

White Paper on Clearing and Settlement in the Secondary Market for U.S. Treasury Securities

Executive Summary

The structure of the U.S. Treasury securities market has undergone significant changes since 2000 with the increased use of advanced technology, innovations in execution venues, and the wide use of automated execution strategies. There has been a marked increase in sophisticated and highly automated electronic trading across multiple execution venues that has significantly increased the speed of trade execution on some venues and likely improved overall liquidity through enhanced order flow and competition. New types of market participants—known as principal trading firms (PTFs)—have emerged, which have successfully developed and deployed high-speed and other algorithmic trading strategies. Traditional broker-dealers also engage in automated trading and also consume pricing and liquidity offered by PTFs for themselves and their customers. Following the uncharacteristic and inexplicable price volatility on October 15, 2014, the *Joint Staff Report on the U.S. Treasury Market* (2015) and the U.S. Treasury Department’s *Request for Information* (2016) and *A Financial System That Creates Economic Opportunities: Capital Markets* (2017) continue to focus attention on the evolving structure of the Treasury market.

Market participants lack a common understanding of the implications of these structural changes for clearing and settlement processes in the Treasury market. In particular, there is not a shared view on whether clearing and settlement processes are evolving in parallel to accommodate the greater diversity of market participants, support the new business models now active in the market, and manage the much more rapid trade execution, all of which may present risks to successful clearing and settlement. Moreover, these typically benign post-trade processes could be disrupted by contingent events, creating stress in the market. Given its systemic importance, any significant disruption in the Treasury market would likely impact financial stability.

The Treasury Market Practices Group (TMPG) formed a working group to study and report on current clearing and settlement practices in the secondary market for U.S. Treasury securities. (See Appendix for a list of workgroup members.) The working group, composed of TMPG members and subject matter specialists from TMPG member and non-member firms, was tasked with:

- mapping the current structure of clearing and settlement,
- identifying potential risk and resiliency issues, and
- facilitating a public discussion of clearing and settlement processes and practices.

This paper provides a detailed description of the various clearance and settlement arrangements for trades in the secondary market for U.S. Treasuries in an effort to help improve market participants’ understanding of any risks they may face. The TMPG encourages all market participants to conduct due diligence to evaluate the robustness of current practices, including whether their risk mitigation tools are sufficient for their level of market engagement.

Current Structure of Clearing and Settlement

There are two large segments of the secondary market for U.S. Treasury securities (see Section I): dealer-to-customer trading and dealer-to-dealer trading. The dealer-to-customer segment accounts for slightly more than half of secondary market trading, with the majority of trading conducted by voice or on electronic

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“request-for-quote” platforms. Even so, there is growing use of more highly automated electronic trading on dealer-to-customer execution platforms. Despite these changes in trading, clearing and settlement practices in this market segment have not changed materially over the recent past, with most trades clearing bilaterally.

Trading in the dealer-to-dealer segment of the Treasury market is generally conducted through interdealer brokers (IDB). Evolution in the IDB segment has been more pronounced, as defined by significant growth in highly automated trading and a commensurate increase in the use of bilateral clearing. Prior to 2000, all IDB platform users were members of a central counterparty (CCP) and trades were centrally cleared and, as such, benefited from the transfer of counterparty credit risk to the CCP through novation, multilateral netting of exposures, and other risk mitigation features like margining. Since that time, the IDB segment has been at the center of innovation with the introduction of highly advanced trading technology and the entrance of new market participants on the IDB platforms. Given that most of the growth in trading through the IDB platforms has involved new market participants that are not members of the CCP, a much smaller share of IDB platform trades clear through the CCP today. Consequently, the TMPG estimates that roughly three-quarters of IDB trades clear bilaterally, which, on balance, has increased the amount and duration of bilateral counterparty exposure in the system (see the table in Section II).

More specifically, the IDB platforms themselves and a number of platform participants continue to clear and settle through the CCP.¹ At the same time, other platform users, including many PTFs, which account for a majority of the IDB trading volume, clear and settle bilaterally with the IDB.²

For bilaterally cleared trades, whether conducted on an IDB or in a dealer-customer setting, intraday and overnight credit risk remains with the original trading counterparties from trade execution to settlement and is subject to risk mitigation practices that are less standardized and less transparent to the broader market than those involving centrally cleared trades. A majority of trades in the secondary Treasury market now clear bilaterally, a trend that is contrary to the direction of recent regulatory requirements in other markets (i.e., swaps) that for some products mandate clearing and for others encourage it through higher margin requirements on bilaterally cleared transactions.

Potential risk and resiliency issues:

The TMPG working group identified the following potential risk and resiliency issues for consideration:

Market participants may not be applying the same risk management rigor to the clearing and settlement of their U.S. Treasury activities as they do to other aspects of risk taking. This may be in part due to the risk-free nature of the underlying instrument and in part due to the typically short settlement cycle. Risks to smooth clearance and settlement in the Treasury market can manifest themselves in a number of ways, including counterparty credit concerns and operational issues. There have been instances in the past in which Treasury market participants have suffered substantial and rapid losses from unexpected counterparty credit concerns and leveraged positions.³

Given changes in trading activity and participation, the counterparty credit risk incurred indirectly through

¹ Based on assumptions in the 2015 *Joint Staff Report*, about 23 percent of IDB trades in 2017 were between two CCP members and were centrally cleared. See the table in Section II. More recent data are not available.

² PTFs typically trade large volumes at sub-second execution throughout the day but end the day with net positions that are a small fraction of their gross activity.

³ Counterparty losses resulting from a sharp inversion of the forward rate curve in 1994 and losses related to an unwinding of Long-Term Capital Management’s leveraged rate positions in 1998 are two examples.

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the clearing chain may not be transparent to participants in the market, including traditional broker dealers, IDBs, CCPs, PTFs, clearing banks, custodian banks, investors, and prime brokers. Where transparency is impaired, market participants cannot accurately identify, measure, and manage their counterparty risk exposure.

Specifically, the TMPG identified the following risk areas:

- **The role of IDB platforms and the associated risks are not well understood by all market participants.** Not all market participants understand the role of the IDB in terms of the composition of its counterparts and credit risk that the IDB and those counterparts present to each other.
- **Risk management practices for clearing and settlement of bilaterally cleared as well as centrally cleared trades may not have kept pace with market evolution.** Margining has not been a common practice for regularly settling bilaterally cleared transactions, and even for centrally cleared transactions, margining typically occurs twice a day, creating the potential for rapid accumulation of unintended exposures given the speed of execution. This may be a particular area of focus and reflection for trades conducted on IDB platforms given the prevalence of high-speed execution and bilaterally cleared activity, making it essential for such platforms to prudently allocate and monitor trading limits and risk levels at all times. Some PTFs transact gross volumes that are quite high in relation to their financial resources, and though their strategy may seek to maintain a much lower net risk exposure, the confluence of high speed, high volume, and limited resources highlights the challenging nature of, and need for, effective risk management.
- **With bilaterally cleared IDB activity as well as bilaterally cleared dealer-to-customer activity, a large and likely growing majority of trades in the secondary Treasury market are risk managed through bespoke arrangements by the trade counterparties.** Bilateral clearing involves varying risk management practices that are less uniform and less transparent to the broader market and may be less efficient with regard to netting exposures and use of collateral as compared to central clearing. An increase in bilaterally cleared trades likely increases the aggregate liquidity risk in the clearing and settlement process because, unlike a CCP, bilateral arrangements may not have the discipline of establishing a contingent liquidity risk framework or uniform requirements for emergency liquidity.
- **Risks associated with operational disruptions, cyber threats, or the introduction of a flawed algorithm may have systemic implications.** Sizable losses stemming from coding errors or flash events have been realized in some markets, for instance, the Knight Capital event in 2012 in the equity market. While such severe operational risks have not yet materialized in the Treasury market, it is unclear how the clearing and settlement market structure would function under such stress and how any related losses would be distributed. More generally, loss mutualization processes employed by the CCP, while prudent, may indirectly expose CCP members to non-members in unexpected ways.
- **A limited number of key providers play an essential role in the Treasury cash market, creating some areas of concentration risk.** One IDB currently accounts for a substantial share of all electronic IDB activity and also serves as the source of the associated market data generated by that activity. Moreover, clearing services for large market participants have become more concentrated.
- **The CCP does not have visibility into its members' Treasury market activity that clears bilaterally, away from the CCP.** The CCP considers the activity submitted by the members for central clearing to determine the financial requirements for daily margin and clearing fund to manage daily and potential future mark-to-market risk.

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- **Some market participants may not fully understand the credit enhancement provided by third parties in the bilateral clearing and settlement chain.** Fundamental to most clearing relationships is the process by which many clearing entities facilitate the settlement process by temporarily extending credit intraday or overnight to customers in anticipation of settlement. Bilateral and bespoke arrangements exist, and some might allow the provider to limit or terminate the agreement with little advance notice. If participants misunderstand the depth, breadth, or durability of these credit enhancement arrangements, they cannot adequately manage their risk.
- **The time between trade execution and trade matching for dealer-to-customer trades varies and can be significant such that trade matching may not even occur on the trade date.** Delays in matching can result in misunderstandings about a trade remaining unrecognized and unmitigated. Any disruption in the range of complex informational flows and operational processes involved in clearing and settlement arrangements could create unexpected credit exposures for entities involved in the process.
- **Liquidity risk management practices in the Treasury cash market should contemplate the gross value of a trade because the entire notional value is required for settlement.** Gross trading volumes need to be considered for evaluating counterparty risk because the full face value has to be paid or funded in a cash trade if one side defaults or fails to settle. This added dimension could add to the cost of cash trading relative to futures. At the same time, and in the normal course of business, intraday netting down of bilateral risk exposures limits potential market risk exposure.

The risks highlighted above exist and are managed under normal market conditions, but participants should examine whether they are managed well enough to endure contingent events such as a participant default, an IDB platform default, a cyber event, or a coding error. The default of a large market participant or an IDB platform could disrupt Treasury market functioning through contagion spreading to interconnected institutions or through the loss of a key trading platform.

Given the Treasury market's global importance and benchmark status, any disruption has the potential to create systemic risk that may be transmitted to other domestic and international capital markets. While the likelihood of such a disruption in the Treasury market is remote, the TMPG believes a discussion of the clearing and settlement processes and practices now is prudent and could help improve the Treasury market's resiliency to stress events.

Public Dialogue

The TMPG seeks public feedback on the following aspects of the secondary Treasury market:

- the accuracy and completeness of various clearing and settlement arrangements described,
- risk and resiliency issues identified, and
- any other feedback and suggestions.

The TMPG expects to develop best practice recommendations following the conclusion of the public comment period.

The paper proceeds as follows: In Section I, we provide an overview of the U.S. Treasury market's structure, including the primary and secondary markets. Section II provides a detailed discussion of clearing and settlement in the secondary market, distinguishing among the various protocols and discussing the associated risks. Section III summarizes the risks and resiliency issues associated with current clearing and settlement practices. A glossary of terms used by market participants follows the appendix.

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I. TREASURY MARKET OVERVIEW

The U.S. Treasury securities market is the largest and most liquid sovereign bond market in the world, with \$14 trillion in outstanding marketable debt and average daily trading volume of \$530 billion.⁴ U.S. Treasury securities are commonly used to price and hedge positions in other fixed-income securities and to speculate on the path of interest rates. The securities' creditworthiness and liquidity also make them a global benchmark for risk-free rates and a key reserve asset, store of value, and source of collateral for central banks and other investors. Because investors value the securities' liquidity and safety, they pay a premium to hold these money-like assets, lowering the financing costs of the U.S. government.

A. Primary Market

The U.S. Department of the Treasury issues debt to finance the federal government through the primary market. The marketable debt is purchased via an auction process administered by the U.S. Treasury.⁵ Primary dealers—trading counterparties of the New York Fed in its implementation of monetary policy—are expected to bid on a pro-rata basis in all Treasury auctions at reasonably competitive prices. For institutional investors, Treasury accepts bids and communicates successful awards for its securities through its Treasury Automated Auction Processing System (TAAPS). Treasury also has a web-based system called TreasuryDirect through which smaller investors, including individuals, trusts, estates, corporations, and partnerships, can bid for and purchase limited amounts of securities.

B. Secondary Market

This paper focuses on the secondary market, where trading takes place over-the-counter. There are two large segments of the secondary market for U.S. Treasury securities: dealer-to-customer trading and dealer-to-dealer trading.

In the dealer-to-customer segment, dealers are significant market makers, buying and selling securities from their customers for their own accounts at their quoted bid and ask prices. Such dealer-to-customer trading takes place either via voice, a dealer's proprietary trading platform, or a multi-dealer electronic trading platform, such as Bloomberg or Tradeweb. Such trades are typically cleared and settled bilaterally. Daily trading volume in the dealer-to-customer market is estimated to average about \$290 billion.

In the dealer-to-dealer segment, the dealers trade with one another and certain other market participants, primarily through IDBs, for hedging, risk management, and other purposes. The IDBs offer the participating firms proprietary electronic screens or trading platforms that post the best bid and offer prices of the participants, along with the associated quantities bid or offered. For trades executed on an IDB, the IDB stands in the middle as principal to each of the participants to preserve the anonymity of each party. Daily trading volume in the IDB market is estimated to average about \$230 billion.

In the past, IDB participants were limited to government securities dealers that were CCP members, and all trades were centrally cleared. Since the mid-2000s, however, IDB participation has expanded to include non-dealer participants, including hedge funds and PTFs that are not CCP members. The *Joint Staff Report* found that PTFs account for 56.3 percent of IDB trading volume in the on-the-run 10-year note, compared to bank

⁴ Trading volume is estimated here and elsewhere in this section using various assumptions and FR 2004 data reported by the [primary dealers](#) to the Federal Reserve (see the table in Section II for details).

⁵ The Federal Reserve Bank of New York executes the auctions of marketable U.S. Treasury debt in its role as the fiscal agent for the U.S. Treasury.

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dealers' and broker dealers' share of 34.7 percent, with the remaining activity split among non-bank dealers and hedge funds.⁶

Electronic trading in the IDB market as of June 2017 was covered primarily by three electronic trading platforms: BrokerTec (owned by NEX Group), Nasdaq Fixed Income (previously known as eSpeed, and owned by NASDAQ) and DealerWeb (owned by Tradeweb).⁷ All three platforms operate as central limit order books (CLOBs) and support a variety of order types, manual and automated trading, and settlement types. Trading on these platforms is anonymous.

While the U.S. Treasury market is extremely active and liquid, activity is highly concentrated in a small number of the roughly 390 issues outstanding. On-the-runs, the most recently issued securities of a given maturity, are especially active, particularly in the IDB market in which they account for most trading. Securities that have been announced for auction but not yet issued are also actively traded in a forward settling when-issued market. Off-the-runs, older issues of a given maturity, are also traded in the IDB market, but to a much lesser extent than on-the-runs, and to a lesser extent than in the dealer-to-customer market. Treasury bills, Treasury inflation-protected securities (TIPS), and floating rate notes (FRNs) are also less actively traded than on-the-run coupon securities, especially in the IDB market.

Once executed, U.S. Treasury security transactions typically settle the following business day. The most notable exception is when-issued trades, which settle on a forward basis on issuance date. Another exception is same-day settling cash trades, but these are rare.

⁶ See Table 3.3 (p. 59) in the *Joint Staff Report* (2015), based on trading activity on the BrokerTec platform from April 2-17, 2014.

⁷ While electronic trading platforms operated by government securities dealers that trade only government securities are exempt from registration under, and compliance with, the substantive requirements of Regulation ATS, all of the IDBs currently active in the U.S. Treasury securities market are registered with the U.S. Securities and Exchange Commission (SEC) as alternative trading systems (ATS).

II. CLEARING AND SETTLEMENT

The liquidity and efficiency of the U.S. Treasury market are dependent on a safe, efficient, and robust clearing and settlement process. This section describes the current state of the most common clearing and settlement processes used by participants executing transactions in the secondary U.S. Treasury securities market. Unlike futures markets, in which clearing and settlement processes are more uniform, secondary U.S. Treasury market clearance and settlement practices vary materially across participants and often involve embedded intraday secured credit extensions. We begin with an overview of the clearing and settlement process, followed by a discussion of the most common clearing and settlement arrangements, accompanied by a set of stylized maps.

A. Overview of Clearing and Settlement Process, Including Market Infrastructure

The life cycle of a secondary market trade consists of three major components: execution, clearing, and settlement. Execution occurs when two parties agree to a trade, an event that occurs on an electronic platform, via voice, or through another channel. Clearing occurs post-execution and refers to the set of steps involved in preparing executed trades for settlement and the submission of settlement instructions. In cases for which clearing is affected by a CCP, clearing also includes guarantee and novation of trades by the CCP and netting of obligations for settlement. Settlement of a cash trade refers to the stage in which ownership of securities passes from the seller to the buyer in exchange for cash.

The clearing process begins with trade booking, a procedure whereby both parties record the trade in their internal systems. It is followed by trade matching, in which both parties confirm the details of a trade with one another, including counterparty name, security transacted, quantity, price, and settlement date. Each participant also makes a determination as to whether a trade is eligible to be submitted to a CCP for novation and netting (centrally cleared) or if the trade should be bilaterally cleared. There is no regulatory requirement that U.S. Treasury security trades be centrally cleared, and many are cleared bilaterally. This is in contrast to the futures market, where trade execution and central clearing are vertically integrated and all transactions are cleared through a CCP.⁸

If the trade is to be centrally cleared, a CCP receives notice of executed trades by both participants to the trade and, upon the matching of trade details – referred to as “comparison” – guarantees and novates the contract. Novation means that the CCP becomes the counterparty to each of the original participants so that they no longer face each other through settlement. For trades executed electronically, the CCP typically receives notice and matches trade details in near real time on the trade date.⁹ At the end of the trading day, after all of the trades are recorded at the CCP, the CCP determines the net obligations by security owing to or from each CCP participant per settlement date. On each settlement day (generally T+1), each CCP participant bilaterally settles its multilaterally netted position with the CCP.

If a trade is not centrally cleared, participants send messaging directly to their clearing or settlement agents.¹⁰ Depending on the contractual arrangement, clearing agents can move securities and cash, or they can act as a limited principal on behalf of their clients by extending credit to facilitate settlement (assuming

⁸ In the Treasury futures market, the full notional value does not settle, as is required in the cash market.

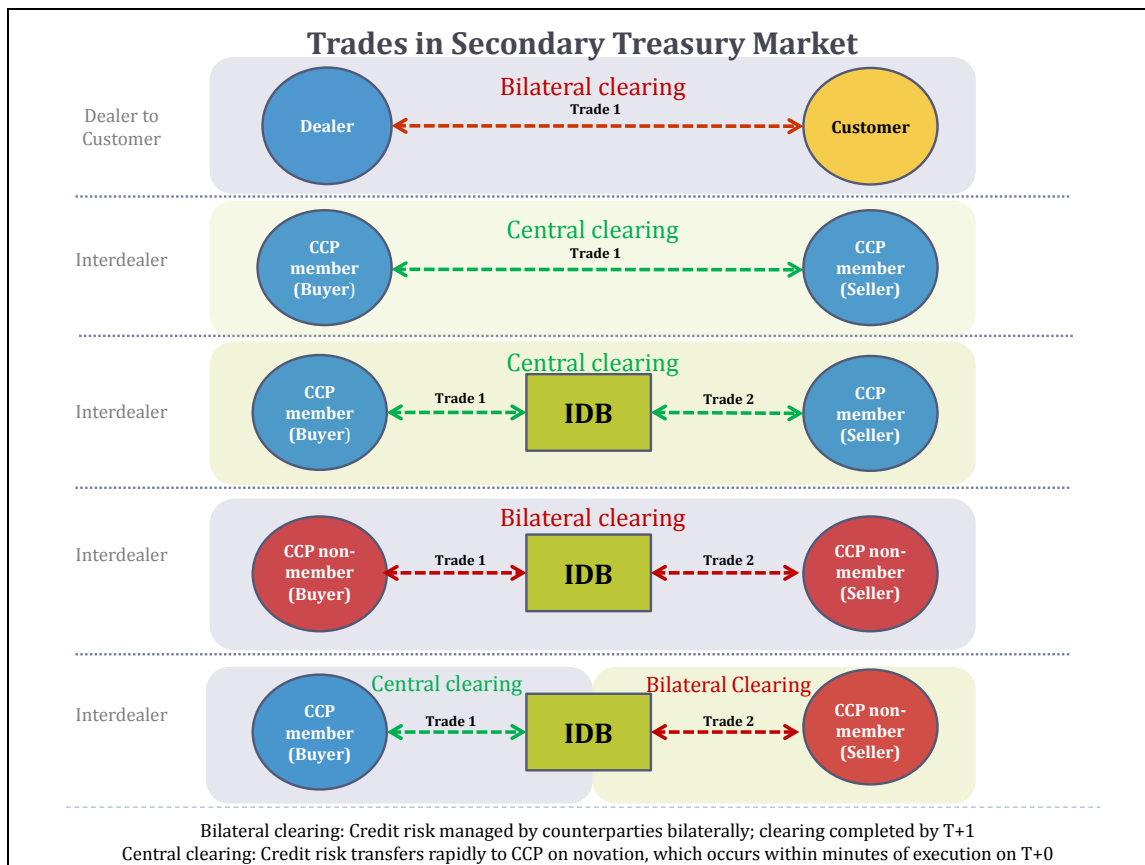
⁹ While most CCP members match trade details in near real time with the CCP, it is possible for the comparison process to take a bit longer, since some CCP members compare more quickly than others.

¹⁰ Clearing and settlement agents provide post-trade services to market participants. Although some agents strictly provide clearing services (e.g., trade matching) and some strictly provide settlement services (e.g., moving securities from a seller’s account to a buyer’s account), other agents provide a mix of both.

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some amount of credit risk). Buy-side firms often use custodial banks as their settlement agents, whereas dealers use clearing banks. Hedge funds and PTFs often depend on prime brokers for clearing and settlement services. Depending on the contractual arrangement, the settlement agents may exchange securities vs. cash on a transaction-by-transaction or gross basis, or they may settle transactions on a net basis (where netting is done by participant and security). Further, settlement may occur throughout the day, or at the end of the day, on T+1. The nature of the differences in arrangements between the different entity types (custodial banks, clearing banks, and prime brokers) is due in part to differences in the amount of credit provided; custodians generally provide some secured intraday or potentially overnight credit, while clearing banks provide large amounts of secured intraday credit, and finally, prime brokers provide both same-day and long-term financing to their clients.

Trades through IDBs, in particular, can clear and settle via three different processes, depending on the identity of the parties to the trade, as shown in the figure below. This reflects the fact that the IDBs stand as principal between the two parties to a trade and that those parties may or may not be CCP members.¹¹ When both parties to the trade are not CCP members, each leg of the trade settles bilaterally. When both parties to the trade are CCP members, each leg is centrally cleared. Finally, when only one of the parties to the trade is a CCP participant, one leg of the trade clears and settles through the CCP and the other leg is bilaterally cleared. This last hybrid case presents distinct settlement risks that are discussed below.



¹¹ IDB platforms act as blind brokers to provide anonymity to their customers. Under the blind broker model, the IDB serves as principal, so what might appear to be a single trade between two customers is really two: one between the broker and the buyer and one between the broker and the seller. The buyer and seller are no longer directly exposed to each other, but both are exposed to the blind broker, and the blind broker is exposed to both buyer and seller.

The safety and robustness of the clearing and settlement practices depend in part on whether the transactions clear bilaterally or centrally. For centrally cleared transactions, gross settlement sizes are reduced through novation and multilateral netting, and highly automated trade comparison processes result in most trades between CCP members clearing in near real time, as discussed above. The CCP collects margin twice a day, maintains a clearing fund balance, and has a predefined loss-sharing arrangement in case of member default. In contrast, bilaterally cleared transactions can be settled on a net or gross basis with individual counterparties and have confirmation processes that can extend past the trade date. Moreover, risk mitigation practices are less uniform and transparent with respect to collateral and margin practices with bilaterally cleared transactions, and there are naturally no loss-sharing arrangements as with the CCP.

B. Detailed Clearing and Settlement Cases

In this section we lay out the details of clearing and settlement for a number of different cases, each with its own stylized map. The maps have a common structure to ease comparison across the different cases and divide the trade life cycle into four steps: (i) execution (including trade booking), (ii) affirmation and confirmation (including trade matching), (iii) further clearing and intermediate settlement, and (iv) final settlement. As detailed below, settlement of a trade usually requires securities to be transferred a number of times through various securities accounts. We define final settlement as the last leg of this settlement chain, where the securities are delivered to the purchaser's account. All other legs of this settlement chain are called intermediate settlement. Steps (i) and (ii) usually occur on the day of execution (T+0) and steps (iii) and (iv) occur on the following business day (T+1). In addition to illustrating the clearing and settlement processes, the maps also highlight the participants in the settlement chain and which of them hold counterparty credit risk and credit extension risk throughout the clearing process.¹²

Some of the common features across the clearing maps include:

- Entity type: included as individual rows in the process, for instance, a clearing bank, CCP, settlement agent, etc. (Note that the number of entity types and hence rows differs across the various maps.)
- Timeline: Day of execution (T+0) and the day of settlement, which is typically the following business day (T+1).
- Information flows and movements of cash or securities designations:
 - Information flows (gray dashed arrows): Two-way information flows include trade messaging, confirmation, and matching processes. One-way information flows include delivering or receiving instructions and settlement confirmations.
 - Movements of securities (solid black arrows): This includes movements across Fedwire Securities® Service¹³ or as a transfer on the books of a bank.
 - Movements of cash (solid black lines with squares).
- Identification of credit risks:
 - Counterparty credit risk (solid red outline): Risk of counterparty non-performance and the associated market risk from liquidating or covering positions.
 - Centrally cleared credit risk (solid green outline): Risk that the CCP assumes in becoming principal to a trade.

¹² Market risk (the risk that the value of the traded security changes between the time a trade is executed and when it's settled) is an important determinant of the amount of counterparty credit risk associated with a trade.

¹³ Fedwire Services include the Fedwire Funds and the Fedwire Securities Services, which banks, businesses, and government agencies rely on for critical same-day funds and securities transfers. "Fedwire Services" is a registered service mark of the Federal Reserve Banks. A complete list of marks owned by the Federal Reserve Banks is available at FRBservices.org.

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- CCP counterparty risk (dashed green outline): Buyer's/seller's risk of CCP non-performance and the associated market risk from liquidating or covering positions.
- Credit extension risk (solid orange outline): Risk assumed by parties advancing cash upon receipt of securities on behalf of the underlying Buyer secured by such securities. In the event of the Buyer's default, the party providing the cash advance may liquidate the Treasuries and absorb credit and market risk.
- Other features of the map include:
 - A summary row at the bottom of each map indicating which entity holds which type of credit risk at various points during T+0 and T+1, as well as overnight.
 - A pie chart at the top right corner of the maps summarizing the evolution of credit risk over the trade life cycle. The numbered quadrants of the pie chart denote stages of the transaction life cycle: (1) Execution, (2) Affirmation/Confirmation, (3) Clearing/Settlement, and (4) Final Settlement. Colored regions denote parties exposed to risk during the corresponding life cycle stage.

A number of different entities may play a role in the clearing and settlement of U.S. Treasury securities, depending on the parties to the trade. A list of the different entities highlighted in the stylized clearing and settlement maps are as follows:

- Buyers/Sellers:
 - Buy-side Firms: Clear and settle bilaterally (not CCP members)
 - Multiple disclosed principals (MDP): Buy-side firm clients who are the underlying ultimate purchasers of U.S. Treasury securities. Trades are transacted as an omnibus principal by the buy-side firm and then allocated to the underlying principals by the end of T+1.
 - Dealers (CCP members): Clear and settle on a bilateral basis with CCP non-members and clear and settle via the CCP when trading with other CCP members.
 - Dealers (CCP non-members): Clear and settle bilaterally as they are not CCP members.
 - PTFs: Clear and settle bilaterally (not CCP members), or use a Prime/Executing Broker to face the market as principal on their behalf.
 - Prime Brokers (PB): Can be CCP members that act as agent or principal when they clear and settle on behalf of their underlying clients.
 - Executing Brokers: May or may not be CCP members and clear and settle as principal on behalf of their underlying clients.
- Clearing/Custody Banks: Clear and settle on behalf of clients with respect to both CCP and non-CCP trades.
- Central Counterparty (CCP): Clearing house that centrally clears for its members.
- Interdealer Brokers (IDB): Dealers that operate electronic and voice platforms that allow participants to trade anonymously.
- Limited Principal Clearing Agents: Parties who act as agent for the final Buyer or Seller in the clearing and settlement process. To facilitate settlement, these types of clearing agents assume some pre-agreed amount of credit risk on behalf of the underlying Buyer.
- Clearing Agents: Parties who act as agent for the final Buyer or Seller in the settlement process and do not extend credit on behalf of the Buyer.

We present five clearing and settlement cases that cover the vast majority of secondary market cash trades in order of increasing complexity. Given the mixture of CCP members and non-members active on IDB platforms, we use three processes to illustrate IDB clearance and settlement processes (Figures 3, 4, and 5

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below). The table below presents estimates of the daily trading volume, and share of volume, attributable to each of the five cases.¹⁴

Table: Secondary Market Daily Trading Volume by Clearing and Settlement Case

	Case	Map	Volume (billions)	Non-IDB share	IDB Share	Overall Share
1.	Bilateral clearing, no IDB	1A & 1B	\$289	95.0%	-	54.3%
2.	Central clearing, no IDB	2	\$15	5.0%	-	2.9%
3.	Central clearing, with IDB	3	\$52	-	22.9%	9.8%
4.	Bilateral clearing, with IDB	4	\$73	-	31.9%	13.6%
5.	Bilateral/central clearing, with IDB	5A & 5B	\$103	-	45.3%	19.4%
Total: \$531 billion (\$304 billion non-IDB (57.2%); \$228 billion IDB (42.8%))						

Note: The figures are estimated using FR 2004 data covering the first half of 2017 and are based on various assumptions: a) primary dealers account for all dealer activity, b) 5% of dealers' trading not through an IDB is with another dealer, c) the shares of dealer and non-dealer activity in the IDB market for coupon securities equal the weighted averages of the shares reported in the October 15 report (that is, 41.5% and 58.5%, respectively), d) only dealers trade bills, FRNs, and TIPS in the IDB market, and e) the likelihood of dealer and non-dealers trading with one another in the IDB market solely reflects their shares of overall volume.

1. Trades bilaterally cleared not involving an IDB (Figures 1A and 1B)

We begin with the least complex and most common clearing and settlement case: a trade bilaterally cleared without the involvement of an IDB. We present two variations. The first involves a trade between a CCP member and a CCP non-member; a typical example is a dealer-to-customer transaction.¹⁵ The second also involves a trade between a CCP member and a CCP non-member, but in this case, the CCP non-member is acting on behalf of multiple disclosed principals. A typical example is where the CCP non-member is an asset manager that executes a large trade with a dealer on behalf of a number of funds. The asset manager then breaks down or allocates the trade as part of the clearance process, with the end result that the dealer settles against each account holder and not the asset manager. For both variations, we begin with a description of the clearing and settlement details and end by highlighting the credit risks taken on by participants in this process, as well as other types of risks that are present.

a. CCP member selling to CCP non-member; bilateral clearing (Figure 1A)

Description

The process starts with market participants executing a trade by either an electronic or a voice trading platform. A significant portion of business for this case is executed electronically, either on a single dealer platform or on multi-dealer platforms. After agreeing to a trade, the trade counterparties book the transaction details in their internal systems and confirm the trade details with one another. This matching process is often performed through various automated channels, but is done manually in some instances.

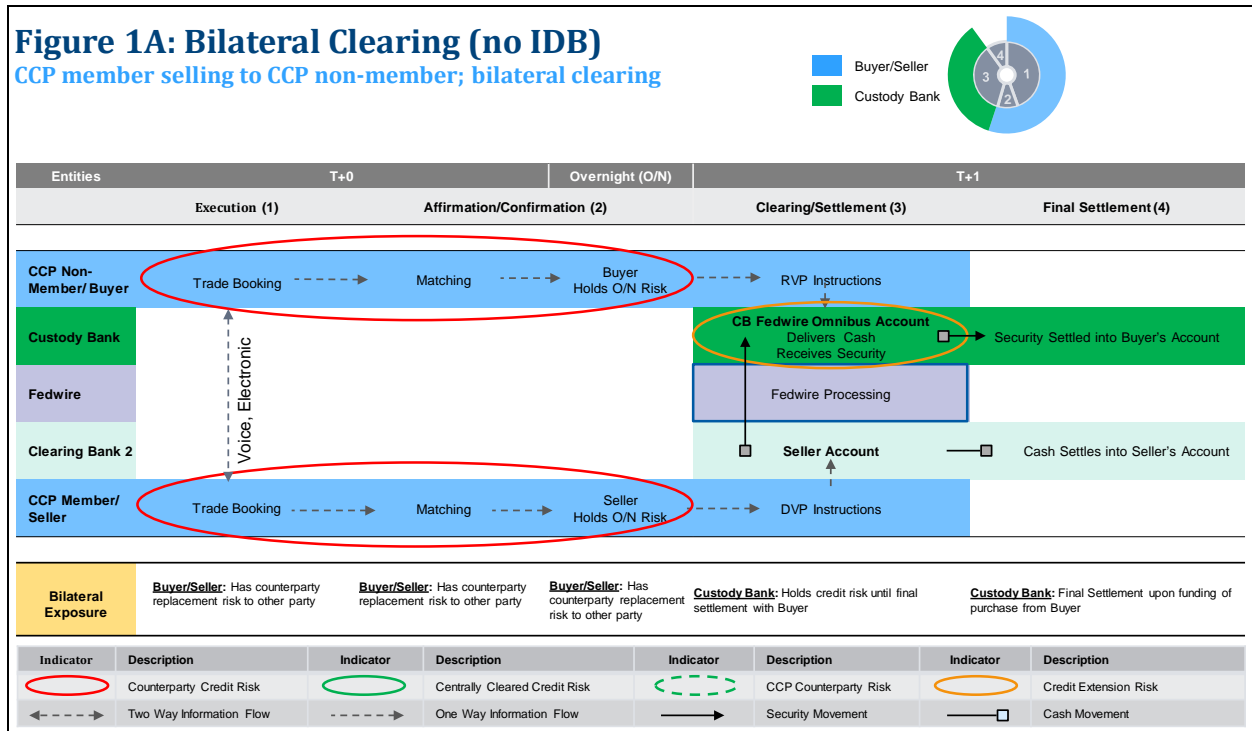
¹⁴ The table presents estimates because precise information is not available on the size of the market or on how activity breaks down by the method of clearing and settlement.

¹⁵ Buy-side firms are a common example of a client or customer, where "buy side" is a market colloquialism for client accounts that generally include hedge funds, asset managers, insurance companies, corporations, and pension funds. These firms share the common characteristic that, in the government securities markets, they typically do not directly use IDBs and by market convention only trade with bank dealers or broker-dealers. As such, most settle their transactions bilaterally on a DVP basis. Very few are members of CCPs or have had the opportunity, until recently, to avail themselves of central clearing through intermediaries. Generally, these buy-side firms use custodians and instruct those custodians to effect settlement with their bank dealer or broker-dealer counterparty.

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On T+1, both parties typically send instructions to their settlement agents. Figure 1A illustrates a CCP member selling securities to a CCP non-member where the Seller uses a clearing bank and the Buyer uses a different custody bank. The Seller instructs Clearing Bank 2 to send the securities from its securities account to the Buyer's securities account at Custody Bank. Clearing Bank 2 follows these instructions by transferring the securities over the Fedwire Securities Service to the Custody Bank's omnibus securities account. The Custody Bank then credits the securities to the Buyer's securities account, which is maintained by the Custody Bank. Because all these transfers are done on a delivery-versus-payment basis (DVP), the movement of securities is accompanied by a simultaneous transfer of cash in the opposite direction.¹⁶

Although not shown in Figure 1A, prime brokers are sometimes involved in this process and can be important actors in trades cleared bilaterally without an IDB, because they facilitate trading of U.S. Treasury securities on behalf of clients such as hedge funds.



Credit Risks

After trade execution, counterparty credit risk arises between the Buyer and Seller. This risk reflects the fact that if one of the parties to the trade does not fulfill its obligations, then the other party may face a cost in replicating the trade with another party.¹⁷ This replacement cost risk naturally encompasses the market risk associated with the security in question. In Figure 1A, the red ovals highlight the fact that for a bilaterally cleared trade without an IDB, the Buyer and Seller have counterparty credit risk to one another throughout T+0 as well as overnight into T+1.

¹⁶ In this paper, we assume all transfers are DVP. It is possible, however, for securities to be transferred free of cash.

¹⁷ The Long-Term Capital Management (LTCM) experience in 1998 illustrates that this process is not risk free. That is, while U.S. Treasury securities are considered risk free, there is counterparty risk associated with trading U.S. Treasury securities, which must be managed prudently.

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On T+1, with the start of the settlement process, a different type of credit risk emerges: credit extension risk. Because securities are transferred on a DVP basis and firms other than the Seller and Buyer are involved in settlement, some parties advance cash upon receipt of securities on behalf of the Buyer secured by those securities. In the case of the Buyer's default, these parties may face costs recovering their cash, for example, in liquidating the securities. Here, the Custody Bank faces credit extension risk to the Buyer when it delivers cash to Clearing Bank 2 upon receipt of the securities. This risk is not present if the Buyer prefunded its account at the Custody Bank; otherwise the Custody Bank holds the risk until the Buyer funds its obligations.

If the Buyer does not prefund and does not have enough credit to complete settlement, the Custody Bank can liquidate the securities to recover its cash. Alternatively, if the Custody Bank doesn't know (DK) the trade, it can reject the trade, and so send the securities back to Clearing Bank 2, which in turn re-credits the securities to the Seller's securities account, resulting in a settlement fail.

Hence, for this case of a trade cleared bilaterally without an IDB, settlement normally depends on the willingness of the Buyer's Custody Bank to extend credit.¹⁸ In the normal course of business, this credit extension is benign, but in a contingency event, this credit arrangement and its durability can be crucial.

The emergence and extinguishment of counterparty credit and credit extension risk over the clearing and settlement process is summarized in the pie chart in the top right corner of Figure 1A. This pie chart also highlights which participants are holding these risks over the phases of the trade life cycle.

Other Risks

The use of manual matching processes increases the risk of trade discrepancies arising between parties. Although both parties have incentive to recognize and rectify discrepancies as soon as possible, a lengthy dispute can lead to increasing mark-to-market exposure and/or unexpected outright market risk for each party. The risk of trade discrepancies is further compounded when parties wait until the end of T+0 to match trades, because there is little time to fix discrepancies or resolve disputes before the settlement process begins on T+1.

b. CCP member selling to a CCP non-member (typically an asset manager); bilateral clearing on behalf of multiple disclosed principals (Figure 1B)

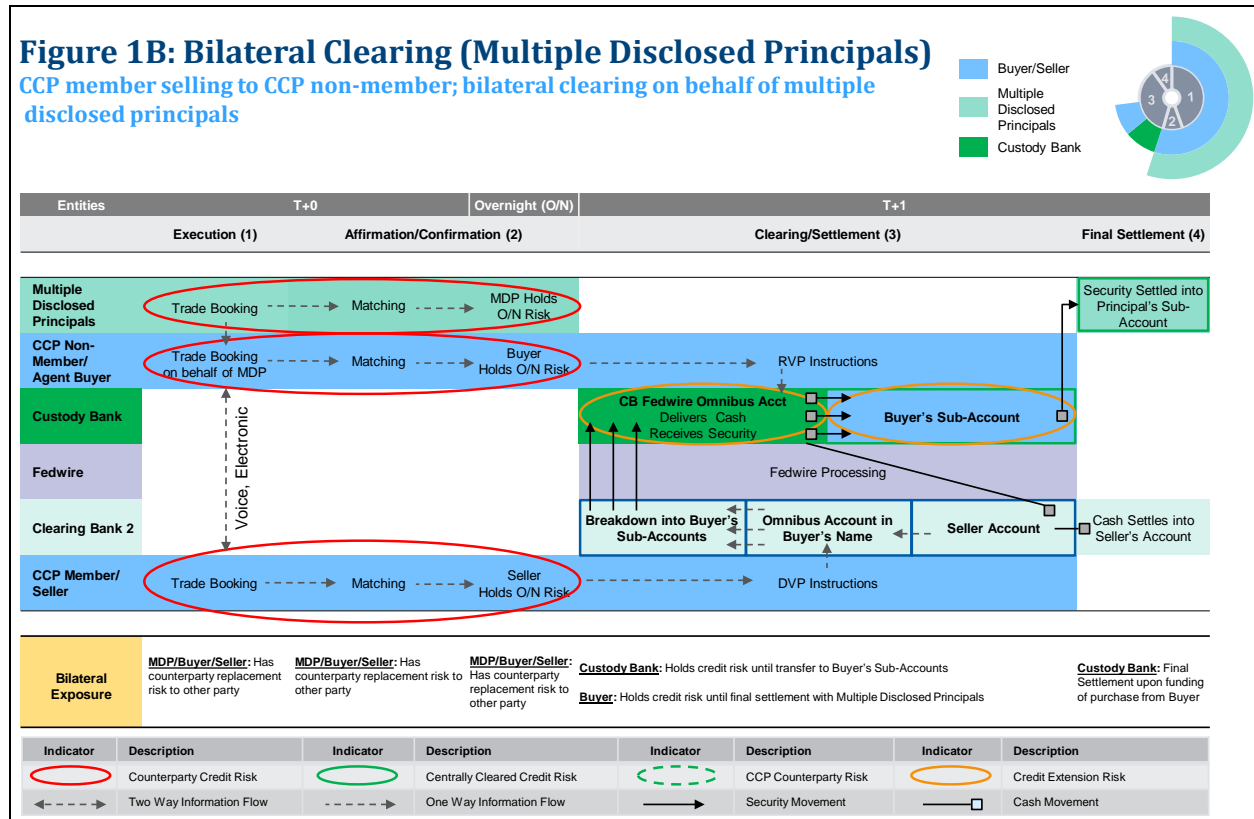
Description

This variation builds upon the previous scenario by considering the case where the CCP non-member Buyer is purchasing securities on behalf of multiple disclosed principals. As before, the CCP member Seller and CCP non-member Buyer execute a trade using a voice or electronic platform. The difference here, however, is that the CCP non-member Buyer needs to communicate the trade details to the multiple disclosed principals as well as to reveal the multiple principals' identities and their individual allocations to the Seller. This increased flow of communication complicates both trade booking and matching.

As in the previous variation, on T+1 both the Buyer and Seller send instructions to their settlement agents. On the books of Clearing Bank 2, the Seller's settlement agent, three stages are depicted in Figure 1B. First, the securities are moved from the Seller's account to an omnibus account in the Buyer's name, reflecting the initial trade between the Seller and Buyer. Then the securities are parceled out into sub-accounts, reflecting the details of the allocation of securities to the multiple disclosed principals. In the example depicted in Figure

¹⁸ Other parties, such as a correspondent clearer or prime broker, can extend intraday credit to facilitate settlement.

1B, we assume that the initial trade between Buyer and Seller is replaced with individual trades between the Seller and each Principal, although legal arrangements vary as to how these trades are booked. Reflecting the many trades that exist between Seller and Principals, multiple arrows are used in Figure 1B to show the delivery of the securities from Clearing Bank 2 over the Fedwire Securities Service to the Buyer’s settlement agent, the Custody Bank. For each trade, the Custody Bank then credits the securities to each Principal’s securities account, which is maintained by the Custody Bank.



Credit Risks

After trade execution, counterparty credit risks arise among several parties. The Buyer (the CCP non-member) has counterparty credit risk with the multiple disclosed principals because we are assuming that the Buyer is acting as more than just an agent.¹⁹ Further, the Seller (the CCP member in Figure 1B) has counterparty credit risk with respect to both the Buyer and the multiple disclosed principals. As in the previous case, this counterparty credit risk extends overnight to T+1.

On T+1, with the start of the settlement process, credit extension risk arises. Similar to Figure 1A, the Buyer’s Custody Bank faces this risk with respect to the Buyer when it delivers cash to Clearing Bank 2 upon receipt of the Seller’s securities (shown in Figure 1B as the transfer of securities into the Custody Bank’s omnibus securities account). Once the Buyer provides the necessary funds, the Custody Bank’s credit extension risk is extinguished and the securities are moved into the Buyer’s securities account (see Buyer’s sub-account in

¹⁹ Contractual arrangements vary, affecting the extent to which the Buyer is acting as principal versus agent.

Figure 1B).²⁰ Because the Buyer is acting on behalf of multiple disclosed principals, the Buyer also holds credit extension risk. This risk immediately disappears if the multiple principals have prefunded their purchase of the securities. Otherwise, the Buyer holds the credit extension risk until the principals fund their obligations.

Other Risks

The addition of multiple principals complicates the clearing process as information on trade details needs to be exchanged across many parties and information may not be available at the time of execution. As a consequence, there may be significant time delays between trade execution, booking, and matching, and there is a greater chance for matching errors to occur.

2. Trades centrally cleared not involving an IDB (Figure 2)

We now move to the case of trades centrally cleared without the involvement of an IDB (see Figure 2). A typical example of such a trade is one directly between two large dealers that are CCP members.

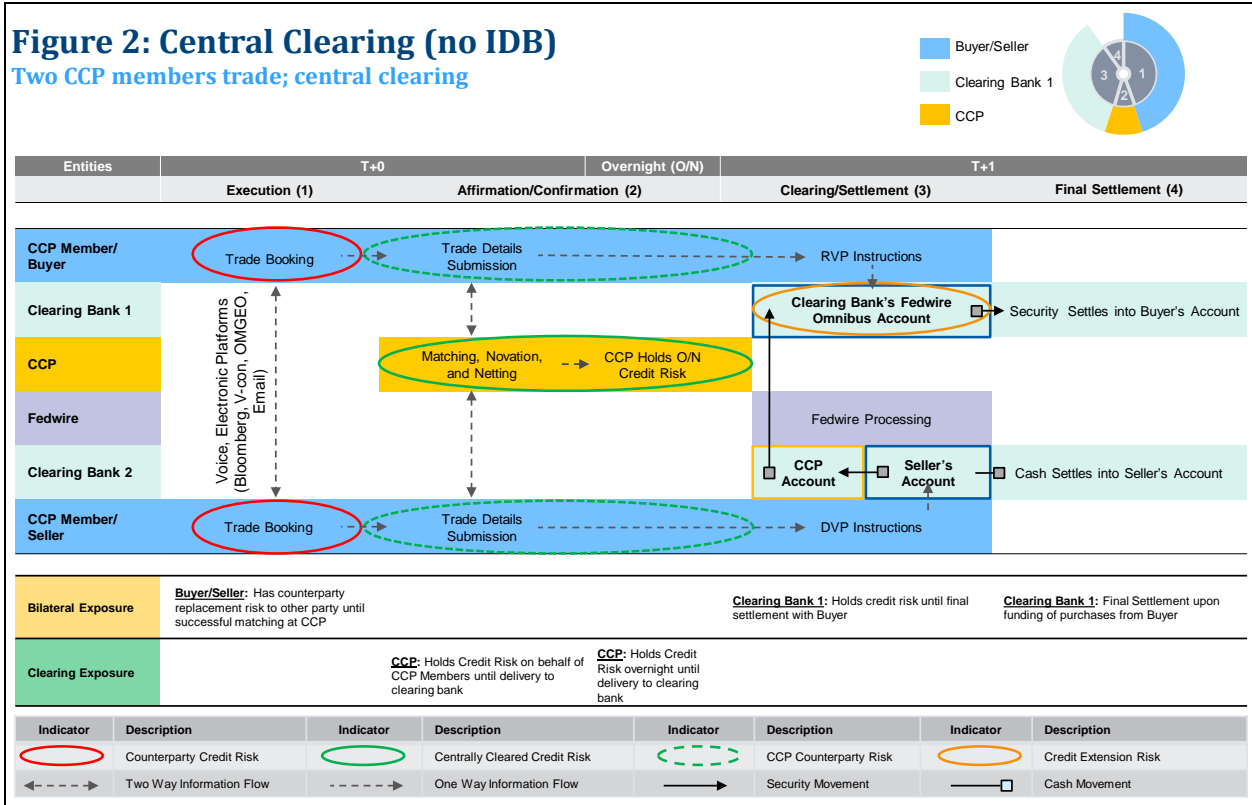
Description

A significant portion of these trades are executed electronically and are booked a number of ways (e.g., using a vendor service provider). After trade confirmation and before the close of business, both parties submit the trade details to the CCP. Once the CCP successfully compares these trade details, it immediately guarantees the trade for settlement purposes and novates it, inserting itself as principal between the two original parties of the trade.

In addition to novation, the CCP calculates each member's net settlement obligation by security at the close of business on T+0 for settlement on T+1 and communicates the resulting settlement obligations to the counterparties. For this example (and consistent with Figure 2), the Seller on T+0 has an end-of-day net position to deliver securities and receive cash on T+1, and the Buyer is obligated to receive securities and deliver cash.

Based on the information from the CCP, the Seller and Buyer send instructions to their settlement agents, Clearing Banks 2 and 1, respectively. The Seller then instructs Clearing Bank 2 to send securities from its securities account to the CCP's securities account. The CCP then instructs Clearing Bank 2 to send the securities from its account to the Buyer's account at Clearing Bank 1. Clearing Bank 2 follows both sets of instructions by first debiting and crediting the cash and securities accounts on its books for the Seller and CCP. Clearing Bank 2 then transfers the securities over the Fedwire Securities Service to Clearing Bank 1's omnibus securities account. Clearing Bank 1 then credits the securities to the Buyer's securities account, which is maintained by Clearing Bank 1.

²⁰ An alternative arrangement is for the Custody Bank to provide intraday credit to the Buyer, with the result that the securities are immediately moved into the Buyer's securities account upon arrival at the Custody Bank.



Credit Risks

Upon trade execution, the two CCP members hold the usual counterparty credit risk to one another. This risk is transformed, however, when the trade details are sent to the CCP and the CCP guarantees the trade, generally within minutes of trade execution. Now, the Buyer and Seller hold centrally cleared credit risk and the CCP has counterparty risk to its members. This is highlighted in Figure 2 with the replacement of the solid red oval outline with the green oval outline for the Buyer, Seller, and CCP as we move from the “execution” part of the trade cycle to “affirmation and confirmation.”

In contrast to Figures 1A and 1B, in this central clearing case, the Buyer and Seller do not hold overnight counterparty credit risk to each other. Rather, they hold overnight centrally cleared credit risk.

With the start of settlement on T+1, credit extension risk arises. In this case, Clearing Bank 1, as settlement agent for the Buyer, holds this risk, because Clearing Bank 1 delivers cash to Clearing Bank 2 upon receipt of the securities. Clearing Bank 1’s credit extension risk is extinguished once the Buyer delivers the necessary funds to Clearing Bank 1.

Other Risks

The service the CCP provides of guaranteeing trades means that counterparty credit risk is transferred to the CCP. The CCP assumes responsibility for settlement, which in practice means that the CCP will source securities to deliver to the Buyer in the event of a default by the Seller. Similarly, the CCP will source cash to deliver to the Seller in case of a default by the Buyer. For instances when a Seller fails to the CCP for operational reasons, and so the expectation is that the fail will be cured shortly (e.g., the fail is not due a

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creditworthiness event on the Seller's part), the CCP may in turn fail to a Buyer. Fails to deliver securities to or receive securities from the CCP are marked to market and netted with new activity each day.

Given these risks, the CCP requires its members to post margin and actively monitors CCP members and their positions. Further, should a case arise wherein the margin is not enough to cover losses from default, the CCP has a loss-sharing procedure that mutualizes loss among its members using the clearing fund.

3. Trades centrally cleared involving an IDB (Figure 3)

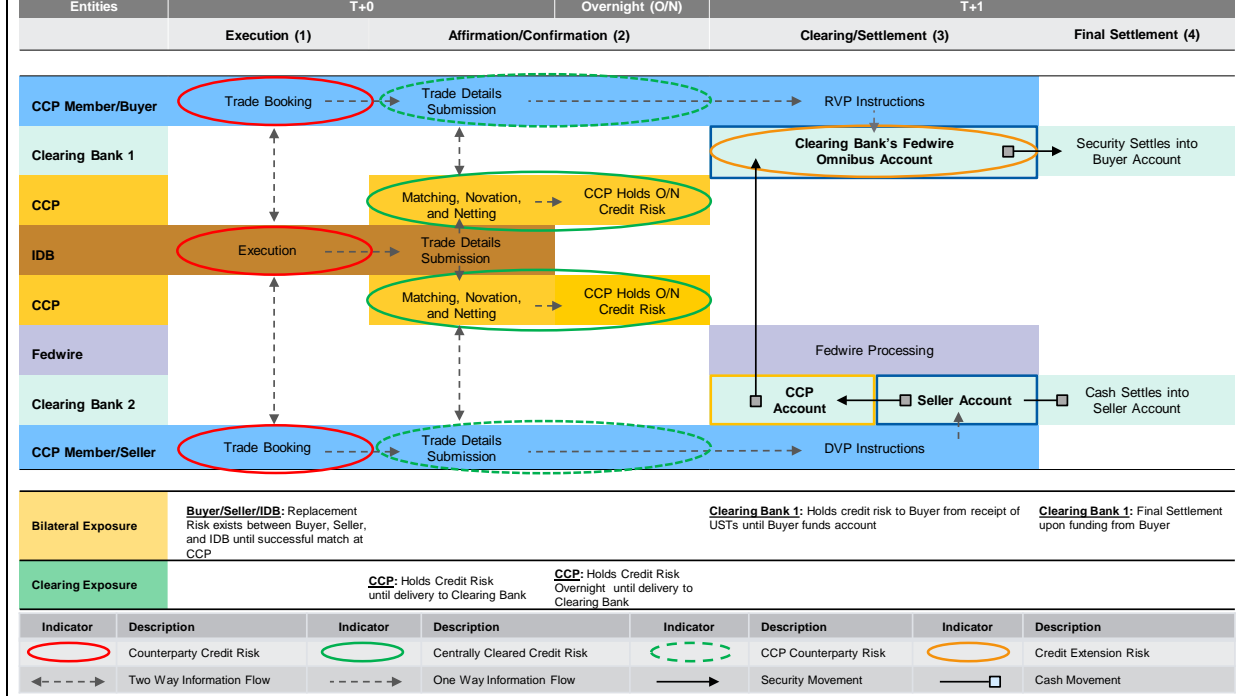
We continue to focus on trades centrally cleared, but now we layer in those involving an IDB (see Figure 3). A typical example of such a trade is one between two larger dealers, both of which are CCP members, executed on an IDB's electronic platform.

Description

These trades begin with market participants executing a trade using an IDB. For each trade execution on the platform, there are two trades: one where the Seller is selling securities against cash to the IDB, and another where the IDB is selling securities against cash to the Buyer.

Because all parties are members of the CCP, both trades are submitted to the CCP for central clearing. After successfully comparing the trade details, the CCP guarantees and novates the two trades. This novation to the CCP results in four new trades: Seller→CCP, CCP→IDB, IDB→CCP, and CCP→Buyer, where the arrow represents the contracted direction of securities movement between the two parties. After multilateral netting, the IDB's net settlement position with respect to the CCP is flat, and the CCP assumes the IDB's settlement obligations to the original parties to the trades. At the close of business on T+0, the CCP calculates a net settlement obligation for each of its members by security, and those net positions are settled on day T+1. The settlement processes on T+1 mirror those described in "trades centrally cleared not involving an IDB" (subsection 2).

Figure 3: Central Clearing (IDB)
Two CCP members trade via IDB; central clearing



Credit Risks

The introduction of the IDB alters the credit risks on T+0, but not on T+1, relative to the case of trades centrally cleared without an IDB (subsection 2). On T+0, the counterparty credit risk now includes the IDB along with the Buyer and Seller because the IDB stands as principal to both the Buyer and the Seller (note the solid red oval outlines in Figure 3). This risk is ordinarily short-lived because all parties typically submit their trade details to the CCP in near real time, usually in automated fashion. Once the CCP successfully compares the trade details, it novates and guarantees settlement of the trades.

With this guarantee, the Buyer, Seller, and CCP now hold centrally cleared credit risk (note the dotted and solid green oval outlines in Figure 3). For this particular case in which the IDB is intermediating between two CCP members, the IDB has a zero net settlement position with the CCP and so is not involved with the settlement process on T+1. With the start of settlement on T+1, credit extension risk arises in the same way as described in Figure 2.

4. Trades bilaterally cleared involving an IDB (Figure 4)

We now focus on trades executed with an IDB and bilaterally cleared (see Figure 4). Typical examples of such a trade are those between two smaller dealers or PTFs that are not CCP members, executed through an IDB.

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Description

As in the previous case of trades centrally cleared with an IDB (subsection 3), market participants execute a trade on an IDB's voice or electronic platform. In the example illustrated in Figure 4, the Seller is a CCP non-member dealer and the Buyer is a PTF. Recognizing that neither the Buyer nor the Seller is a CCP member, these trades are not submitted to the CCP, but rather are bilaterally cleared and settled.

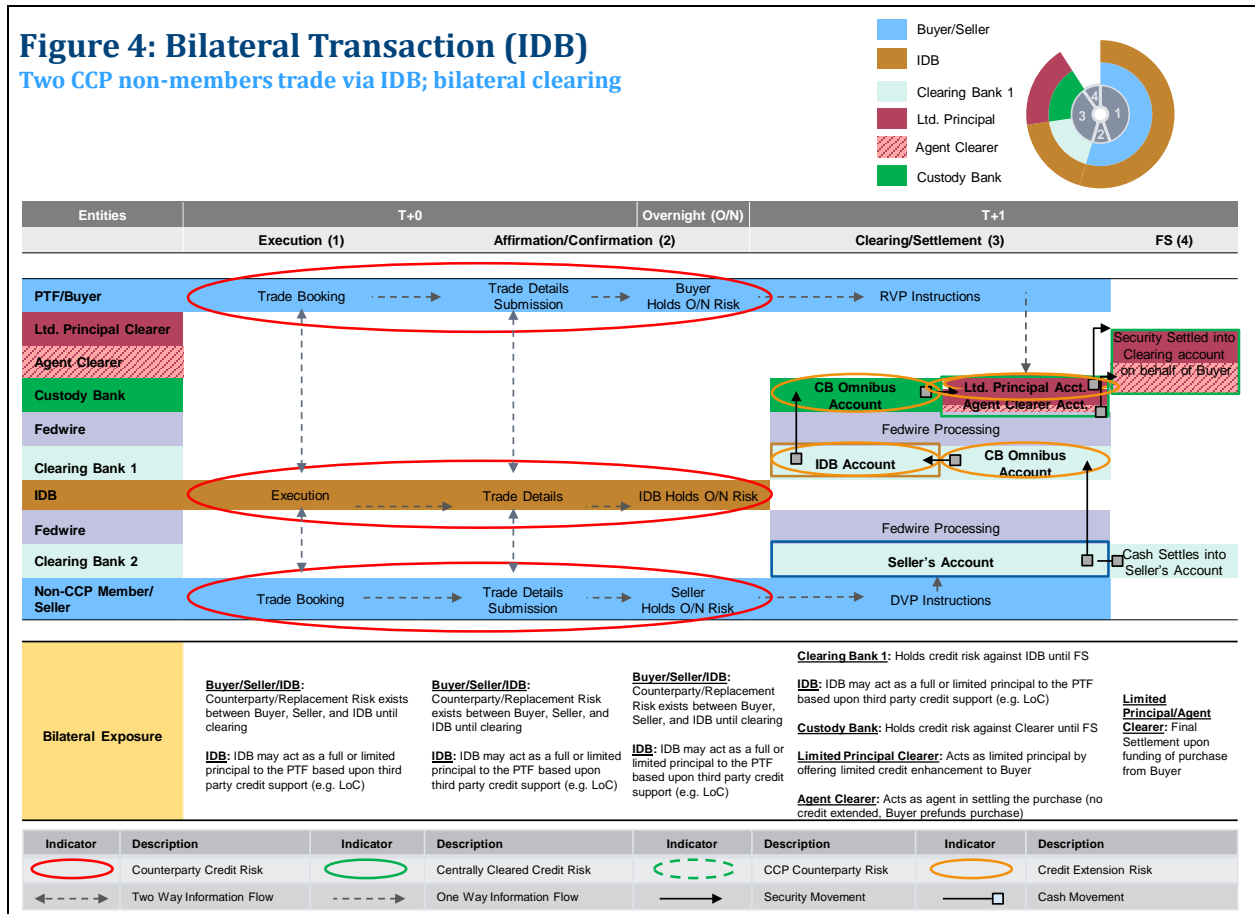
Because the IDB is principal to both the Buyer and the Seller, it is possible for the IDB to clear and settle trades on a net basis with respect to each party. This netting occurs throughout the day on T+0 and the net position is settled on T+1.²¹ For the discussion here, however, we consider the case of a single trade, and not the net position, being settled.

On T+1, both the trade between the Seller and IDB and the trade between the Buyer and the IDB are settled. Following Figure 4, we assume that the Seller uses Clearing Bank 2 as its settlement agent and the IDB uses Clearing Bank 1. We assume that the Buyer uses a clearing agent that, in turn, uses the Custody Bank for settlement. To reflect the range of market practices, in Figure 4 we show the clearing and settlement processes for two cases: one in which the clearing agent acts solely as agent (agent clearer) and one in which the clearing agent acts as a limited principal (limited principal clearer).

To settle its trade with the IDB, the Seller instructs Clearing Bank 2 to send securities against payment from its securities account to the IDB. Clearing Bank 2 does so by transferring the securities from the Seller's securities account over the Fedwire Securities Service to Clearing Bank 1's omnibus securities account. Clearing Bank 1 then credits the securities to the IDB's securities account, which is maintained by Clearing Bank 1.

To settle its trade with the Buyer, the IDB instructs Clearing Bank 1 to transfer securities to the Buyer's securities account at the Custody Bank. To do so, Clearing Bank 1 transfers the securities from the IDB's securities account over the Fedwire Securities Service to the Custody Bank's omnibus account. Upon receiving the securities, Custody Bank credits the securities to the clearing agent's securities account, which is maintained by the Custody Bank. In a final step, the clearing agent credits the securities to the Buyer's securities account, which is maintained by the clearing agent.

²¹ Because netting often reduces the value of the securities needed to be settled, it helps reduce potential fails, decreases counterparty credit risk, and lessens operating costs. As a result, most participants choose to settle on a net basis with the IDB.



Credit Risks

The absence of the CCP changes the credit risk picture relative to the previous centrally cleared transaction with an IDB (subsection 3). In particular, because the IDB stands as principal between the Buyer and the Seller but does not submit the trades for central clearing, the IDB (alongside the Buyer and Seller) holds counterparty credit risk for net unsettled positions throughout T+0 and overnight on the net exposures it has to each party.

Further, the IDB is now involved with settlement, where credit extension risks arise. Clearing Bank 1 faces credit extension risk to the IDB because it delivers cash to Clearing Bank 2 upon receipt of the securities. With the transfer of securities from the IDB's securities account over the Fedwire Securities Service to the Custody Bank, the Clearing Bank's credit risk is extinguished because the Custody Bank delivers cash to Clearing Bank 1 upon receipt of the securities. As in past cases, the Custody Bank holds credit extension risk to the Buyer until it receives the required funds.

For the case of the agent clearer, the Custody Bank holds the credit extension risk until the Buyer delivers the necessary cash (note the agent clearer does not hold any credit extension risk). For the limited principal agent clearer, the clearing agent itself takes on credit extension risk because it delivers cash to the Custody Bank on behalf of the Buyer. The credit extension risk is extinguished when the Buyer funds its obligations.

Other Risks

Because the IDB stands as principal between the two parties and the trades are not centrally cleared, the IDB has a legal obligation to deliver securities to the Buyer even if the Seller fails to deliver or defaults. In practice, an IDB might fail to deliver securities if the Seller fails, generating what is known as a matched fail, where there is an expectation that the fail will be cured shortly (to the extent that it is not caused by a creditworthiness or liquidity event on the Seller's part). If the Seller is impaired or goes into bankruptcy, the IDB is likely to source securities for delivery to the Buyer, rather than carry an open fail to deliver. Similarly, the IDB will likely source cash if the Buyer is impaired or goes into default. Given these obligations, the IDB actively monitors participants and their positions across its various platforms.

5. Trades both bilaterally and centrally cleared, the hybrid case (Figures 5A and 5B)

Our final, and most complex, clearing and settlement case, the hybrid case, considers transactions executed through an IDB in which one participant is a CCP member (or uses an agent who is a CCP member) and the other is not. We present two variations. The first considers a CCP member dealer trading with a PTF, in which the PTF uses an agent or limited principal clearer. The second considers a CCP non-member dealer trading with a PTF, in which the PTF uses a prime broker who acts as principal to the trade and is a CCP member.

a. A CCP member and PTF execute a trade through an IDB (Figure 5A)

Description

As with the previous clearing and settlement cases involving an IDB, these trades begin with the CCP member and CCP non-member matching anonymously through the IDB with the IDB as principal to each (see Figure 5A). In this example, the Seller is the CCP member, and the Buyer (a PTF) is not.

As CCP members, the IDB and Seller submit their trade details to the CCP. The CCP, after matching the trade details, guarantees and novates the trade, becoming principal to both the Seller and the IDB. The trade between the IDB and the Buyer is not submitted to the CCP because the Buyer is not a CCP member, which results in one trade clearing through the CCP and the other clearing bilaterally. In contrast to the previous case of trades cleared centrally with an IDB (subsection 3), in this case the IDB's rights and obligations vis-à-vis the CCP are not offset, and therefore, the IDB is not in a zero net settlement position with respect to the CCP at settlement date. The IDB does have a neutral market risk position overall because its obligation to receive securities from the CCP (and to pay for them) is exactly offset by its obligation to deliver securities to the Buyer (and to be paid for them).

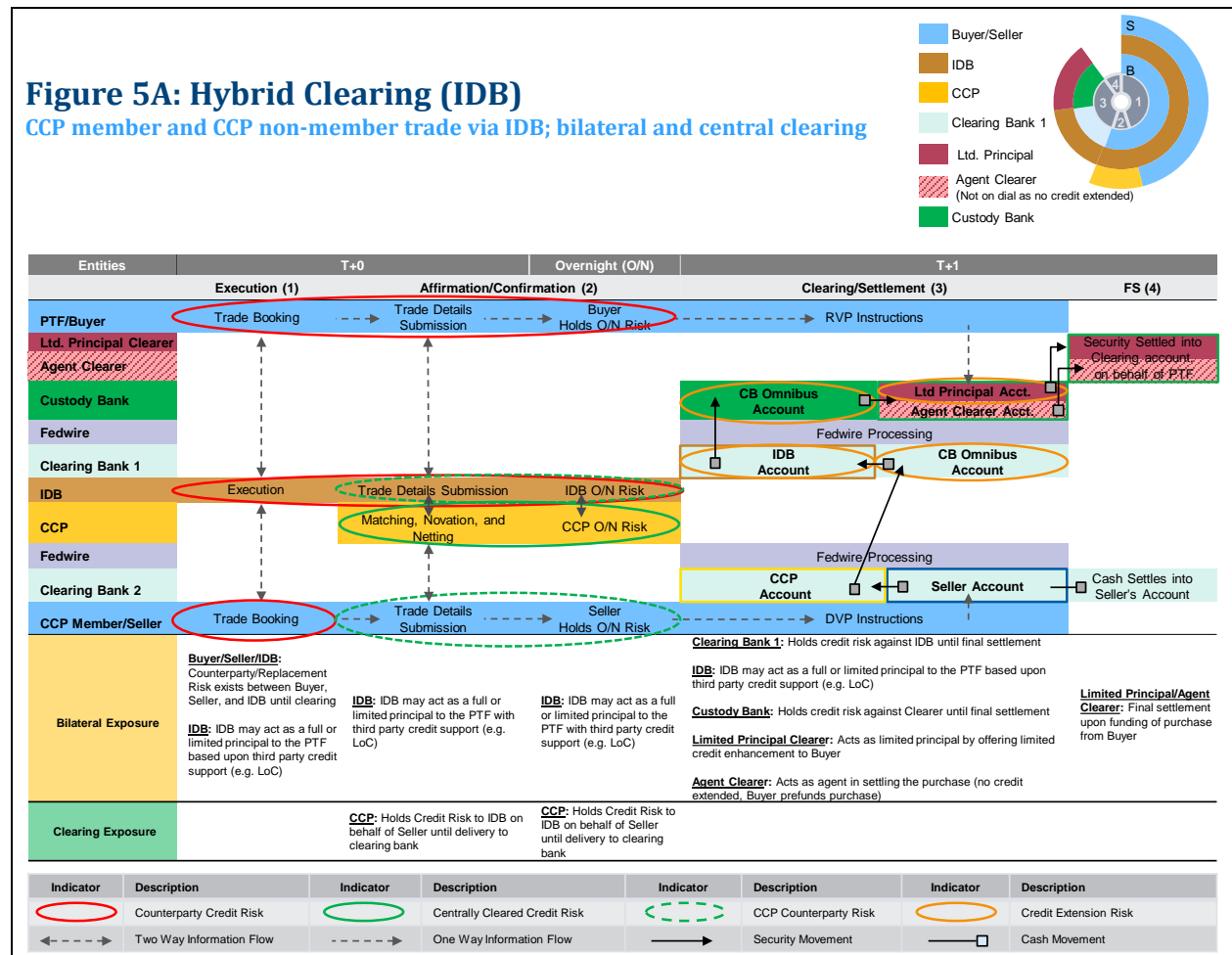
As mentioned previously, the CCP nets each of its member's positions by security at the end of day T+0. In most cases, the IDB also nets a participant's position by security. We assume that the Seller's and Buyer's net positions at the end of day T+0 require the Seller to deliver securities and the Buyer to receive securities on T+1.

On T+1, both the centrally and bilaterally cleared trades are settled. As detailed in Figure 5A, the Seller uses Clearing Bank 2 and the IDB uses Clearing Bank 1 as their settlement agents. The Buyer uses a clearing agent that uses a different Custody Bank for settlement. As in the case of trades bilaterally cleared with an IDB (subsection 3), we show the clearing and settlement processes for two cases: one in which the clearing agent acts solely as agent (Agent Clearer) and one in which it acts as a limited principal clearer (Limited Principal Clearer).

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For the centrally cleared trade, the Seller instructs Clearing Bank 2 to transfer the securities to the CCP against payment. Clearing Bank 2 does so by debiting and crediting the securities and cash accounts on its books for the Seller and the CCP. The CCP then instructs Clearing Bank 2 to transfer the securities to the IDB's securities account. Clearing Bank 2 does this by transferring securities from the CCP's securities account over the Fedwire Securities Service to Clearing Bank 1's omnibus securities account. Clearing Bank 1 then credits the securities to the IDB's securities account maintained by Clearing Bank 1. At this point, the trade between the Seller and IDB, the centrally cleared portion of the overall transaction, is settled.

To settle the bilaterally cleared trade, the IDB instructs Clearing Bank 1 to transfer securities against payment to the Buyer's account. Clearing Bank 1 executes this by transferring securities from the IDB's securities account over the Fedwire Securities Service to the Custody Bank's omnibus securities account. The Custody Bank then credits the securities to the clearing agent's securities account maintained by the Custody Bank. Finally, the clearing agent credits the securities to the Buyer's securities account, maintained by the clearing agent.



Credit Risks

With trade execution through the IDB, counterparty credit risk arises among the Buyer, Seller, and IDB. With the trade between the Seller and IDB being centrally cleared, however, the counterparty credit risk between these two parties transforms into centrally cleared credit risk. This is illustrated in Figure 5A with the

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replacement of the solid red oval outline by the dashed green oval outline for the Seller and the IDB and a solid green oval outline for the CCP. Importantly, the counterparty credit risk between the IDB and Buyer remains because this trade is bilaterally cleared and settled, illustrated in Figure 5A by the solid red oval outlines for the Buyer and IDB through T+0 and overnight. Given the hybrid nature of this case, both the IDB and the CCP hold overnight counterparty credit risk.

With the start of the settlement process on T+1, a number of parties face credit extension risk. For the centrally cleared trade, Clearing Bank 1 assumes credit extension risk to the IDB when it delivers cash to Clearing Bank 2 upon receipt of the securities.

For the bilaterally cleared trade, the Custody Bank takes on credit extension risk to the Buyer because it delivers cash to Clearing Bank 1 upon receipt of the securities. (This delivery of cash extinguishes Clearing Bank 1's credit extension risk to the IDB, which arises from settling the centrally cleared trade.) Finally, as described in Figure 5A, the Custody Bank's credit extension is extinguished once the Buyer's clearing agent delivers the necessary cash or the Buyer funds its obligations.

b. A CCP non-member and a prime broker execute a trade through an IDB (Figure 5B)

Description

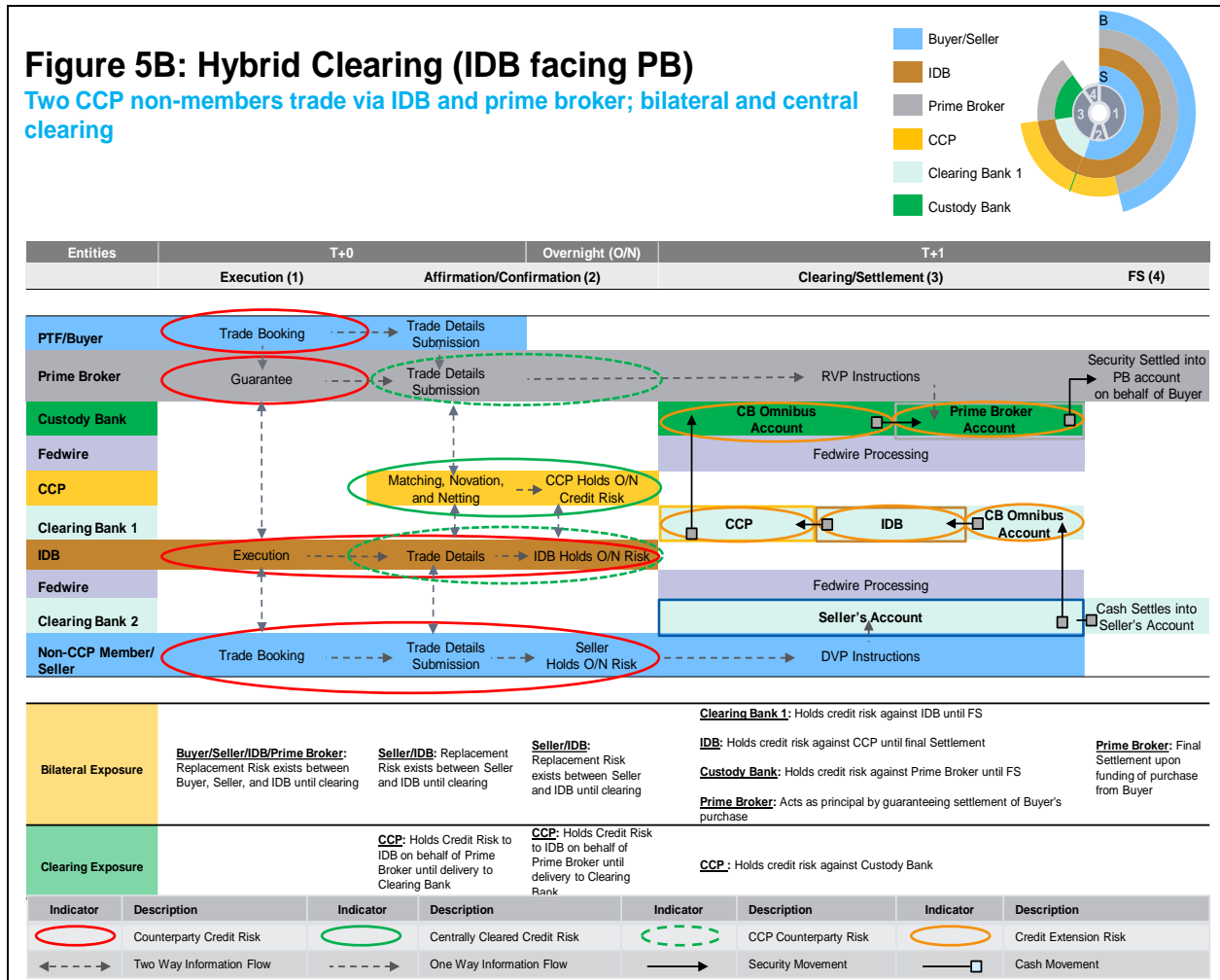
As in the previous variation, this case begins with a trade being executed through an IDB (see Figure 5B). Here, however, the Buyer is a PTF that uses a Prime Broker. The Prime Broker acts as principal for the PTF by guaranteeing the trade and is a CCP member, while the Seller is a CCP non-member.

As CCP members, the IDB and Prime Broker submit their trade details to the CCP. The CCP, after matching the trade details, guarantees and novates the trade, becoming principal to both the Prime Broker and the IDB. The trade between the IDB and the Seller is not submitted to the CCP because the Seller is not a CCP member, which results in a hybrid clearing and settlement case.

On T+1, both the centrally and bilaterally cleared trades are settled. As detailed in Figure 5B, the Seller and IDB use Clearing Banks 2 and 1, respectively, as their settlement agents. The Buyer uses the Prime Broker, which uses a different Custody Bank for settlement.

For the bilaterally cleared trade, the Seller instructs Clearing Bank 2 to transfer securities to the IDB's securities account. Clearing Bank 2 does this, sending the securities from the Seller's securities account over the Fedwire Securities Service to Clearing Bank 1's omnibus securities account. Clearing Bank 1 then credits the securities to the IDB's securities account, maintained at Clearing Bank 1. At this point, the trade between the Seller and IDB, the bilaterally cleared portion of the overall transaction, is settled.

For the centrally cleared trade, the IDB instructs Clearing Bank 1 to transfer the securities to the CCP against payment. Clearing Bank 1 can do so by debiting and crediting securities and cash accounts on its books for the IDB and the CCP. The CCP then instructs Clearing Bank 1 to deliver securities to the Prime Broker. Clearing Bank 1 does this by transferring the securities from the CCP's securities account over the Fedwire Securities Service to the Custody Bank's omnibus account. The Custody Bank then credits the securities to the Prime Broker's securities account maintained by the Custody Bank. Finally, the Prime Broker credits the securities to the Buyer's securities account maintained by the Prime Broker.



Credit Risks

With trade execution through the IDB, the usual counterparty credit risk arises among the Buyer, Prime Broker, Seller, and IDB. With the trade between the Prime Broker and IDB being centrally cleared, the counterparty credit risk between these two parties transforms into centrally cleared credit risk. The counterparty credit risk between the IDB and Seller remains because this trade is bilaterally cleared. Once again, given the hybrid nature of this case, both the IDB and the CCP hold overnight counterparty credit risk.

When settlement begins on T+1, for the bilaterally cleared trade, Clearing Bank 1 faces credit extension risk to the Buyer because it delivers cash to Clearing Bank 2 upon receipt of the securities. For the centrally cleared trade, the CCP, Custody Bank, and Prime Broker all face credit extension risk as the securities are transferred through their securities accounts, on their way to the Buyer's securities account. As in the previous clearing and settlement cases, each party assumes credit extension risk when it advances cash on behalf of the Buyer with the receipt of the securities. Further, this risk is extinguished when the party onward delivers the securities against payment. Credit extension risk arising from this trade is extinguished when the Buyer funds its obligations to the Prime Broker.

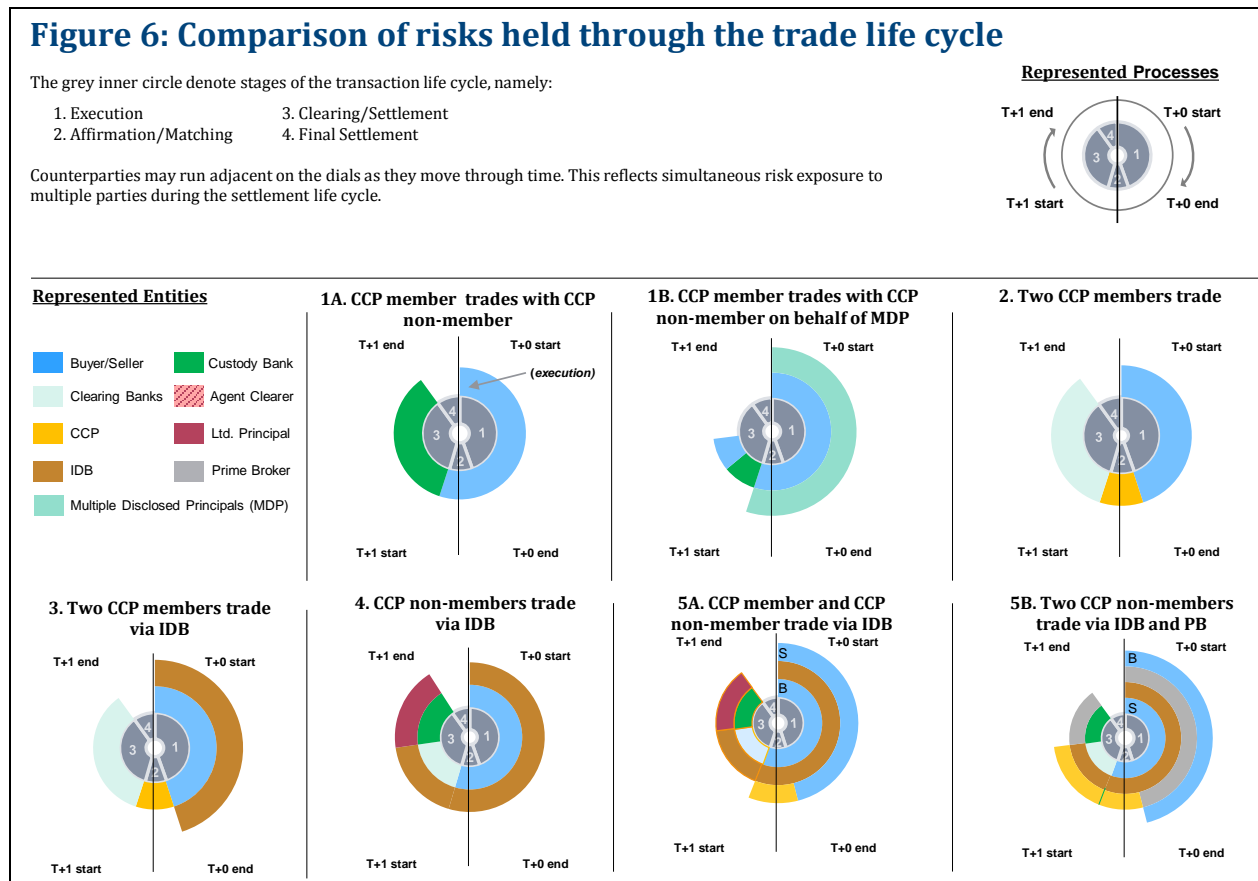
6. Summary of credit risks across the clearing and settlement cases

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In Figure 6 we compare the credit risks across the five cases by lining up the associated pie charts that illustrate the transfer of credit risk across participants. Some of the highlights:

- Execution of a trade on an IDB's platform can result in the IDB holding overnight credit risk when a CCP non-member is involved (see pie charts 4, 5A, and 5B)
- Clearing through the CCP results in the CCP holding overnight credit risk (see pie charts 2, 3, 5A, and 5B).
- During settlement, numerous participants, including clearing and custody banks, take on credit extension risk to facilitate settlement of a trade.

These complex arrangements can lead to fragility, since the impairment of a clearing or custody bank or another entity in the clearance and settlement chain can inhibit the settlement of trades between market participants or have contagion risks to the broader market.



III. RISK AND RESILIENCY ISSUES

This section is intended to facilitate a discussion of clearing and settlement risks and to remind individual participants of the importance of periodically verifying that their own risk mitigation tools are sufficient for their level of market engagement and the importance of considering such risks under both normal and contingent market circumstances. This section is not intended to offer conclusions on whether structural change is necessary, but rather to provide a framework for discussion and reflection from a broad range of market stakeholders.

Market participants may not be applying the same risk management rigor to the clearing and settlement of their U.S. Treasury activities as they do to other aspects of risk taking. This may in part be due to the risk-free nature of the underlying instrument and in part due to the typically short settlement cycle.

The TMPG has learned from its work that many market participants, even those actively involved in the Treasury market, may not have fully investigated nor may fully understand all the risks associated with the clearing and settlement process and the way those risks have been impacted by important changes to the marketplace. Indeed, because Treasury market activities are not perceived to be risky, market participants may not be employing the same counterparty due diligence and risk controls that they would for trading in lower-quality or forward-settling instruments. Moreover, market participants often described certain roles and mechanisms within the marketplace—i.e., blind broker platform, IDB, clearer, clearing agent, settlement agent, central counterparty, prime broker, margin, agent/principal, DVP/RVP—without a uniform or precise understanding of the actual legal, credit, and other risks associated with those roles and mechanisms, both generally and as they change at different points in the life cycle of execution through settlement. This apparent lack of understanding is partially a result of the changes in the market's structure and partially due to a limited focus on the ways in which clearing and settlement occurs.

A lack of visibility prevents market participants from accurately identifying, measuring, and managing their direct and indirect counterparty risk exposure and can affect their decision-making, causing them to bear more risk than they would if they were better informed. As a result, this lack of visibility creates a level of risk that is undesirable across the market ecosystem. Indeed, history has shown that a particular party's Treasury trading strategy can generate sizable and rapid losses, and participants should not assume that because the underlying product is safe, they would not have exposure to unsettled trades with a defaulted counterparty. When a counterpart defaults, unsettled trades would need to be replaced at prevailing market prices.

High-speed trading has become an increasingly prominent feature of the U.S. Treasury market, particularly in the electronic IDB market. High-frequency trading now routinely makes up more than half of the daily trading activity on the leading IDB electronic platforms, and during the extreme volatility that was seen on October 15, 2014, high-frequency firms were more active than traditional dealers. While this change in the mix of participants did not occur overnight, the TMPG found through its work that the clearing and settlement risks associated with this change are not well understood. That said, certain aspects of automation and high-speed activity have the potential to reduce risks by permitting participants to administer and impose risk limits around execution in real time (the SEC's market access rule, for example, requires an alternative trading system to create and implement customer-specific automated pre-order blocks).

Potential risks and resiliency issues identified

Specifically, the TMPG identified the following risk areas:

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Incomplete understanding of IDB platform credit risk

The role of IDB platforms and the associated risks are not well understood by all market participants. IDB platforms for the on-the-run U.S. Treasury securities historically served as an execution venue for dealer participants only, who, along with the IDB itself, were members of the CCP. For over a decade, a number of such platforms also include, as significant customers, non-dealers and other market participants who are not members of the CCP, including PTFs, hedge funds, and foreign affiliates of U.S. banking institutions. On such platforms, the IDB acts as a blind brokerage principal between the ultimate trading parties, such that a transaction involving another CCP member will be submitted to and novated by the CCP shortly upon execution, whereas a transaction involving a CCP non-member will clear bilaterally, typically on a T+1 basis.²² The TMPG found that many market participants do not understand the role of the IDB platform in terms of who their counterparty credit risk was to and the roles of various market participants in settlement and clearing.

The TMPG also found that while such platforms may subject their new customers to an onboarding due diligence process that includes a financial review and the assignment of credit limits, many customers themselves are not subjecting the platforms to a similar review, notwithstanding that participants could have that same risk exposure to the platform. The failure of market participants to fully understand the risks such platforms have, how they manage them, and their financial resources raises the concern that such risks may be underappreciated and not appropriately managed.

Risk management developments may lag in high-speed environment

The speed with which trading occurs in the interdealer market has the potential to exacerbate risks, particularly since many market participants do not have a complete and accurate understanding of the clearing and settlement risks different parties have at different times in the trading and settlement cycle. Errors in an algorithm, or even a cyber event, could cause the risk levels taken on by a high-frequency firm and/or its counterparties to increase rapidly, and the uncertainty around who may bear those risks at what points in the process could heighten the risks in an already challenging situation.

The growth of high-speed trade execution in the front office may not have been matched in all cases by an equally rapid evolution in middle and back office reconciliation, risk mitigation practices, and other aspects of the clearing and settlement process. Risk management procedures, whether those of a trade counterparty or a clearing intermediary, can still involve human intervention, and while such processes worked well in the past, they may not be suitable to today's high-frequency trading environment. For example, while the collection of variation margin is a powerful risk mitigant in many markets, the T+1 nature of Treasury trading has made margining uncommon in bilateral clearing relationships, and the increased levels of high-frequency trading create the potential for unmargined risk to accumulate even more rapidly; indeed, even at the CCP, margin is normally just collected twice a day (but can be collected more frequently based on market conditions). At the same time, increasing automation to middle and back office processes may help reduce trade errors, improve reconciliation, and offer other risk mitigation benefits.

In the high-speed execution environments, traders should understand their own risk management practices and should be keenly aware of their reliance on the risk management practices of various market participants

²² Although the IDB has a matched position, the activity is not riskless for the blind broker or its customers. The blind broker must manage actual and potential liquidity and counterparty risk given the potential for a counterparty to default or fail to settle a transaction on the contractual settlement date. The blind broker's customers should also recognize and manage potential exposures related to a default by the broker.

and verify that they are comfortable with processes and standards related to market access under a range of scenarios.

Increase in share of bilateral clearing and use of bespoke risk management practices

The clearing maps referenced in the previous section illustrate the complex range of informational flows and operational processes involved in clearing and settlement. In total, given changes in market structure, there may be greater system-wide risk due to the increased prevalence of bilateral clearing. While bilateral clearing has been routine in the dealer-to-customer segment of the market, it has become a much more prominent aspect of the interdealer market as PTFs and other CCP non-members have increasingly accounted for the majority of electronic trading volume in on-the-run Treasuries.²³ While individualized bilateral clearing arrangements between parties may be robust and work well in the ordinary course of business, deficiencies, human errors, management failures, or disruptions from external events can cause these systems and processes to deteriorate or fail, resulting in an interruption in the clearance and settlement flow. A cessation in clearing and settlement processes could create unexpected credit exposures.

Furthermore, exposures from trades cleared bilaterally are risk managed under methodologies different than exposures from trades cleared centrally. Exposures may be less mitigated in the bilateral context, and practices are certainly less uniform. For instance, “golden source” pricing and intraday margin are employed at the CCP, whereas bilaterally agreed pricing and a range of risk mitigation techniques (such as collateral exchange and netting) are often employed bilaterally. Moreover, the CCP’s pre-defined loss-sharing arrangements and margin collection practices likely mitigate uncertainty and the risk of a run compared to bilateral arrangements, where available resources to cover losses vary across market participants who have different regulatory, capital, and liquidity requirements.

Operational disruptions may have systemic implications

In a contingency event, such as a cyber-attack, other operational disruption, or the introduction of a flawed algorithm, the indirect risks in the hybrid clearing model, and bilateral settlement more generally, could create unanticipated exposures and might have systemic implications. For example, a cyber-attack or flawed algorithm used by a trading firm could result in significant losses (similar to the Knight Capital event in the equities market in 2012). Such losses would heighten the exposure of the counterparties of the affected participant and other interconnected entities. Operational disruptions that are not related to specific participants, such as failure of the electric grid, could create similar risks for all market participants, whether in the interdealer or dealer-to-customer segment.

These types of contingent events could disrupt clearing and settlement processes in a way that could have a number of spillover effects. As an example, many high-frequency firms have a strategy that entails large gross volumes of intraday activity with materially lower end-of-day net positions; this could create a risk for such firms and those that face them if they do not ensure that netting is legally supported and tracked and monitored throughout the day. In the absence of such controls, sizable exposures at an IDB or at other CCP member firms engaged in bilateral trading could potentially impact the CCP. While the CCP plans for tail events like the default of a member, it has limited visibility into the concentration and gross levels of bilateral trading activity of a member with counterparties that are not CCP members.

²³ This variety of clearing and settlement processes that support central limit order books (CLOBs) in the cash market contrasts with the futures market, where all transactions are subject to mandatory clearing. No such mandate exists for the cash market.

Limited number of key providers play an essential role

In the electronic IDB market, one participant currently accounts for a substantial share of all electronic IDB activity and also serves as the source of the associated market data generated by that activity. There are other competitors, and market shares have fluctuated over the years, sometimes by large amounts. However, as this platform currently serves as a major platform for risk transfer by dealers and high-frequency trading firms, market participants could face risks from the sudden and unexpected unavailability of that platform in the event of a contingency event, both in terms of ability to execute and accessibility to data. Market participants' failure to have in place effective contingency plans for maintaining their ability to transfer risk and access data in the event of such an occurrence could lead to increased risk.

The provision of clearing services has become more concentrated for both large broker-dealers and CCP non-members. The Treasury market previously experienced a challenge generated by problems at a clearing firm in 2011, when Treasury clearing customers of MF Global were unable to access their securities and cash held by MF Global because of a pending investigation. While that was a highly specific scenario, it did generate significant risks for many participants, since they were unable to settle their transactions and needed to find alternative clearing arrangements urgently. Market participants' failure to consider contingency plans for clearing their trades in the event of a disruption to their current clearing arrangements could lead to increased risk.

Insufficient attention to indirect credit risk

The TMPG's work found that market participants may not be sufficiently considering the indirect credit risks to which they are exposed through their counterparties. In particular, the CCP faces direct credit risk to its members and indirect credit risk to non-members from CCP members' bilateral credit exposures if they are not appropriately risk managed. While the CCP can model credit risk associated with activity a member submits to the CCP, it does not have insight into a member's bilateral activity. With the growth in bilateral clearing, the indirect credit risk that the CCP faces has likely also grown. For instance, "hybrid" clearing has become increasingly common in the interdealer market segment, whereby an IDB stands between a CCP member and a non-member to facilitate trade anonymity; one trade clears centrally (between the IDB and the CCP member) and the other related trade settles bilaterally (between the IDB and the CCP non-member). The transmission of credit risk in the process may not be well understood by all participants in the settlement chain, and the availability of resources to mitigate such risk varies across participant types. The risks related to increased bilateral settlement may be heightened under contingent scenarios for some participants that engage in high-frequency algorithmic trading with high gross intraday volumes, or others that have large directional positions intraday. If growing bilateral settlement risk is not priced and managed correctly, it could lead to the default of a CCP member and thereby expose other CCP member firms through their obligations under the CCP's loss-sharing mechanisms to the failing members' counterparts.²⁴

Credit enhancement arrangements may not be fully understood

Fundamental to most clearing relationships is the process by which many clearing entities facilitate the settlement process by temporarily extending credit or liquidity support intraday or overnight to customers in anticipation of settlement. Entities in the settlement chain include prime brokers, custodian banks, clearing banks, IDBs, or a central counterparty, and within some of these categories, bilateral and bespoke arrangements exist. Credit enhancement or liquidity provision arrangements vary widely, from none (such as

²⁴ The CCP is indirectly exposed to bilateral activity of its member firms, and to the extent that such bilateral exposures are concentrated, it would present a different set of challenges under some contingent scenarios compared to normal market operation.

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in a pure agent arrangement) to full indemnification, in which the clearing entity is responsible for the financial obligations of the transacting party through final settlement (such as under CCP guarantee and novation), to something in between these two extremes. It is also notable that even strong credit enhancement agreements might allow the credit enhancer to limit or terminate the agreement with little advance notice, which is most likely to occur in circumstances when that enhancement is most needed. By design, these credit arrangements are uncommitted and an unanticipated change in credit terms or availability of funds could prove problematic in the daily settlement of trades or otherwise adversely impact the settlement process.

Unmatched trades or delays in matching create uncertainty about counterparty exposures

Trades in the secondary U.S. Treasury market are executed using electronic methods or via voice. When trades are executed via non-electronic methods, there may be delays between the time of execution and the time when trades are matched by the counterparties, particularly in the dealer-to-customer segment.²⁵ At times, delays can be significant and trade matching may not even occur on the trade date, i.e., T+0. Some of the factors that allow this situation to persist include manual processes, ineffective communication, and errors in the exchange of essential trade elements necessary to complete matching. Based on an analysis of reporting by primary dealers and certain assumptions, the volume of activity in the dealer-to-customer segment that may be executed by non-electronic methods is likely between 15 to 30 percent.²⁶

Ineffective or non-existent trade matching on the trade date adversely impacts the efficacy of the trade settlement process by allowing trade entry errors and/or fundamental misunderstandings about a trade to remain unrecognized and unaddressed. If trades remain unmatched on settlement day, i.e., T+1, the probability of settlement instructions being rejected, or “DKed,” increases as does the likelihood of settlement fails, creating inefficiencies and added risk in the settlement process (see below, Box 1: Settlement Fails Considerations). The sooner matching occurs, the more accurately can bilateral exposures to counterparties be tracked and managed. While the need for improvement applies more to trades cleared bilaterally than centrally, rapid matching yields the same benefits for both arrangements.

Gross value of trades carries potential liquidity and funding risks

Market participants typically manage and limit bilateral credit exposure on a netted portfolio basis but may not have similar controls on gross volume and specific security delivery obligations. Security settlement obligations for cash Treasury trades are not fungible—they require delivery of a specific security (i.e., collateral funding risk); and large gross volumes carry potential intraday and overnight exposure under contingent circumstances (i.e., liquidity risk). For instance, if a participant is very long one security versus very short another with a modest duration-weighted net position, the closeout costs associated with each security could be larger than looking at the net valuation of the portfolio if a counterpart defaults. Even flat netted positions in a single security within a firm can result in liquidity risk if a counterpart defaults or fails to settle on one side of this netted exposure. In general, gross exposures need to be well understood and managed as they may become critical to a firm’s exposure under contingency scenarios.

Consequence of not recognizing and pricing these risks

Although the risks highlighted above exist under normal market conditions, the test of whether they are well-managed by each entity in the chain will arise during rare tail events, such as a default. Default by firms that

²⁵ It is particularly important for participants to communicate and match trade details in a timely manner for large or “block” trades.

²⁶ The estimate is based on an informal survey of dealers.

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provide services enabling trade execution, clearing, or settlement in the U.S. Treasury cash market could cause contagion because it could jeopardize participants' ability to access the U.S. Treasury market and/or their normal clearing and settlement mechanisms unless suitable services are offered elsewhere. Given its benchmark status, stress in the U.S. Treasury market could spread to other domestic and international capital markets through various transmission channels.

Defaults are rare, but they can lead to capital exposure for the counterparties or entities in the clearance and settlement chain. Counterparty exposure arises from the time span between trade execution and final settlement, the price volatility of the traded securities, and the limited ability of the clearing process to fully mitigate this risk. Default can occur at any node in the clearance and settlement chain, and the impact may vary greatly. In a central clearing arrangement, risk management practices are transparent to the members, and the CCP has established default management processes. In contrast, default management processes of market participants other than CCPs vary and may not be transparent, and the settlement exposure chain is subject to more handoffs. Independent management of bilateral credit risk by each participant in the clearance and settlement chain likely creates uncertainty about the levels of exposure across market participants and may make runs more likely. After establishing that default has occurred, the defaulting firm's positions are closed out by its counterparties. Any loss on the closeout is a loss to the non-defaulting counterparty, and hence a reduction in its capital, unless the loss is secured by credit support, offset by gains elsewhere in the defaulting firm's portfolio, or recovered from the defaulting firm.

Further, default can leave a counterparty with long or short security exposures to cover; so it is incorrect to assume that the risk of clearing and settling U.S. Treasury securities is necessarily low because of the asset's high quality and credit status. Participants should avoid the temptation to conflate asset quality with counterparty creditworthiness. For example, if a large participant in a U.S. Treasury trade defaults, it can leave a counterparty with a short securities position to cover. Moreover, in reaction to a large participant's default, a flight to quality could push U.S. Treasury security prices rapidly higher, escalating replacement costs.²⁷

Box 1: Settlement fails considerations

Failures of U.S. Treasury security trades to settle on the scheduled settlement date are not uncommon. Some settlement fails arise because of routine operational errors and other administrative problems and are not concerning from a systemic perspective. In other circumstances, however, fail levels can become extremely high or persistent. Once a security begins to fail, it can have a cascading effect on downstream counterparties who await delivery to make their counter deliveries to their buyers. Fails for trades that are centrally cleared are margined by the CCP, along with the other trades, providing protection to the CCP from a build-up of related exposures, although such margin collection does not cure the settlement fail and the related cascading effects. For bilaterally cleared trades, there is no systematic margining of settlement fails and the counterparties have to manage that exposure. As noted in Section II, most trading volume is not centrally cleared and as such is not margined in a uniform or transparent manner, thereby creating uncertainty about counterparties' exposure to credit and market risk.*

Moreover, the economic incentive to borrow a security to avoid failing has been too low at times, providing insufficient incentive to market participants to avoid failing.** As fails lengthen in duration, the mark-to-market exposure may increase and firm capital may be redirected from more productive uses.

* Some protection is provided by SEC capital rules, but not all market participants are subject to the same level of SEC regulation, and some active IDB platform users and dealers' customers are unregulated.

** Following extremely high levels of fails during the financial crisis, the TMPG recommended adoption of a fails charge as of May 1, 2009 to increase the incentive for market participants to borrow securities to avoid failing.

²⁷ Some examples of when this occurred include the bond market stress in 1986, in 1994 when Treasury prices moved rapidly and caught a number of market participants off guard and the Lehman failure in 2008.

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APPENDIX: TMPG Clearing and Settlement Working Group Members

<i>TMPG member firms</i>	
BNY Mellon	James Slater John Morik
Citadel	Daniel Dufresne (Co-chair) Mark Wendland
Citigroup	Deirdre Dunn (Co-chair) Christopher Suozzo
Depository Trust & Clearing Corp.	Murray Pozmanter Brian Disken James Hraska
Global Trading Systems	Ryan Sheftel
Goldman Sachs	Christopher Crocitto
JPMorgan Chase	James Glynn Mark Trivedi
Morgan Stanley	Tom Wipf Neil Christianson Edward Corral Paul Taglierini Charles Wang
NEX Group	Stuart Wexler Joseph Buthorn
UBS Americas	Giuseppe Nuti (until May 2018)
<i>Non-member firms</i>	
Cantor	Noel Kimmel (until November 2017)
Nasdaq Fixed Income	Charles Randazzo Christopher Setaro Jonathan Wakefield (until January 2018)
<i>Federal Reserve Bank of New York</i>	
Adam Copeland	Radhika Mithal
Michael Fleming	Carolyn Windover
Frank Keane	Nathaniel Wuerffel

GLOSSARY²⁸

Treasury Cash Market

- **Secondary market transaction** – After the new issuance has settled, all of the subsequent purchases and sales of a Treasury security make up secondary market trading. Some also refer to this as “cash market” trading.
- **High-frequency trading (HFT)** – is a subset of automated trading in which the trading opportunities are identified and acted upon algorithmically and often executed via low-latency technology and with high message rates (orders, modifications, and cancellations). PTFs and broker-dealers both engage in HFT in the Treasury market. (TMPG white paper, *Automated Trading in Treasury Markets*)

Settlement Architecture

- **Settlement system** – An arrangement used to facilitate the settlement of funds or financial instruments. (BIS)
- **TAAPS** – An application for the exclusive use of institutions that provides direct access to U.S. Treasury auctions. This system electronically receives and processes tenders sent into U.S. Treasury auctions. It allows institutions to purchase marketable securities directly and reduce or eliminate intermediary costs, bringing direct bidding to your desktop.
- **Fedwire® Funds Service** – This service is an electronic funds-transfer service that banks, businesses, and government agencies rely on for mission-critical, same-day transactions. (FRS)
- **Fedwire® Securities Service** – This service is an electronic securities service that provides cost-effective issuance, maintenance, transfer, and settlement services for all marketable U.S. Treasury securities, as well as certain securities issued by other federal government agencies, government-sponsored enterprises, and international organizations. (FRS)

“Sell Side”

- **Agent** – Engaged in the business of effecting transactions in securities for the accounts of others.
- **Principal** – Engaged in the business of buying and selling securities for its own account, through a broker or otherwise.
- **Interdealer Broker (IDBs)** – An entity that acts as an intermediary between major wholesale market participants to facilitate trading. In the Treasury market, IDBs act as principal to both sides of a trade executed on their platform so that there is anonymity between platform users.
- **Blind brokerage principal** – Blind brokerage platforms where the broker acts as principal in two offsetting trades between two customers, with the broker having no intention to take market risk or a directional position. The reason for this arrangement is to preserve the anonymity of buyers and sellers from each other.
- **Electronic execution** – The execution of a trade on an electronic platform as opposed to via voice. Execution speeds on electronic trading platforms vary, from sub-second to a number of minutes.
- **Voice execution** – The execution of a trade via telephone.
- **Central limit order books (CLOB)** – A system that matches anonymous limit orders provided by market participants.

Banks and Other Settlement Intermediaries

²⁸ For certain terms the source for the definition is provided in parenthesis. BIS refers to the [Glossary](#) published by the Bank of International Settlements’ Committee on Payments and Market Infrastructures, FRS refers to the [Federal Reserve Financial Services](#), and DTCC refers to the [Depository Trust Clearing Corp.](#)

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- **Clearing bank** – A bank that is regularly engaged in the business of providing clearing, custody, and tri-party services to its customers.
- **Custody bank** – A bank that safeguards and administers securities or other assets for its customers and may provide various other services, including clearing and settlement, cash management, foreign exchange transactions, securities lending, and collateral management.
- **Prime broker** – Provides execution, settlement, custodial, financing, and accounting services to the hedge fund community; may act as a principal or agent in providing these services.
- **Agent lender** – An institution that lends securities on behalf of beneficial owners to securities borrowers (usually dealers). The securities borrower will provide collateral in the form of cash or securities to the agent lender to safeguard the beneficial owner (the agent lender’s customer).
- **Central counterparty, or CCP** – An entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the performance of open contracts. (BIS)
- **FICC** – The Fixed Income Clearing Corporation (FICC) was created in 2003 to reduce costs and give DTCC customers a common approach to fixed-income transaction processing by integrating the Government Securities Clearing Corporation and the Mortgage-Backed Securities Clearing Corporation. (DTCC)
 - **GSD** – The Government Securities Division of the Fixed Income Clearing Corporation (FICC), a subsidiary of the DTCC, provides real-time trade matching, clearing, risk management, and netting for trades in U.S. Government debt issues, including repurchase agreements, or repos. (DTCC)
 - **MBSD** – The Mortgage-Backed Securities Division of the Fixed Income Clearing Corporation, a subsidiary of the DTCC, provides real-time automated and trade matching, trade confirmation, risk management, netting, and electronic pool notification to the mortgage-backed securities market. (DTCC)
 - **Novation to a CCP** – A process through which the original obligation between a buyer and a seller is discharged through the substitution of the CCP as seller to the buyer and buyer to the seller, creating two new contracts.
 - **CCP netting** – Through netting, a central counterparty establishes a single net long or short position for each participant’s daily trading activity in a given security, including all cash buy/sell, repo/reverse and U.S. Treasury auction purchases. The participant’s net position is the difference between all long and all short positions in a given security. (DTCC)

“Buy Side”

- **Buy side/Asset manager** – Financial institutions or firms that buy securities and assets for their own use or for their clients.
- **Institutional investor** – An organization that trades securities in large quantities. Examples include mutual funds, banks, pension funds, hedge funds, and insurance companies.
- **Hedge funds** – Hedge funds are alternative investments using pooled funds that employ numerous different strategies to earn active return, or alpha, for their investors.
- **PTF** – Principal trading firm. A firm that typically trades in the market for its own proprietary interests. PTF firms often employ HFT technologies and strategies, acting as both providers and takers of intraday liquidity.

Settlement Terminology

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- **Gross** – The settlement of transfer instructions or other obligations individually on a transaction-by-transaction basis for full value. (BIS)
- **Net** – A participant's net credit or net debit position in a netting system is the sum of the value of all the transfers it has received up to a particular point in time less the value of all transfers it has sent. (BIS)
- **Delivery versus payment, or DVP** – A securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs. (BIS)
- **Fails to deliver/receive** – A transaction that does not settle on the contractual settlement date is a settlement fail. The party obligated to deliver the security is said to “fail to deliver” and the receiver of the delivery obligation is said to “fail to receive.”
- **Pair off** – A net transaction in securities markets where unsettled and offsetting buy and sell trades are settled in cash, based on the difference in the prices between the offsetting outstanding trades.
- **Round robin** – A series of obligations across numerous counterparties that start and end with the same counterparty. The need for a number of security deliveries can be eliminated and the counterparties settle only the net cash obligations between each participant if all links in the chain can be identified.

Asset Servicing

- **Custody** – The safekeeping and administration of securities or other assets on behalf of others. (BIS)

Risk Metrics

- **Market risk** – Is defined by the magnitude of an asset's price volatility.
- **Liquidity risk** – The risk that a counterparty, whether a participant or other entity, will have insufficient funds to meet its financial obligations as and when expected, although it may be able to do so in the future. (BIS) The counterparty's non-performance may result in a temporary need to borrow money.
- **Collateral funding risk** – The risk that a counterparty, whether a participant or other entity, will have insufficient collateral to meet its financial obligations as and when expected, although it may be able to do so in the future. The counterparty's non-performance may result in a temporary need to borrow a specific security.
- **Credit risk** – The risk that a counterparty, whether a participant or other entity, will be unable to meet fully its financial obligations when due or at any time in the future. (BIS)
- **Operational risk** – The risk that deficiencies in information systems or internal processes, human errors, management failures, or disruptions from external events will result in the reduction, deterioration, or breakdown of services. (BIS)
- **Counterparty risk** – The risk that a counterparty will fail to complete a transfer of funds or securities in accordance with the terms and rules of the system in question.
 - **Closeout** – The act of terminating and liquidating a contract or position. (BIS)

Exposure Management (Margining)

- **Initial margin** – Collateral that is collected to cover potential changes in the value of each participant's position (that is, potential future exposure) over the appropriate closeout period in the event the participant defaults. (BIS)

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- **Variation margin** – Funds that are collected and paid out to reflect current exposures resulting from actual changes in market prices. (BIS)
- **Clearing fund** – A prefunded default arrangement that is composed of assets contributed by a CCP's participants that may be used by the CCP in certain circumstances to cover losses or withstand liquidity pressures resulting from participant defaults. (BIS)
- **Kill switch** – A risk management tool that can be automatically or manually activated to lock a participant out of further use of an exchange or trading platform if the participant breaches risk controls.

Selected Regulatory Considerations

- **Alternative trading system (ATS)** – A trading system that meets the definition of “exchange” under federal securities laws but is not required to register as a national securities exchange if the ATS operates under the exemption provided under Exchange Act Rule 3a1-1(a). To operate under this exemption, an ATS must comply with the requirements set forth in Rules 300-303 of Regulation ATS. For platforms that trade only “government” securities, compliance with ATS regulation is voluntary. (SEC)

The Treasury Market Practices Group (TMPG) is a group of market professionals committed to supporting the integrity and efficiency of the Treasury, agency debt, and agency mortgage-backed securities markets. The TMPG is composed of senior business managers and legal and compliance professionals from a variety of institutions—including securities dealers, banks, buy side firms, market utilities, and others—and is sponsored by the Federal Reserve Bank of New York. Like other Treasury Market Practices Group publications, this document represents the views of the private-sector members. The ex-officio members do not express a position on the matters herein. More information is available at www.newyorkfed.org/tmpg.

