The customer settlement risk externality at U.S. securities CCPs[*]

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Abstract

The architecture of securities clearing and settlement in the United States creates an externality: Investors do not always bear the full cost of settlement risk for their trades and can impose some of this cost on the brokerages where they are customers. When markets are volatile and settlement risk is high, this externality can result in too much or too little trading relative to the efficient level, because investors ignore trading costs but brokerages may refuse to allow investors to trade. Both effects were evident during the volatility in GameStop stock in 2021. Alternative approaches for clearing customer trades that are used in derivatives markets would eliminate the externality. I examine the potential benefits and costs of different approaches for clearing customer securities trades.

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1. Introduction

When people trade stocks in the United States, money and shares do not change hands immediately. Instead, after a trade takes place, the buyer has two business days to deliver the money, and the seller has two business days to deliver the shares. This system allows people to trade more quickly, because they need not pause to gather money and shares before trading.[1] But it creates settlement risk. If two days pass and the buyer defaults on the obligation to deliver the cash, the seller will be stuck holding the shares – a bad result for the seller if the stock price has fallen in the meantime. The buyer may likewise worry that the seller could default on the obligation to deliver shares whose price has risen. A similar risk arises in the market for Treasury securities, though those trades typically settle in one business day. In general, settlement risk in the U.S. securities markets is the risk that a trader's counterparty will default on completing a transaction, requiring the trader to incur a cost to replace the transaction at current market prices.[2] Settlement risk is higher when the risk of default[3] is elevated and when market prices are more volatile, increasing the likely difference between the original transaction price and the price of any replacement trade.

The securities markets have developed methods to mitigate settlement risk, but, importantly, the buyer and seller typically do not directly bear the cost of mitigating the risk associated with each trade. Rather, buyers and sellers are usually customers of brokerage firms, and it is the brokerages that exchange money and securities and pay the cost of managing

[1] Delayed settlement also reduces the size of cash flows needed for securities settlement by allowing the netting of offsetting cash flows for transactions that take place on the same day but not simultaneously. See Depository Trust & Clearing Corp. (2021) and Monahan (2019).

[2] Settlement risk can also include principal risk, which is the risk that a trader will perform their part of the bargain but receive nothing in return, losing the full value of the transaction (Committee on Payments and Market Infrastructure, 2016). Principal risk has largely been eliminated in U.S. securities settlements through the use of delivery-versus-payment systems, which condition the transfer of securities on the transfer of money and vice versa.

[3] Securities market participants distinguish between settlement failures due to operational problems and settlement failures due to defaults. Operational failures are typically addressed by different mechanisms, such as fails charges.

settlement risk. Brokerages can recover the average cost of risk management from their customers by charging account and trading fees or as part of an overall package of services. But if a particular trade has above-average settlement risk, such as when market prices are unusually volatile, the infrastructure and regulations of the U.S. securities markets make it difficult for brokerages to charge that above-average cost to their customers.

In consequence, settlement risk for customer securities trades is subject to an externality: An investor who decides whether to trade does not always bear the full cost of this action and may impose some of the cost on a third party, the brokerage. This paper argues that when markets are volatile and settlement risk is expensive to manage, the externality can result in either too much or too little trading, relative to what would be efficient for the financial system as a whole. Customers may trade more than is efficient during volatile times because they do not pay the full cost of settlement risk management for their trades at these times. However, when customers' trades create higher costs of settlement risk management than a brokerage is prepared to pay, the brokerage's main option in the moment is to stop such trades altogether, which can result in less than the efficient volume of trades. (Before the stress arises, brokerages can also choose the degree to which they prepare for it, such as by maintaining larger capital and liquidity buffers than the regulatory minimums.)

Recent stock market events illustrate the externality. In January 2021, the price of GameStop Corp. stock rose and became extremely volatile amid a "squeeze" on hedge funds that had sold the stock short. Even though the volatility meant that settlement risk was elevated, trading volumes soared as investors sought to capitalize on the rising price (Banerji, Chung, and McCabe, 2021). But brokerages were required to post large amounts of collateral to a clearinghouse to cover the settlement risk on their customers' trades. The sudden calls for cash

challenged some brokerages. To avoid even larger margin calls, these brokerages temporarily stopped their customers from buying GameStop shares.[4] Brokerages applied the restrictions even to customers who already had enough cash in their accounts to pay for the purchase, because under current regulations, a brokerage cannot use its customers' funds to cover margin calls associated with settlement risk on the customers' securities trades.

The externality arises from the design of the clearinghouses, or central counterparties (CCPs), that handle stock and bond trades. CCPs are specialized financial institutions that step into the middle of transactions in a market to provide each participant with a guarantee that the other participants will fulfill the commitments they have made by trading (Cox and Steigerwald, 2017). The CCPs serving the U.S. stock and bond markets[5] guarantee obligations only between their members, typically broker-dealers where ordinary investors hold accounts. If a customer at one brokerage buys a stock from a customer at a second brokerage, money must move from the first brokerage to the second and shares from the second brokerage to the first. The CCP guarantee applies to the movement of money and shares between member brokerages but not to the customers' original trade. As I detail below, this system of guaranteeing brokerages' obligations to each other, but not customers' individual obligations, is what lets customers avoid paying the full cost of settlement risk for some trades. The externality does not arise in systems that guarantee and collect collateral for customers' positions separately from members' positions, such as the systems used at CCPs serving U.S. futures, options, and swaps markets.

[4] See, for example, McCabe (2021) and Robinhood (2021a).

[5] The cash securities CCPs in the United States are the National Securities Clearing Corp. (NSCC), for stocks, corporate and municipal debt, American depositary receipts, exchange-traded funds, and unit investment trusts, and the Fixed Income Clearing Corp. (FICC), for U.S. government securities and mortgage-backed securities. NSCC and FICC are subsidiaries of the Depository Trust & Clearing Corp. (DTCC).

There is a growing literature on the design of CCPs. Berndsen (2021) and Menkveld and Vuillemey (2021) provide thorough reviews of this literature, focusing on why CCPs exist, how they influence market functioning and aggregate risk, and how they are made resilient. As indicated by Berndsen (2021) and exemplified by Chamorro-Courtland (2016), the existing literature on customer positions at CCPs focuses on customers' exposure to the risk of default by fellow customers at the same brokerage. To my knowledge, the literature has not examined the externality between customers and their brokers that I describe here.

The paper proceeds as follows. Section 2 describes the mechanics of central counterparties in the securities and derivatives markets, highlighting the effects of differing treatments of customer trades, as well as a form of hidden leverage that the existing securities system can create. Section 3 examines how these mechanics interact with the unique structure of trading relationships in the Treasury market, where there recently have been calls to consider expansion of central clearing. Section 4 discusses potential benefits and costs of guaranteeing and margining customer trades separately from CCP member trades in U.S. securities markets; the direct cost of margining imposed on typical customer trades appears likely to be small, as buyers would simply need to pay a fraction of the purchase price on the trade date rather than two days later, but there could be a range of broader effects. Section 5 concludes and considers how steps to address the customer settlement risk externality could complement a move to faster securities settlement.

2. Mechanics of CCP guarantees and margins for customer trades

CCPs serve a wide variety of financial markets, including securities as well as derivatives such as commodity and financial futures, interest rate and credit default swaps, and stock

options.[6] CCPs use three main tools to guarantee transactions: *membership requirements, novation*, and *margining*. All three tools are at play in the customer settlement risk externality at securities CCPs.

CCPs transact directly with only a limited number of carefully vetted market participants, known as members. These firms must meet *membership requirements*, such as minimum capital levels, and have the potential responsibility to share in losses if another member defaults and its collateral is insufficient to cover the loss. Most market participants are not CCP members and interact with the CCP indirectly, as customers of its members. Customers do not have loss-sharing obligations to the CCP but typically compensate members for their services.[7] CCPs require members to cover their customers' obligations if the customers default.

Novation is the legal action by which a CCP steps into the middle of contracts, becoming buyer to each seller and seller to each buyer, so that traders can count on the CCP to perform on their contracts. For example, novation replaces a contract requiring Buyer to pay $14 per bushel to Seller for 5,000 bushels of soybeans with one contract requiring Buyer to pay the CCP for soybeans and a separate contract requiring the CCP to pay Seller for soybeans.

Margining is how the CCP covers the risk that one of the traders will default, which could force the CCP to incur a cost to fulfill the contract with the other trader. For example, if Buyer does not pay as agreed, the CCP will have to accept Seller's soybeans and sell them on the open market. If the market price has fallen in the meantime to $13 per bushel, the CCP will lose $5,000. To protect itself, when the contract is novated, the CCP requires the participants to provide collateral that can be used to absorb losses from future price changes. This collateral is

[6] Derivatives CCPs in the United States include, among others, CME Clearing, for commodity and financial futures and interest rate swaps; ICE Clear Credit, for credit default swaps; and the Options Clearing Corp. (OCC), for equity options.

[7] This compensation can include explicit fees or implicit costs such as below-market interest rates on cash balances. Customers may also receive clearing services from a CCP member as part of a larger package of services.

sometimes called initial margin.[8] The CCP returns participants' collateral after they fulfill their contractual obligations. CCPs also periodically mark open positions to market and require participants to make variation margin payments covering any losses, thus preventing a buildup of obligations before settlement.[9]

For CCP members, novation and margining work similarly in cash securities markets and derivatives markets in the United States. (Indeed, the obligation to settle a securities trade is essentially a forward contract, although derivatives contracts typically span much longer time frames than securities settlements.) In both types of markets, members' obligations to other members are novated to the CCP, and members post initial margin to cover the risk of default and pay variation margin to cover interim mark-to-market losses. Also, in both types of markets, if a member trades the same instrument with more than one other member, the CCP nets down the trades and bases the margin requirement on the member's net obligations. For example, if member A buys 500 shares of a stock from member B for $1,000 and sells 400 shares of the same stock to member C for $802, then—as illustrated in Table 1—member A must pay the CCP $198 and receive 100 shares of the stock, and margin requirements are based on the net obligations for $198 and 100 shares.

[8] The CCP can typically call for additional initial margin during the life of a contract if risks change.
[9] At some CCPs, initial and variation margin are effectively combined. Some CCPs pay out variation margin to holders of positions with mark-to-market gains.

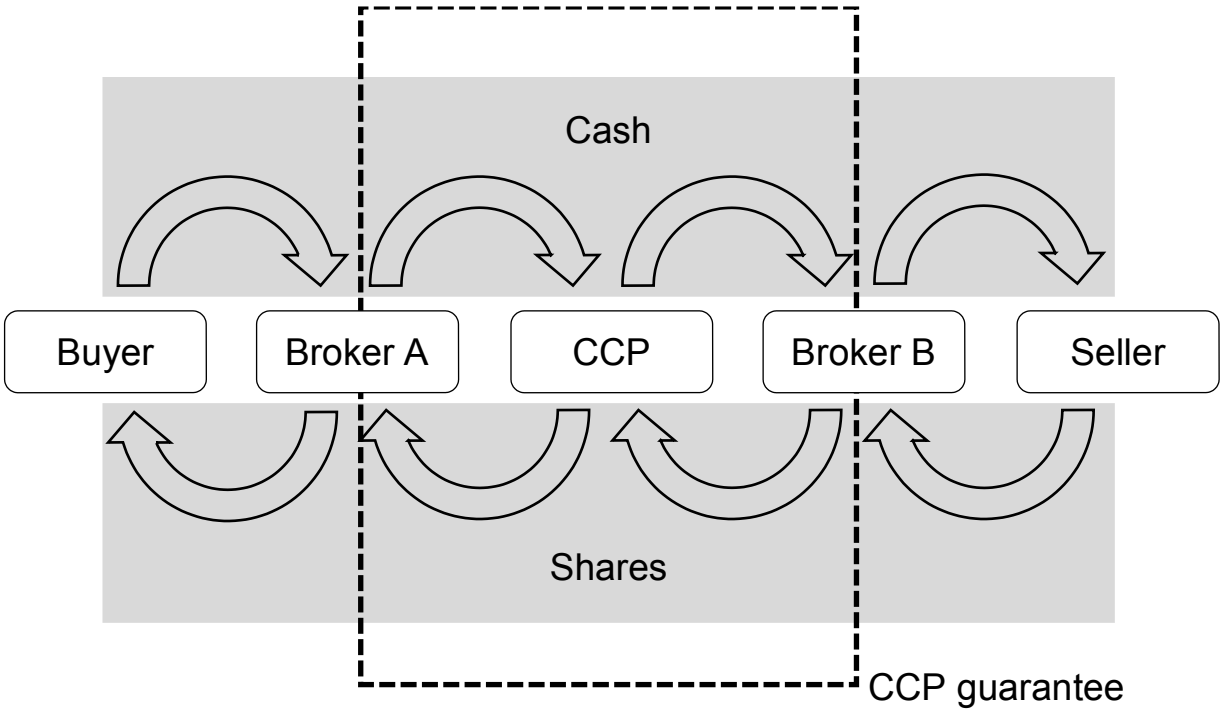
Table 1: Netting of a member's trades.

Buyer	Seller	Shares from Member A	Shares to Member A	Cash from Member A	Cash to Member A
Member A	Member B		500	$1,000	
Member C	Member A	400			$802
Total		*400*	*500*	*$1,000*	*$802*
Net		*0*	*100*	*$198*	*$0*

What differs between securities and derivatives markets is the treatment of trades by members' customers. In the futures and swaps markets in the United States,[10] customers are treated as beneficiaries of trades conducted on their behalf by clearing members, distinct from trades that clearing members conduct for their own accounts. Each customer's contracts are separately novated to the CCP.[11] The Commodity Futures Trading Commission (CFTC), which regulates futures and swaps, also requires CCPs in these markets to collect customer margin on a gross basis.[12] The CCP calculates a separate margin requirement for the portfolio of each member and each customer.[13] A member collects initial and variation margin from each of its customers and remits the margin to the CCP, along with margin for the member's own positions. The CCP holds customers' margin in a separate account from the margin for members' "house" trades,[14] so that customers' margin essentially remains their own property. The only netting is within each customer's account.

[10] Rules differ in some foreign jurisdictions.
[11] Formally, what is novated to a futures CCP when two customers trade is a contract between the customers' respective clearing members, but this contract is for the benefit of the two customers and is kept separate from contracts made by the clearing members themselves. See Steigerwald (2015) and references therein.
[12] The CFTC and the Securities and Exchange Commission jointly adopted the relevant regulations for certain products, such as security futures, that the two agencies jointly regulate.
[13] See 17 CFR §39.13(g)8(i).
[14] See 17 CFR §1.20(g)5(ii).

Figure 1: The movement of cash and shares and the CCP guarantee in stock transactions.



The Securities and Exchange Commission (SEC), which regulates the markets for stocks and bonds, does not require CCPs in these markets to collect customer margin on a gross basis. The CCPs for stocks and bonds collect margin on a net basis and guarantee transactions only between their members. If a customer at one brokerage buys a stock from a customer at a different brokerage, the two customers do not directly exchange money and shares. Rather, they give their money and shares to their brokers, which complete the transaction.[15] In other words, the trade between the two customers gives rise to a transaction between their brokers. The

[15] In practice, investors in the United States typically do not directly own shares of stock. The registered owner of most stock shares and corporate and municipal bonds in the United States is Cede & Co., a corporate nominee of the Depository Trust Co. (DTC), which is a subsidiary of DTCC. DTC's records assign shares to brokerages, and the brokerages' records assign beneficial ownership of the shares to investors. This system of holding shares in "street name" simplifies settlement: The movement of shares consists simply of entries on DTC's and brokerages' records, without any change in registered ownership. See Morris and Goldstein (2010).

transaction between brokers is novated to and guaranteed by the CCP, but not the legs between customers and their brokers, as shown in Figure 1.[16]

An added complication is that securities transactions at a given broker do not all come from the same customer. There are trades from many different customers, and potentially trades that the broker makes for its own account as well. At the CCP serving the equity market, the National Securities Clearing Corp. (NSCC), all of these trades are aggregated to compute a member's net position at the CCP and the member's margin requirement.[17] Suppose that, as illustrated in Table 2, member A not only buys 500 shares of a stock from member B for $1,000 and sells 400 shares of the same stock to member C for $802, but also has one customer who buys 100 shares from a customer of member D for $202 and another customer who sells 200 shares to a customer of member E for $400. On net, these trades add up to 0 shares and $0. Member A has no net position with other members and no net position at the CCP in this stock, and no margin is due from member A. The CCP serving the Treasury market, the Fixed Income Clearing Corp. (FICC), applies a generally similar netting approach, with some differences discussed below in section 3.[18]

[16] See National Securities Clearing Corp. (2021), Rule 11, section 1(b); Fixed Income Clearing Corp. (2021a), Rule 5, section 8; Fixed Income Clearing Corp. (2021b), Rule 5, section 13.
[17] See National Securities Clearing Corp. (2021), Rule 11, section 1(a), and Procedure XV.
[18] See Fixed Income Clearing Corp. (2021a), Rules 1 and 4; Fixed Income Clearing Corp. (2021b), Rules 1 and 4.

Table 2: Netting of a member's trades and its customers' trades.

Buyer	Seller	Shares from A and its clients	Shares to A and its clients	Cash from A and its clients	Cash to A and its clients
Member A	Member B		500	$1,000	
Member C	Member A	400			$802
A's customer	D's customer		100	$202	
E's customer	A's customer	200			$400
Total		*600*	*600*	*$1,202*	*$1,202*
Net		*0*	*0*	*$0*	*$0*

The net approach to both novating trades and collecting margin for securities transactions is what generates the customer settlement risk externality. When novation and margining are both carried out on a net basis, one cannot attribute any specific part of the margin requirement to any specific customer's unsettled trades. Indeed, because margin is a function of all the trades at a brokerage, including the brokerage's trades for its own account, and because only the brokerage's obligations to other brokerages are novated to the CCP, the margin requirement is an obligation solely of the brokerage and not of its customers. Furthermore, the SEC requires brokerages to protect their customers by keeping customers' money in separate accounts from the brokerage's money.[19] A brokerage cannot count margin posted at the CCP for customers' stock and bond purchases and sales as protected customer funds,[20] because the margin is an obligation of the brokerage and not its customers. Thus, even if a brokerage could attribute a margin call for securities trades to a specific customer, it could not use the customer's funds to post margin—the margin must come from the brokerage's own funds, meaning that the brokerage pays the cost of managing settlement risk for the customer's transactions. It would appear difficult to allow brokerages to post customer funds as collateral without also segregating customer positions at the CCP, because using customer funds to collateralize an account

[19] See 17 CFR §1.20(a) and 17 CFR §240.15c3-3(e).
[20] See 17 CFR §240.15c3-3a.

containing both house and customer positions would expose customers to a risk of loss should the brokerage fail.

The derivatives and securities markets' differing methods of novating and margining customer trades create different incentives for customers. In the futures and swaps markets, and to a substantial degree in the equity options market,[21] customers directly bear the cost of risk management for their own positions. A derivatives portfolio that entails greater risks, such as a position in a volatile market, requires the customer to post more initial margin and exposes the customer to a greater risk of variation margin calls. The customer must consider these costs in deciding how to trade. On the other hand, when margin requirements are high, derivatives customers who can meet those requirements can generally continue to trade. They do not need to worry that their clearing member will reject trades just because the member does not want to use its own assets to post the margin for those trades. (The member might still stop a customer from trading if the member feared that the customer would default and leave debts in excess of posted margin, which the member would have to cover.) In the cash securities markets, by contrast, while a brokerage can use fees or other methods to recoup the average cost of posting margin for customer trades, there is generally no additional cost to the customer for a trade that requires unusually high margin or poses an unusually high risk of future variation margin calls. (Just as in derivatives, however, the brokerage might set risk limits for customers that it fears may default.) Cash securities customers who make trades with unusually high settlement risk, such as when

[21] The margining approach for equity options, cleared at the Options Clearing Corp. (OCC), is intermediate between the gross approach in futures and swaps and the net approach in securities, with the ultimate effect that customers bear the costs of risk management even though OCC nets margin requirements across some customers. OCC calculates margin on equity options separately for a member's own trades and for the net value of customer trades at the member (Options Clearing Corp., 2021, Rule 601). In addition, some customers' trades that pose unusually high or low risks can be margined separately from other customers' trades (Options Clearing Corp., 2021, Rule 611; Options Clearing Corp., 2020, Article VI, section 3). Because member and customer trades are segregated, a brokerage can post customer funds at OCC as margin for customer trades (17 CFR §240.15c3-3a). Finally, Federal Reserve regulations require a brokerage to collect margin from each of its customers for their options trades (12 CFR Part 220).

prices are moving rapidly, do not pay the cost of managing this risk. If they are allowed to trade, they may ignore the risk management cost and leave their brokers to absorb it. In consequence, brokers may find it in their best interest to refuse these customer trades even when there is no risk that the customer will default, such as if a customer is buying stock and has sufficient cash on deposit to pay for the purchase.

The use of a brokerage's funds to post margin for customer securities trades can also create a hidden form of leverage in a customer's account during the settlement period. When customers buy shares, they have two business days to pay for the purchase. Some brokerages require customers to have settled funds in their accounts before making a purchase. However, many major brokerages allow typical customers to provide the funds by selling other, previously settled shares in their account on the same day, so that the purchase and sale will settle simultaneously.[22] And some brokerages allow some customers to enter purchase orders without available cash and subsequently transfer money from a bank account in time for settlement. For example, Fidelity allows such transactions for certain customers, depending on their assets and credit history, and by default, Robinhood allows customers to trade with up to $1,000 from bank transfers that have been requested but not completed.[23] If the customer requests a transfer on the same day as the trade, and the money arrives one or two days later, this will meet the settlement deadline and is not considered to involve purchasing on credit under regulations that limit customer leverage. Nevertheless, the brokerage effectively is providing credit to the customer in the amount of the margin due to the CCP because the brokerage bears the settlement risk until the customer's transfer is complete. Similarly, if a customer sells one stock and buys another

[22] See, for example, Fidelity (2021a) and Payne (2019).
[23] See Fidelity (2021b) and Robinhood (2021b).

with the proceeds on the same day, the brokerage effectively is providing credit to the customer in the amount of the margin due to the CCP on the combined sale and purchase position.[24]

Conceivably, instead of refusing securities trades that have elevated settlement risks, a broker could try to pass risk management costs through to customers. In practice, however, this appears to be difficult under current rules. For example, if a broker required its customers to post collateral to the broker to cover settlement risk, customers would be aware of risk management costs, but the broker would still need to use its own funds to post margin to the CCP, and risk management costs would now be paid twice—by the broker and by the customer. Alternatively, the broker could seek to charge higher commissions for trades that create higher risk management costs. However, when a customer pays a commission, the customer permanently loses the amount, whereas collateral is refunded when the trade settles. The cost of posting collateral can be thought of as two days' interest on the amount posted. If the broker charged a fee equal to the full amount of collateral due to the CCP, this would far exceed the actual cost of posting margin. But if the broker collected less than the full amount of margin as a fee, the broker would still need to use its own funds to post the remaining margin.

The different treatment of customer trades at derivatives CCPs suggests a possible strategy for eliminating the customer settlement risk externality in securities markets: Cash securities CCPs could guarantee customer trades and collect collateral for them on a gross rather than net basis. The rest of the paper examines the potential implications of such a change.

[24] Since the prices of the stocks bought and sold may not be perfectly correlated, the margin for the combined position may not net to zero.

3. Net clearing, gross clearing, and customer trades in the Treasury market

The stock market is an "all-to-all" market. Investors can trade shares on an exchange with anyone else who wants to trade, whether that counterparty is a broker-dealer or another investor and no matter where the counterparty holds an account. The market for Treasury securities works differently. Dealers that are members of the CCP (the Fixed Income Clearing Corp., or FICC) trade Treasuries with each other, either directly or through interdealer brokers (IDBs), which are also members of the CCP; trades between two FICC members are always centrally cleared. Other market participants, such as institutional investors and principal trading firms (PTFs), generally trade Treasuries over the counter with dealers where they are customers or through IDBs. IDBs often operate anonymous trading platforms that produce a form of all-to-all trading. However, ordinary investors generally cannot directly access these platforms, and most activity on them is in the most recently issued securities.[25]

A consequence of this complex market structure is that non-member trades typically are not centrally cleared, but if they are centrally cleared, it may be on either a net or gross basis. The typical case is when a dealer trades with its own customer; the dealer usually would not submit this trade for central clearing. Similarly, FICC non-members' positions on IDB platforms are usually cleared bilaterally.[26] However, a FICC non-member can arrange for a member that provides correspondent clearing services to submit the non-member's trades for central clearing, or a member that provides prime brokerage services can submit trades from its prime brokerage clients. In these arrangements, the margin requirement is based on the net trades submitted

[25] Treasury Market Practices Group (2019) provides additional detail on Treasury market structure.

[26] As IDBs and some participants on their platforms are CCP members while other participants on these platforms are not CCP members, transactions on IDBs result in a mixture of central and bilateral clearing. Each trade on an IDB is split into a leg between the buyer and the IDB, and a leg between the IDB and the seller. Legs where the buyer or seller is a FICC member are centrally cleared, while legs where the buyer or seller is not a member are generally not centrally cleared. A trade between two non-members through an IDB results in two transactions with the IDB and no net obligation of the IDB to the CCP or other CCP members.

(Depository Trust & Clearing Corp., 2021b). Finally, under FICC's sponsored membership service, a non-member can become a "sponsored" member and have its trades novated and margined separately; another member, the sponsor, guarantees the sponsored member's obligations to FICC. Although sponsored membership creates a situation akin to gross customer novation and margining, it is used mainly for repurchase agreements, not for cash purchases and sales.

Duffie (2020), Fleming and Keane (2021), Liang and Parkinson (2020), and U.S. Department of the Treasury et al. (2021) suggest that centrally clearing more Treasury trades could have risk management and netting benefits and call for further study of this possibility. Given that the trades not currently centrally cleared involve customers, the analysis in this paper implies that the consequences of expanded clearing would depend in part on whether a gross or net approach is used for customer clearing. As long as clearing is on a net basis, submitting a typical dealer-to-customer cash trade for clearing would not change the dealer's net position at the CCP and would not have any netting benefit. Extending central clearing to typical dealer-to-customer cash trades would appear to require guaranteeing and margining customer trades separately from member trades. Alternatively, more non-member trades could be centrally cleared if the market developed an all-to-all trading structure similar to that seen in equities: A trade between two investors that are customers of different dealers would create an obligation between dealers that would be centrally cleared, as can already happen with FICC's prime brokerage and correspondent clearing services. However, if all-to-all trading were to expand but the CCP retained a net approach to customer clearing and customer funds remained ineligible to be posted as collateral, the same settlement risk externality would arise that is present in the

equity market. As discussed by Chaffee and Schulhofer-Wohl (2021), both broader central clearing and all-to-all trading in the Treasury market would also have many other implications.

4. Potential benefits and costs of addressing the customer settlement risk externality

The customer settlement risk would be eliminated if securities CCPs separated customer from member positions and regulations were changed to allow members to post customer funds as collateral for customer positions. Customers would then effectively be required to make down payments on the day that they entered trades. For example, a buyer might pay a fraction of the purchase price on the trade date, and the rest at settlement. Because the margin payment would count toward the purchase, the cost to the customer of posting margin would not be the full amount of margin posted, but just the time value of paying that money on the trade date rather than the settlement date—in typical interest rate environments, a small cost.

Many of the potential benefits of these changes would flow from the incentive for customers to act in ways that minimized the cost of posting margin. Simultaneously, many of the costs would come from requiring more margin than in a net system. I outline the benefits and costs here at a conceptual level. Quantifying them, determining their incidence on different market participants, and assessing the relative magnitude of benefits and costs would require analyzing data, such as on customer-level settlement exposures at each brokerage, that are not publicly available to my knowledge.

Customer positions could be separated from member positions in two ways: by margining customer securities trades on a gross basis, similar to procedures for futures and swaps, or by establishing separate margin accounts for a member's position and for the net position of its customers and then having members collect margin from each customer, similar to procedures in

equity options. For the most part, these two approaches would have similar effects, so this discussion considers them together and uses the term "gross margining" as shorthand for both of them. However, where relevant, I note differences in the potential effects of the two approaches.

Putting a price on settlement risk: The disincentive to trade at times when settlement risks are especially high could limit excessive risk taking and reduce the aggregate settlement risk in the financial system at volatile times, though at the potential cost, discussed in the next paragraph, of reducing market liquidity in some instances. Simultaneously, there would be less reason for brokerages to shut down trading if they could not or did not want to pay the cost of margin for customer trades.

Costs of participation and market liquidity: Because gross customer margining requires more margin to be posted, in the aggregate, than net margining, the gross system effectively raises the cost of participating in the market. This higher cost might be viewed as detrimental to customers in and of itself. In addition, increased trading costs could make markets less liquid. However, paying a fraction of the purchase price on the trade date rather than two days later might not be a large cost. Margining the net customer position at a brokerage, rather than each customer's position individually, would further reduce this cost.

Efficiency of use of liquid assets: Net margining uses liquid assets in the financial system more efficiently than gross margining because, under net margining, many trades do not have to be margined at all. Gross customer margining would require cash securities CCPs to collect margin on all trades, not just net trades at each member. To precisely estimate how much additional margin would be required, one would need customer-level data on all trades in the relevant markets. The amount is likely to be substantial. NSCC, for example, reports that netting reduces transaction volumes by 98% (Depository Trust & Clearing Corp., 2021a). If the margin

savings from netting are similar to the transaction volume savings, then gross margining at NSCC could require a 50-fold increase in required margin from the $11.5 billion that NSCC reported as of June 30, 2021, the most recent available (Depository Trust & Clearing Corp., 2021c). These resources would have to be posted at the CCP, often in the form of cash or other high-quality liquid assets, rather than held elsewhere in the financial system and used for other purposes. Margining the net customer position at a brokerage could significantly reduce this cost, though under the net margining procedures used in equity options, each customer would still need to post margin to the brokerage.

Novating more trades to the CCP could also require the CCP to have more liquid resources such as credit lines available to help manage member defaults. Estimating these needs would require detailed transaction data.

However, novating and margining customer trades on a gross basis would not require settlement of these trades to take place on a gross basis. The CCP could still compute the net amount of cash and securities to be moved between member firms and settle all transactions at once by moving these net amounts. Thus, the liquidity savings from net settlement could be preserved even in a system of guaranteeing and margining gross customer trades.

Reducing hidden leverage: The hidden customer leverage from brokerages using their own funds to post margin on customer trades could lead to unexpected losses in a volatile market. If customer trades were novated and margined on a gross basis, customers would have to post margin on the trade date, eliminating the hidden leverage.

Competitive effects: Posting margin for customer trades may be less costly for clearing members that face lower costs of capital or liquidity. In addition, for a given total amount of customer trading, a clearing member's margin obligation is lower when its customers make

offsetting trades than when its customers make similar trades. Large clearing members with diversified customer bases thus may face lower costs in the current system. A transition to gross customer margining could reduce this advantage and might thereby increase competition among brokerages, which could benefit customers. However, such competitive changes might also weaken the clearing ecosystem if CCPs became more reliant on smaller, less creditworthy members or ones whose customers have a greater tendency toward herding. CCPs could strengthen their membership requirements to address this risk.

Transition and operational costs: CCPs and their members would need information systems capable of calculating each customer's margin requirement, collecting the requisite funds from each customer on the trade date and returning them upon settlement, and keeping track of customer ownership of funds posted to the CCP as margin. The implementation and operation of such systems could be costly, especially given the large number of retail investors in the equity market. Such systems already exist for exchange-traded futures, but fewer investors trade futures than equities. In 2011, when the CFTC adopted its current margin rules for futures, it decided that the benefits of a transition to gross margining outweighed the operational costs for futures CCPs that were then allowing some netting across customers.[27]

5. Conclusion

The current system for handling customer positions at securities CCPs creates an externality: The traders who decide whether to create settlement risk do not always pay the full cost of managing the risk. This paper examines the sources of the externality and the potential costs and benefits of addressing it.

[27] See Commodity Futures Trading Commission (2011), pages 69374-69376.

Solutions to the customer settlement risk externality could complement faster, but not instantaneous, securities settlement. Settling equity trades in one business day rather than two, as the U.S. financial services industry proposes to do by 2024 (Securities Industry and Financial Markets Association et al., 2021), would reduce settlement risk because there would be less time for prices to move between trade and settlement. But some settlement risk would remain, and under the current architecture, the externality would remain as well. Even with T+1 settlement, guaranteeing and margining customer trades on a gross basis would have the benefit of eliminating the externality and the associated risks. At the same time, because a shorter settlement period reduces settlement risk, less collateral would be required, and the liquidity cost of gross margining would be reduced.

If the market moved to real-time settlement of securities trades, settlement risk and the associated externality would be eliminated. But real-time settlement would entail many other risks and costs, such as the inability to net offsetting flows of cash and securities as well as difficulties arranging financing. Monahan (2019) and Depository Trust & Clearing Corp. (2021) provide detailed discussions of the costs and benefits of real-time settlement, which is beyond the scope of this paper.

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