dealer intermediated by Gilt Edged Market Makers (GEMMs), PTF presence very small (circa 1% of trading volumes)	GEMMs use electronic platforms for dealer-to-client trades (Tradeweb and Bloomberg) and largely CLOB platforms run by IDBs for interdealer trades.  Approximately 90% of GEMM interdealer activity is electronic. Larger trades initiated via voice	No central clearing, all trades cleared bilaterally
USA	Largely dealer intermediated, with large PTF presence, electronic CLOB for interdealer on-the-run market, electronic RFQ for dealer to client, some voice for large trades, central clearing for banks and dealers, bilateral for rest	Foreign investors, Federal Reserve, private funds, pension funds, insurance firms, OEFs, MMFs	Primary dealers, bank dealers, non-bank dealers, principal trading firms (PTFs)	Interdealer: electronic CLOB for on-the-run securities, off-the-run traded mostly on voice  Dealer to client: electronic RFQ and voice	Interdealer: centrally cleared at Fixed Income Clearing Corp (FICC) for FICC members (PTFs are notably non-members of FICC)  Dealer to customer: primarily bilateral clearing

**Table 2: Characteristics and structure of the repo market**

<b>Jurisdiction</b>	<b>Key characteristics</b>	<b>Main types of cash borrowers</b>	<b>Main types of cash lenders</b>	<b>Trading Venues</b>	<b>Clearing arrangements</b>
Euro area	Fast growing market (5-7% annually), mostly electronic and centrally cleared	Overall, banks are net borrowers of cash, insurance companies, leveraged investors	Investment funds and money market funds		Euro area: around 70% of euro-denominated repo market is CCP cleared
				Germany: electronic via centrally cleared platforms (Eurex/LCH)	Germany: 80% of repo volume by banks is centrally cleared
				Italy: MTS Repo main interdealer electronic platform	Italy: 95% of MTS repo is CCP cleared
				France: high proportion of repo market is traded on BrokerTec and MTS or BBG Chat. Short dated repo traded through CLOB on MTS, Brokertec, TpRepo. Reverse repos negotiated through BBG Chats	France: roughly 50% of market is cleared
Japan	Interdealer is almost entirely electronic and centrally cleared, Dealer to client mostly voice bilateral	Banks, securities brokers, insurance companies and other financial intermediaries. The presence of non-financial corporates is not significant.	Most active participants: securities financing companies, securities companies, and trust banks	Interdealer is mostly electronic D2C is mostly voice	All interdealer volumes CCP cleared (JSCC) Some D2C CCP cleared (where client is member of JSCC, e.g. commercial banks); most D2C bilateral

UK	Mostly electronic, interdealer mostly centrally cleared	Main non-bank cash borrowers are liability driven investors, pension funds, hedge funds (matched against reverse repo),	The main non-bank lenders of cash in gilt repo to dealers/banks are hedge funds and funds, incl. MMFs. MMFs are most active in the overnight segment of the market.	Interdealer is mostly electronic (Brokertec/Tradeweb)	Majority of interdealer repo is cleared (LCH RepoClear), majority of dealer to customer is bilateral
US	Interdealer is mostly electronic and centrally cleared, bilateral market is material	B/Ds, banks, levered funds (e.g. hedge funds, REITs)	MMFs (all – government MMFs may invest in repo backed by government securities), securities lending firms, banks, asset managers	Interdealer: electronic IDB platform	FICC cleared repo included tri-party and GC, and also sponsored Participants that are not FICC or sponsored members trade bilaterally

**Table 3: Characteristics and structure of the futures market**

<b>Jurisdiction</b>	<b>Key characteristics</b>	<b>Main types of participants</b>	<b>Main types of liquidity providers</b>	<b>Trading venues</b>	<b>Clearing arrangements</b>
Euro area	German, French, and Italian government bond futures are all exchange traded and centrally cleared on Eurex. Due to limited liquidity or lack of longer-term products, many investors use the German Bund future to hedge 30 year BTP/OAT positions		Dealers, hedge funds, and PTFs	Exchange Traded (CLOB) on Eurex	Central clearing through Eurex
Japan	Exchanged traded and centrally cleared, large participation by foreign investors	Foreign investors, securities companies, and banks	Foreign investors and securities companies	Exchange Traded	Centrally cleared
UK	Exchanged traded and centrally cleared, PTFs have significant (35%) market share	Clearing members, clients include asset managers, hedge funds and PTFs, insurance companies, and other banks	Dealers and PTFs (PTFs account for 35% of long gilt futures volume)	Exchange traded (CLOB) on ICE	Centrally cleared
US	Exchange traded and centrally cleared, PTFs comprise majority of volume	PTFs, dealers, traditional asset managers (mutual funds, pension funds, insurance companies) and leveraged funds	PTFs and primary dealers	Exchanged traded (CLOB) on CME	centrally cleared through CME

## Annex 2: The Basel III treatment of government bond exposures

This annex summarises the existing Basel “Pillar 1” regulatory treatment of government bond exposures. It covers the treatment of government bond exposures under the risk-weighted framework (including credit and market risk), large exposures framework, leverage ratio framework and liquidity standards.<sup>60</sup>

The existing treatment of government bond exposures (Table A2.1) include a national discretion in the risk-weighted framework for jurisdictions to apply a lower risk weight for government bond exposures denominated and funded in domestic currency. In addition, government bond exposures are currently not included in the large exposures framework. Finally, no limits or haircuts are applied to domestic government bond exposures that are eligible as high-quality liquid assets (HQLA) as part of the liquidity standards. In contrast, government bond exposures are included as part of the leverage ratio framework.

**Table A2.1: Summary of current regulatory treatment of government bond exposures**

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<b>Credit risk: standardised approach</b>
<ul style="list-style-type: none"><li>• Ratings-based look-up table.</li><li>• National discretion to apply a preferential default risk weight for government bond exposures denominated and funded in domestic currency.</li></ul>
<b>Credit risk: internal ratings-based (IRB) approach</b>
<ul style="list-style-type: none"><li>• Exemption of 0.03% PD floor for government bond exposures.</li></ul>
<b>Credit risk: credit risk mitigation framework</b>
<ul style="list-style-type: none"><li>• National discretion to apply a zero haircut for repo-style government bond transactions with core market participants.</li></ul>
<b>Revised market risk framework</b>
<ul style="list-style-type: none"><li>• Standardised approach: national discretion to apply a preferential default risk charge for government bond exposures denominated and funded in domestic currency.</li><li>• Internal models approach: government bond exposures included in models, including default risk models.</li></ul>
<b>Large exposures framework</b>
<ul style="list-style-type: none"><li>• Exemption of government bond exposures.</li></ul>
<b>Leverage ratio framework</b>
<ul style="list-style-type: none"><li>• Inclusion of government bond exposures.</li></ul>
<b>Liquidity standards</b>
<ul style="list-style-type: none"><li>• No limits on amount of domestic government bond debt eligible as high-quality liquid assets, with no haircuts applied.</li></ul>

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<sup>60</sup> The Basel II risk-weighted framework is available at [www.bis.org/publ/bcbs128.pdf](http://www.bis.org/publ/bcbs128.pdf). The large exposures framework is available at [www.bis.org/publ/bcbs283.pdf](http://www.bis.org/publ/bcbs283.pdf). The leverage ratio framework is available at [www.bis.org/publ/bcbs270.pdf](http://www.bis.org/publ/bcbs270.pdf). The liquidity standards are available at [www.bis.org/publ/bcbs238.pdf](http://www.bis.org/publ/bcbs238.pdf) and [www.bis.org/bcbs/publ/d295.pdf](http://www.bis.org/bcbs/publ/d295.pdf).

## Risk-weighted framework

The risk-weighted framework sets capital requirements for sovereign exposures to mitigate credit risk and market risk. In both cases, the framework currently applies a more favourable treatment for sovereign exposures relative to other asset classes.

The credit risk framework comprises the standardised approach and internal ratings-based (IRB) approach.

### *Standardised approach for credit risk*

Under the existing standardised approach, sovereign exposures are defined as exposures to central governments, central banks, international organisations, certain multilateral development banks and, subject to national discretion, certain non-central government public sector entities (PSEs). Claims on other PSEs are treated as exposures to banks.

Exposures to sovereigns and central banks are risk-weighted based on a ratings-based look-up table (Table A2.2). Alternatively, supervisors may recognise the country risk scores assigned by qualifying export credit agencies.<sup>61</sup> This table applies to sovereign exposures denominated in the domestic currency of the issuer and in any foreign currency.

**Table A2.2: Current standardised approach look-up table for exposures to sovereigns and central banks**

Credit assessment	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	Unrated
Risk weight	0%	20%	50%	100%	150%	100%

At national discretion, a lower risk weight may be applied to banks' exposures to their sovereign (or central bank) of incorporation denominated in domestic currency and funded in that currency.<sup>62</sup> Where this discretion is exercised, other national supervisory authorities may also permit their banks to apply the same risk weight to domestic currency exposures to this sovereign (or central bank) funded in that currency.<sup>63</sup> In practice, all members of the Basel Committee on Banking Supervision currently exercise this discretion and set a 0% risk weight. On average, banks' risk weight for central government exposures (including both domestic and foreign-currency exposures) under the standardised approach is currently about 3%.<sup>64</sup>

Claims on non-central government PSEs are risk-weighted as exposures to banks. Subject to national discretion, claims on certain domestic PSEs may also be treated as claims on the sovereigns in whose jurisdictions the PSEs are established. Where this discretion is exercised,

<sup>61</sup> See paragraphs 53 and 55 of the Basel II framework.

<sup>62</sup> This is to say that the bank would also have corresponding liabilities denominated in the domestic currency. The lower risk weight may also be extended to the risk-weighting of collateral and guarantees.

<sup>63</sup> See paragraph 54 of the Basel II framework.

<sup>64</sup> For a sample of 142 internationally active banks, as at end-June 2016.



other national supervisors may allow their banks to risk-weight claims on such PSEs in the same manner.<sup>65</sup>

Claims on the Bank for International Settlements, the International Monetary Fund, the European Central Bank and the European Community may currently receive a 0% risk weight. In addition, a 0% risk weight is applied to claims on highly rated multilateral development banks (MDBs) that fulfil a set of criteria established by the Committee.<sup>66</sup>

When calculating the degree of credit risk mitigation (CRM) provided by collateralised transactions, supervisors may choose, under certain conditions, to apply a haircut of zero for repo-style transactions where the counterparty is a core market participant.<sup>67</sup>

### *IRB approach for credit risk*

Under the IRB approach, sovereign exposures are generally treated in a similar manner to exposures against corporates and banks. However, banks' estimates of the probability of default (PD) of sovereign exposures are not subject to the 0.03% floor, which applies to all other asset classes.<sup>68</sup> On average, banks' risk weights for central government exposures (including both domestic and foreign-currency exposures) under the internal ratings-based approach are currently about 6.5%.<sup>69</sup>

## Market risk framework

The revised market risk framework includes a standardised approach and an internal models approach.

The standardised approach capital requirement is the sum of three components: the default risk charge, the risk charges under the sensitivities-based method and the residual risk add-on charge. At national discretion, claims on sovereigns, PSEs and MDBs may be subject to a zero default risk weight. A preferential treatment is not applied for sovereign exposures when calculating the credit spread risk and general interest rate risk charges.

Under the internal models approach, banks are required to include trading book sovereign exposures as part of their models. This includes default risk models.<sup>70</sup>

## Large exposures framework

Under the large exposures framework, banks' exposures to sovereigns and central banks are exempted. This exemption also applies to PSEs treated as sovereigns according to the risk-weighted capital framework. Any portion of an exposure guaranteed by, or secured by financial

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<sup>65</sup> See paragraphs 57–58 of the Basel II framework.

<sup>66</sup> See paragraphs 56 and 59 of the Basel II framework.

<sup>67</sup> See paragraph 170 of the Basel II framework.

<sup>68</sup> See paragraph 285 of the Basel II framework.

<sup>69</sup> For a sample of 142 internationally active banks, as at end-June 2016.

<sup>70</sup> See paragraph 186(c) of the revised market risk framework.

instruments issued by, sovereigns are similarly excluded from the framework to the extent that the eligibility criteria for credit risk mitigation recognition are met.<sup>71</sup>

## Leverage ratio framework

Consistent with its nature, the leverage ratio includes all balance sheet assets in the exposure measure, including sovereign exposures.<sup>72</sup> As set out in the Committee’s finalised Basel III standard, at national discretion, and to facilitate the implementation of monetary policies, a jurisdiction may temporarily exempt central bank reserves from the leverage ratio exposure measure in exceptional macroeconomic circumstances. To maintain the same level of resilience provided by the leverage ratio, a jurisdiction applying this discretion must also increase the calibration of the minimum leverage ratio requirement commensurately to offset the impact of exempting central bank reserves.

## Liquidity standards

The liquidity standards – comprising the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) – ensure that a bank has a stable funding profile relative to the liquidity of its assets and an adequate stock of HQLA to meet a short-term liquidity stress event.

The stock of eligible HQLA consists of “Level 1” and “Level 2” assets. Level 1 assets consist of a range of sovereign securities and exposures.<sup>73</sup> Level 2 assets can also include some sovereign securities in addition to other asset classes.<sup>74</sup> While Level 2 assets are subject to haircuts and can comprise no more than 40% of the overall HQLA stock, no haircuts or restrictions are applied to Level 1 assets, as their liquidity-generating capacity would remain intact even in periods of severe idiosyncratic and market stress. In addition, while banks are required to diversify their HQLA within asset classes, this does not apply to the sovereign debt of the bank’s home jurisdiction or the jurisdiction in which the bank operates, central bank reserves and debt securities and cash.<sup>75</sup>

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<sup>71</sup> See paragraph 61 of the large exposures framework.

<sup>72</sup> See paragraph 15 of the leverage ratio framework.

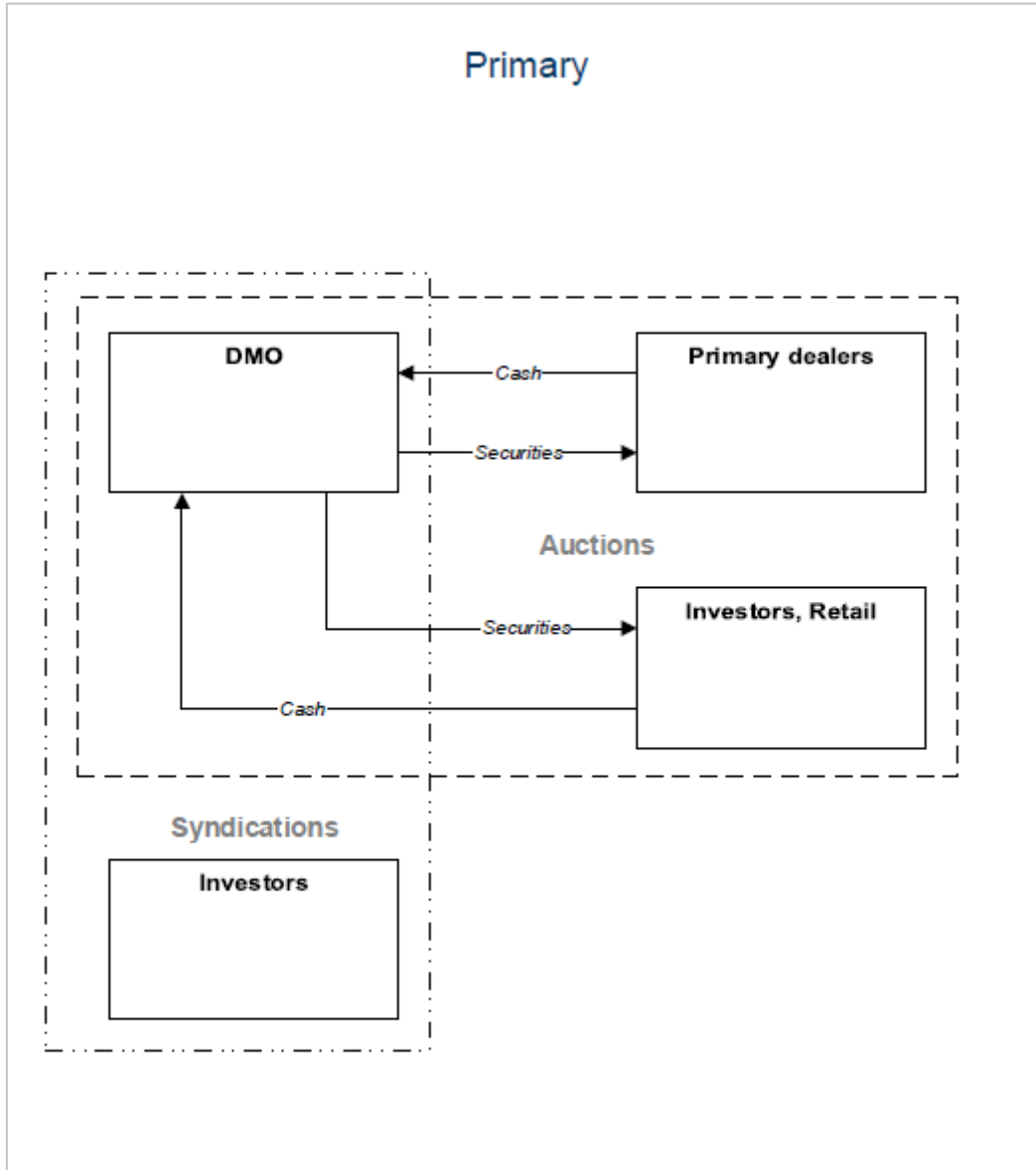
<sup>73</sup> See paragraph 50 of the LCR framework.

<sup>74</sup> See paragraph 52 of the LCR.

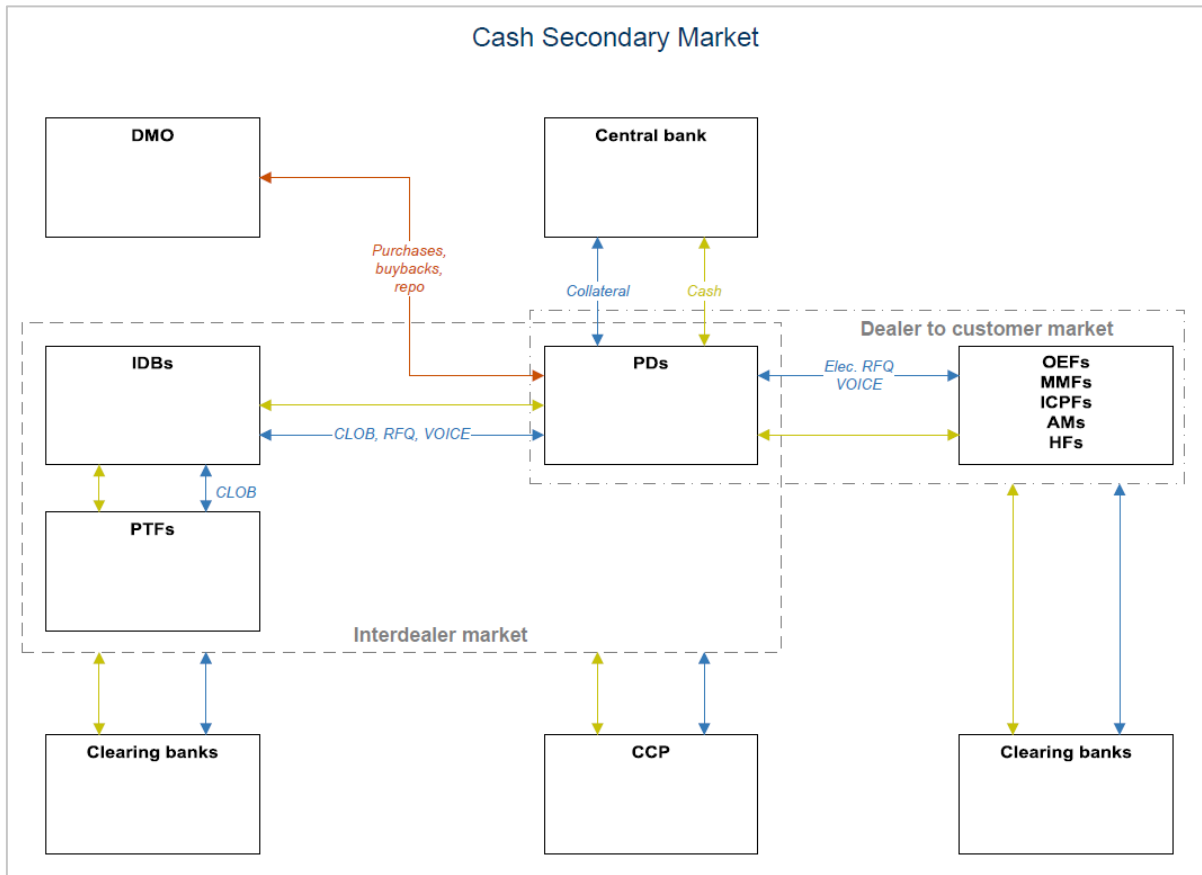
<sup>75</sup> See paragraph 44 of the LCR.

# Annex 3: Illustrative maps of the relevant markets

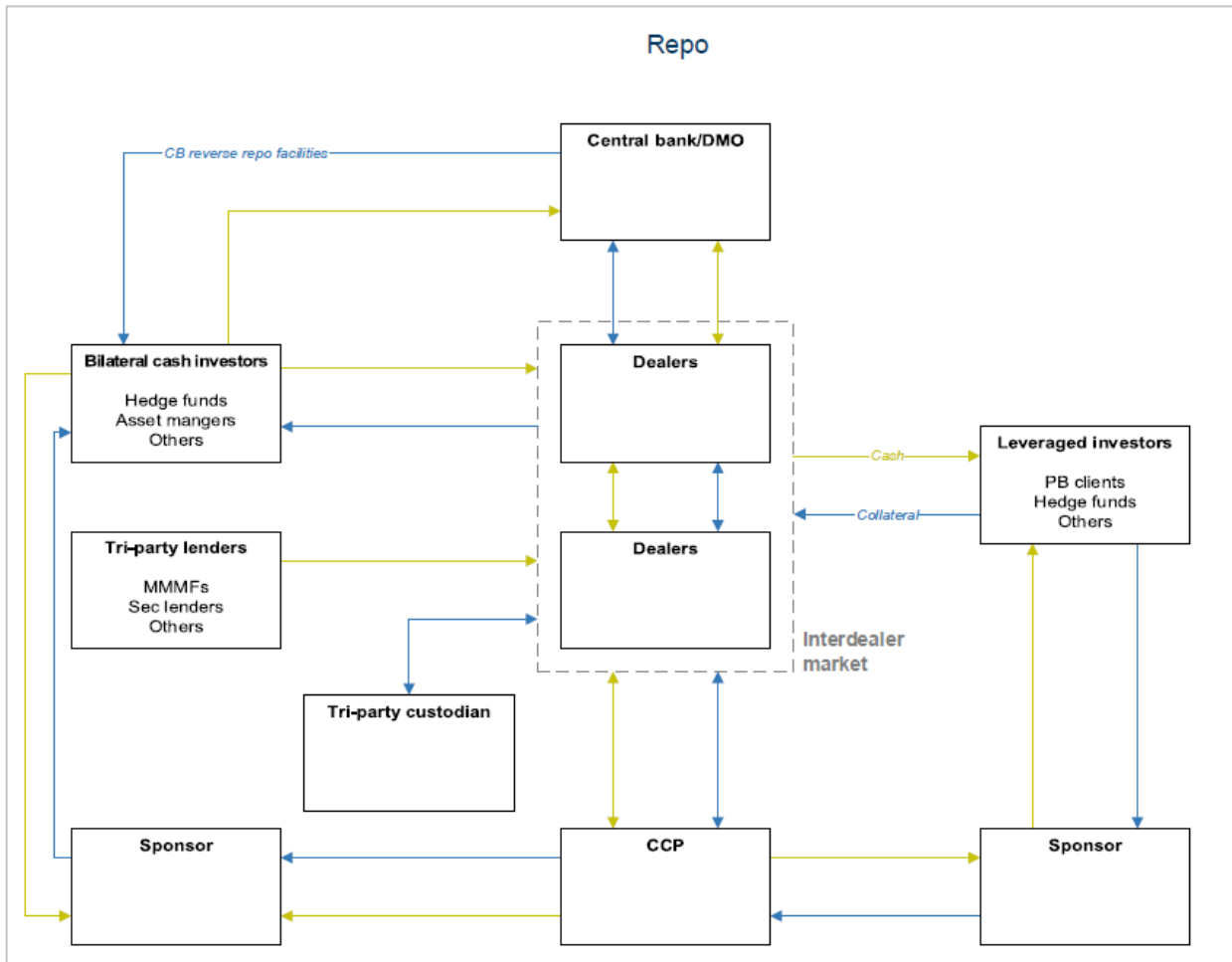
Map 1: illustrative structure of primary government bond markets



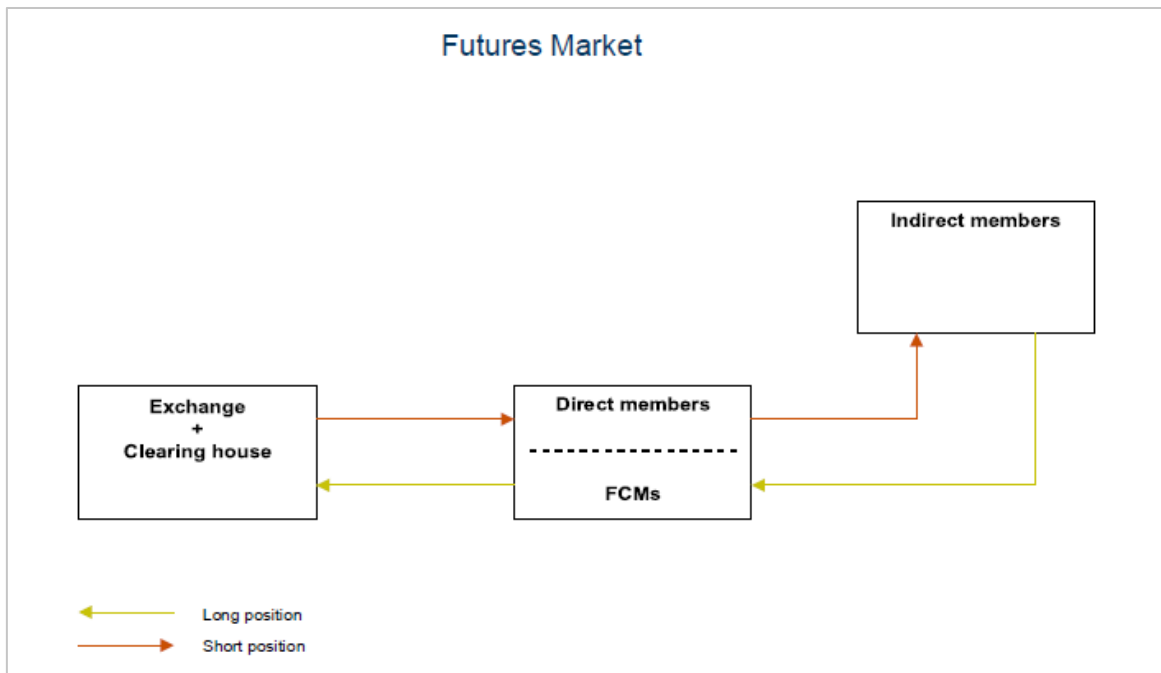
**Map 2: illustrative structure of government bond secondary markets**



Map 3: illustrative structure of government bond repo markets



Map 4: illustrative structure of government bond futures markets



## Annex 4: Main takeaways from stakeholder outreach

The FSB organised virtual outreach meetings in the first half of 2022 with debt management offices (DMOs), dealers and other liquidity providers, investors, as well as academics, former regulators and think tanks. The meetings followed the Chatham House Rule and each of them was structured in two sessions. The first session focused on the government bond market structure and the behaviour of different market participants during the March 2020 turmoil. The second session explored the drivers of behaviour and policy implications.

The key issues raised in the first session of these outreach meetings were as follows:

- The structure of both primary and secondary core government bond markets has remained relatively stable in the last decade. Changes took place after the 2008 financial crisis, but little has happened more recently. While electronification has increased in these markets, most participants noted this increase has not led to material changes in market structure. These markets remain largely dealer intermediated, but some stakeholders noted that dealers now have lower risk warehousing capacity to support intermediation especially in stress. There is also increased presence of non-banks such as hedge funds and principal trading firms (PTFs) as liquidity providers.
- Participants noted that investors in the primary market rely on the ability to sell in the secondary market, finance in the repo market, or hedge in the futures market (which tends to be more liquid and hence useful for price discovery).
- In normal times funds use futures to rebalance their portfolio as it can be done efficiently. Repo is also used to avoid selling when in need of cash and to take advantage of additional returns from sought-after ('special') bonds.
- Primary markets are structured around three main issuance channels: auctions through primary dealers; syndications directly to end investors (particularly for new bond instruments or long-dated bonds); and tender offers (most for short-dated bills). Auctions through primary dealers remains the largest funding channel for DMOs.
- Liquidity in on-the-run government bonds is higher than in off-the-runs, and is usually the most liquid part of the market along with futures. Government bonds are increasingly used as a liquidity buffer by many non-banks, especially OEFs, to quickly raise cash. This makes the government bond market even more important than in the past.
- Despite some dysfunction in the secondary government bond markets in March 2020, primary markets proved resilient and there was record bond issuance. Sales mostly took place in the dealer-to-client segment due to high cash needs of end-investors.
- DMOs highlighted the importance of several tools to manage the turmoil, including using relatively more syndications or other operations to reach end investors directly and reduce reliance on primary dealers; increasing DMO purchases and buybacks to expand dealers' balance sheet capacity or repo operations to deliver specific bonds to the market; increasing the number of scheduled debt auctions or syndications; and increasing the issuance of bills as opposed to longer dated bonds to meet investor demand for cash-like securities and act as a shock absorber.

- Some participants argued that the size of the exogenous shock in March 2020 explains one-sided market movements. Others highlighted that while most of the selling was in off-the-run bonds, the interdealer segment (which focuses on on-the-run ones) also experienced some disruptions which is not typical. Some participants noted that, even in the interdealer segment of the market, a share of trading moved onto voice protocol, exacerbating illiquidity in the electronic segment.
- Foreign (especially official) investors, mutual funds and hedge funds were responsible for most of the selling in the US Treasuries market, which overwhelmed dealers, while there were a lot of inflows into government money market funds. The amounts intermediated by some PTFs on the US platforms using a central limit order book increased significantly as leveraged investors involved in the basis trade were forced to unwind their positions. Non-bank liquidity providers need a well-functioning repo market to provide meaningful levels of liquidity and some disruptions were also present in repo.
- Central bank purchase programs were crucial to address the challenges in market functioning during March and April 2020. Some participants cautioned that, with likely increasing levels of government debt issuance in many jurisdictions and a shift in the monetary policy stance, similar episodes of illiquidity may take place. A few participants noted that liquidity is already quite low in a number of government bond markets.
- The macro-financial backdrop was one explanatory factor for the turmoil. There was very large issuance of new US Treasuries prior to March 2020, while ECB purchases had reduced the availability of euro area government bonds.
- A substantial share of the selling during March 2020 was due to investors that are usually not active in the market and tend to hold on to their bonds for a long time. The fear of further liquidity deterioration led to their selling for precautionary purposes. Participants noted that repo funding availability was not a key driver of selling pressure.
- Many funds were trying to raise cash both to meet redemption requests and in anticipation of potential future redemptions. Trading conditions were very difficult and funds sold more than they needed in case the situation deteriorated further. High uncertainty and remote working conditions also added to liquidity pressures.
- The growth in the basis trade in the US prior to the turmoil was attributed to real money investors buying large futures positions resulting in an imbalance in the market. Hedge funds intermediated most of the demand for futures by engaging in the basis trade.
- Dealers were overwhelmed by the flows as they were subject to intermediation demand from various investors. In some cases even participants that wanted to buy government bonds could not do so because dealers would not intermediate the trade.

The key issues raised in the second session of these outreach meetings were as follows:

- Participants emphasized the importance of having a diversified set of investors with different outlooks and trading strategies and the need to improve data reporting to better understand participants' needs and behaviour as well as market linkages.

- There is no silver bullet in terms of enhancing resilience in government bond markets. The effectiveness of different policies will depend on the extent to which liquidity demand versus supply factors are important drivers of a future shock.
- More active public debt management may be worth exploring as a policy response. If market participants want to access very liquid and short dated assets in a future stress episode, governments could directly issue large quantities of short-term bills rather than rely on central bank interventions. This would have the advantage of keeping monetary and fiscal policy separate and would also be more transparent.
- Policies to reduce the amount of selling in stress include appropriately calibrated swing pricing for mutual funds and margining or central clearing to limit (and make more stable) hedge fund leverage. These policies may reduce procyclical behaviour but also have costs, as they imply a trade-off in liquidity demand between normal and stress times.
- A few participants noted that a well-functioning central bank repo facility would help investors to borrow against their bonds rather than sell them in episodes of stress. However, it needs to be designed properly including in terms of which entities will have access to it and under what conditions.
- Policies to consider on the supply side include more central clearing, easing of the certain regulations (e.g. to avoid the leverage ratio becoming the backstop in stress) for bank dealers without reducing their overall resilience, and 'congruent' regulation for PTFs commensurate with their increased activities in US Treasuries.
- A more transparent market where all participants have access to relevant data in real time would favour liquidity provision in normal and stress times. This is particularly true in the dealer-to-customer segment and the repo market as they are quite opaque.
- The role of repo is not sufficiently discussed even though it acts as an amplifier of stress. Repo transforms reductions in prices into illiquidity and rehypothecation makes the problem worse. After the 2008 financial crisis there were proposals to increase haircuts and limit collateral re-use, but there have been few reforms since then.
- All-to-all trading platforms can reduce reliance on dealer intermediation by providing more options to trade. Increasing transparency in the market is important and especially information on trades and orders in the dealer-to-customer segment. Authorities should monitor the proportion of bonds held by investors with liquidity mismatches.
- Reforms may necessitate liquidity being more expensive in good times but more resilient in stress. The cost of issuance for governments also needs to be factored in.
- It is unclear whether central banks will or should play the role of buyer/market maker of last resort. First, this policy is not generally found in their mandates – and even if it did, it would involve some oversight of the institutions to whom the central bank lends. And second, in March 2020 the monetary policy and financial stability mandates of central banks were aligned, but it is not a given that they would be willing to increase liquidity provision in future market stress if the outlook for inflation was different.



## Abbreviations

AEs	Advanced economies
AMs	Asset Managers
CCPs	Central counterparties
CLOB	Central limit order book
DMOs	Debt management offices
EMEs	Emerging market economies
FCMs	Futures Commission Merchants
FICC	Fixed income clearing corporation
GCF	General collateral financing
HQLA	High-quality liquid assets
ICPFs	Insurance companies and pension funds
IDBs	Inter-dealer-brokers
IRB	Internal ratings-based
MDBs	Multilateral development banks
MMFs	Money market funds
NBFI	Non-bank financial intermediation
OEFs	Open-ended funds
PB	Prime Broker
PDs	Primary Dealers
PSEs	Public sector entities
PTFs	Principal trading firms
RFQ	Request for quote
SFTs	Securities financing transactions
SLR	Supplementary leverage ratio