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The Treasury Auction Process: Objectives, Structure, and Recent Adaptations

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Treasury auctions are designed to minimize the cost of financing the national debt by promoting broad, competitive bidding and liquid secondary market trading. A review of the auction process—from the announcement of a new issue to the delivery of securities—reveals how these objectives have been met. Also highlighted are changes in the auction process that stem from recent advances in information-processing technologies and risk management techniques.

The stated goal of Treasury debt management is to meet the financing needs of the federal government at the lowest cost over time.[1] Since Treasury auctions provide the principal means of financing the federal deficit and refinancing maturing debt, Treasury officials have sought to structure the auction process to minimize the government's costs, both directly by promoting broad, competitive bidding and indirectly by promoting liquid post-auction secondary markets for new issues.[2]

This edition of *Current Issues* offers a concise explanation of the modern Treasury auction process. We follow the process from the announcement of a new issue to the delivery of the new securities, looking at key aspects of the process such as the form of bidding and restrictions on tenders and awards.

We also consider why, and how, the auction process has changed in recent decades. Treasury bills were first auctioned in 1929; coupon-bearing securities, in 1970. Given this lengthy history, an observer might reasonably hypothesize that an efficiently administered auction process would have long since converged to some optimal form. Surprisingly, however, the process continues to evolve. Understanding the nature of, and reasons for, this persistent change is important for both public officials and private market participants. We suggest that it reflects adaptations to new developments in the financial services industry, such as futures trading and net settlement, and advances in communications and information-processing technologies.

Treasury Securities

The federal government presently auctions three types of marketable securities: bills, notes, and Treasury inflation-protected securities (TIPS). Bills are single-payment securities that are sold at a discount and pay a specified face amount at maturity. Notes are interest-bearing obligations that pay interest semiannually both prior to and at maturity and repay principal at maturity. TIPS are interest-bearing

securities whose payments are indexed to the monthly nonseasonally adjusted *U.S. City Average All Items Consumer Price Index for All Urban Consumers,* published by the U.S. Department of Labor's Bureau of Labor Statistics.

The Treasury auctions an astonishing quantity of securities. In calendar year 2003, it auctioned $3.42 trillion of securities, including $2.78 trillion face amount of bills, $616 billion principal amount of notes, and $26 billion indexed principal amount of TIPS, in a total of 202 auctions. Most of the auction proceeds went to redeem maturing issues ($2.83 trillion) or to bridge short-term gaps between expenditures and receipts ($229 billion), but $363 billion was new money.

Marketable Treasury securities come in two forms: entries in book-entry accounts at Federal Reserve Banks and entries in book-entry accounts in *TreasuryDirect*. The Federal Reserve book-entry securities system is operated by the Federal Reserve District Banks in their own capacity and as fiscal agents for the United States. The system maintains the primary records of bill, note, and TIPS holdings of depository institutions and certain other entities. (Depository institutions hold book-entry securities on behalf of their customers as well as for their own account.) *TreasuryDirect* is a proprietary Treasury book-entry system introduced in 1986 to accommodate retail investors that buy securities at original issue and typically hold them to maturity.

The Auction Announcement and When-Issued Trading

The Treasury auction process begins with an announcement by the Treasury that it will soon auction a specified quantity of a particular security. For example, at 11 a.m. on Monday, August 23, 2004, the Treasury announced that it would auction $24 billion of new two-year notes on August 25 for delivery and payment on Tuesday, August 31. The announcement did not specify a coupon rate for the notes. As explained below, the auction would determine the coupon rate as well as the issue price of the notes. Note, however, that the Treasury sometimes "reopens" a security by selling additional amounts of an outstanding issue. In the case of a note or TIPS reopening, the coupon rate on the new securities is identical to that on the outstanding securities and is not determined in the auction process.

Immediately following the announcement of a forthcoming auction, dealers and other market participants begin to trade the new security on a when-issued basis. Secondary market transactions in outstanding Treasury securities typically settle on the business day after the trade date, when sellers deliver securities to buyers and receive payment. When-issued transactions, by contrast, settle on the issue date of the new security (which can be as much as a week or more after a trade is negotiated) because the security is not available for delivery at any earlier date.

When-issued trading enables market participants to contract for the purchase and sale of a new security before the security has been auctioned. This type of trading is important because public dissemination of the yield at which a new note is trading, or the discount rate at which a new bill is trading, provides valuable information about the market's appraisal of the prospective value of the security. The *Joint Report on the Government Securities Market* prepared by the U.S. Department of the Treasury, the Securities and Exchange Commission, and the Board of Governors of the Federal Reserve System pointed out that when-issued trading "reduces uncertainties surrounding Treasury auctions by serving as a price discovery mechanism. Potential . . . bidders look to when-issued trading levels as a market gauge of demand in determining how to bid at an auction" (1992, p. A-6). When-issued trading thus contributes to the Treasury's goal of promoting competitive auctions by enhancing market transparency.

A particularly important part of pre-auction when-issued trading involves purchases by private investors from dealers.[3] The purchases have two significant distributional effects. First, they facilitate distribution of a new issue ahead of its auction. The *Joint Report* noted that when-issued trading "benefits the Treasury by . . . stretching out the actual distribution period for each issue, . . . allowing the market more time to absorb large issues without disruption" (p. 9). Second, when-issued sales by dealers to private investors leave the dealers with a need to make offsetting purchases in the auction, concentrating bidding interest in the hands of market participants that have a substantial financial incentive to identify correctly the price that balances demand with supply.

Auction Structure

An auction market participant can submit either (a) one or more competitive bids, each specifying a minimum yield at which the participant is prepared to buy a specified quantity of notes (or a minimum discount rate at which it is prepared to buy a specified quantity of bills), or (b) a single noncompetitive bid, specifying the quantity of securities that it is prepared to buy at whatever price is paid by successful competitive bidders.[4] Noncompetitive bids are limited to $5 million and are usually due before 12:00 noon (ET) on the day of an auction.[5] Competitive bidding usually closes at 1:00 p.m.

The Treasury conducts note auctions in a "single-price" format. After the close of bidding, it subtracts the noncompetitive

bids from the total quantity of securities offered and then accepts competitive bids, in order of increasing yield, until it has exhausted the offering. The highest accepted yield is called the "stop." Bids specifying yields below the stop are filled in full, bids above the stop are rejected, and bids at the stop are filled on a pro rata basis.[6] All auction awards are made at a single price, computed from the yield at which the auction stopped. If the note does not reopen an outstanding note, the coupon rate on the note is set at the highest level, in increments of 1/8 percent, that does not result in a price greater than 100 percent of principal (see the example in Box 1). Bill and TIPS auctions are similar, except that competitive bids for bills are specified in terms of discount rates rather than yields and there is no coupon rate on a bill.

The 1990s witnessed several important changes in auction structure, including a change from a multiple-price format (in which successful competitive bidders paid prices computed from their own bid yields rather than from the stop), a significant elaboration of restrictions on auction awards, and an increase in the arithmetic precision with which bids are expressed. Each of the changes was motivated by the Treasury's interest in promoting competitive bidding and liquid secondary markets.

Box 1
The August 2004 Auction of Two-Year Notes

On Wednesday, August 25, 2004, the Treasury auctioned $24 billion of two-year notes that would be issued on August 31 and that would mature on August 31, 2006. It received noncompetitive bids for $994,798,000 of the notes, and competitive bids for $51,580,904,000.

After allocating enough notes to satisfy the noncompetitive bids, the Treasury had $23,005,202,000 notes remaining to be sold to competitive bidders. Accepting bids in order of increasing yield, the Treasury stopped at a yield of 2.494 percent. All bids specifying yields below 2.494 percent were accepted in full; a bid at 2.494 percent was allocated 32.34 percent of the amount specified. (The allocation at the stop is the ratio of (a) the quantity of securities that remain to be sold at the stop to (b) the quantity bid at the stop, rounded up to two digits to the right of the decimal point.) At that allocation, the Treasury actually sold a total of $23,005,209,000 notes to competitive bidders.

The highest coupon rate that did not produce a price greater than 100 percent of principal was 2 3/8 percent. At that coupon rate, the price of the notes, rounded to three digits to the right of the decimal point, was 99.769 percent of principal.[a]

[a] In September 2004, the Treasury began to compute invoice prices to six digits of precision to the right of the decimal point. See the Treasury's "August 2004 Quarterly Refunding Statement," August 4, 2004, available at <http://www.treas.gov/press/releases/js1825.htm>.

Auction format. The best-known feature of a Treasury auction—the single-price format—was introduced in 1992. The change from the earlier multiple-price format was part of a major overhaul of the auction process that followed several violations of auction rules in 1991.

The Treasury first adopted the multiple-price format when it initiated bill auctions in 1929 and it continued to use that format when it introduced auctions of coupon-bearing securities in the early 1970s. However, when the auction process came under scrutiny in 1991, public officials became interested in alternative formats that might appeal to more investors and that might lead to lower financing costs. Several academics had suggested earlier that single-price auctions might reduce financing costs (see Carson [1959], Friedman [1960, 1963], and Smith [1966]). In a single-price auction, a participant can bid its actual reservation yield for a new security, that is, the minimum yield at which it is willing to buy the security. The bidder certainly has no reason to bid a lower yield, but if the auction stops at a higher yield it will get the full benefit of buying at that higher yield. In contrast, the multiple-price format encourages a participant to bid higher than its reservation yield in hopes of getting the security on more favorable terms.

Whether the Treasury would be better off selling securities in a single-price format or a multiple-price format was a matter that could only be resolved by empirical analysis.[7] In September 1992, the Treasury announced that, in an experiment, it would begin to auction two-year notes and five-year notes in the single-price format. It subsequently produced two empirical studies analyzing the results of the experiment (see Box 2). Although the evidence was not unambiguous, the Treasury decided in October 1998 that it justified extending the single-price format to all auction offerings.

Restrictions on auction awards to competitive bidders. In the interest of fostering a liquid post-auction secondary market for a new issue, the Treasury limits the maximum auction award to a single bidder to 35 percent of the offering, less the bidder's "reportable net long position" in the security. A bidder's net long position is the sum, as of one-half hour before the close of bidding, of

(a) when-issued, forward, and futures contracts for the security and for principal STRIPS to be derived from the security (STRIPS—an acronym for Separate Trading of Registered Interest and Principal of Securities—are single-payment claims for the respective interest and principal payments from a coupon-bearing security) and

Box 2
Treasury Assessments of the Single-Price Auction Format

The Treasury produced two empirical studies of the results of its experiment with a single-price auction format: Malvey, Archibald, and Flynn (1995) and Malvey and Archibald (1998). The studies calculated—for both single-price and multiple-price auctions—the difference between the auction yield of a security and the yield at which the same security was trading in the when-issued market at the time of the auction. A positive difference indicated that the securities had been auctioned at a yield higher than the one at which they were trading in the when-issued market. For securities auctioned in a multiple-price format, the average difference was statistically significantly greater than zero. For securities auctioned in a single-price format, however, the studies were unable to reject the hypothesis that the average difference was zero. These results suggest that moving to a single-price format would lead to lower financing costs. Nevertheless, the studies were also unable to reject the hypothesis that changing auction formats would leave the average difference unchanged. The apparent inconsistency arose because the differences between auction yields and when-issued yields in single-price auctions were quite volatile. The studies could neither reject the hypothesis that the average difference in single-price auctions was different from zero, nor could they reject the hypothesis that the average difference was different from the (positive) average difference that characterized multiple-price auctions.

The studies also examined whether single-price auctions reduced the concentration of auction awards. The studies found that the single-price format did not materially affect the distribution of awards between dealers and others but that it did lead to a lower concentration of auction awards to the largest dealers.

(b) the excess, if any, of (1) its net holdings of previously issued securities with the same identifying CUSIP number[8] and principal STRIPS derived from such securities over (2) an exclusion amount equal to 35 percent of the aggregate amount of previously issued securities with the same CUSIP number.

A bidder must report its net long position along with its auction bids if the sum of its net long position and its bids exceeds 35 percent of the offering.

Limitations on auction awards go back more than forty years. A limitation was first imposed following an auction of thirteen-week bills in August 1962, when Morgan Guaranty Trust Company bid for half of the bills offered. To avoid a market "disruption," Secretary of the Treasury Douglas Dillon exercised his right to reject any tender in whole or in part and reduced Morgan's award to 25 percent of the amount offered. He stated that, going forward, no bidder would be awarded more than 25 percent of a bill offering.[9] Limitations on auction awards were subsequently understood to apply to all offerings of marketable Treasury securities.

Limitations on auction awards have been modified several times since 1962 in response to innovations such as futures trading and STRIPS. Box 3 contains a summary of the modifications.

Limitations on the size of a bid. Although the maximum *award* to an individual bidder has been limited since 1962, before 1990 there was no limit on the size of a *bid*. Because bids at the stop are filled on a pro rata basis, bidders could get larger awards (subject to the 35 percent limitation) if they bid (at what turned out to be the stop) for more securities. For example, if a dealer wanted $100 million of a new issue at a yield equal to what the dealer expected would be the stop, the dealer might bid for $200 million if it expected a 50 percent allotment. Such "strategic" bidding led to individual bids for more securities than were offered in an auction of four-year notes in June 1990.[10]

Strategic bidding by some large auction market participants made competitive bidding riskier and more complicated for other participants. Bidders had to anticipate the likely volume of overbidding; if the expected overbidding did not materialize, they would end up owning more securities than they wanted. In the interest of encouraging broad public participation in its auctions, the Treasury announced in July 1990 that it would limit the total bids by a given participant at a given yield or discount rate to 35 percent of the amount offered to the public.

Granularity of bidding. When the Treasury introduced bidding on notes and bonds in terms of yields in 1974, it specified that bids should be expressed to a whole basis point.[11] When it introduced bidding on bills in terms of discount rates in 1983, it made a similar stipulation.[12] Bidding to a whole basis point continued until 1995, when Treasury officials specified that bids on notes and bonds should be expressed to 1/10 of 1 basis point. The greater precision was intended to "increase participation in Treasury auctions and to conform the auctions to market practice for when-issued trading."[13] Officials refined the bidding increment to 1/2 of 1 basis point in late 1997 for thirteen-, twenty-six-, and fifty-two-week bills and in April 2002 for cash management bills, saying that they expected the change "to promote more efficient and aggressive bidding and lead to marginally higher revenue."[14]

Box 3

Evolution of Restrictions on Auction Awards

The limitation on auction awards to a single bidder has been modified several times since it was introduced in 1962. The modifications reflect the emergence of new financial instruments and changes in investor behavior and Treasury debt management practices.

In May 1979, the Treasury reduced the maximum award from 25 percent of the amount offered to 25 percent of the amount sold to public bidders—thereby excluding securities sold to foreign official institutions and to the Federal Reserve System in exchange for maturing securities. Treasury officials made the change because "the proportion of Treasury bill offerings accounted for by the competitive plus noncompetitive award to the public has declined significantly in recent years" and said they expected the change would "broaden the competitiveness of the auction process and contribute to improved distribution of new securities."[a]

Also in May 1979, the Treasury introduced the concept of a net long position to address certain consequences of the growth of when-issued trading and trading in Treasury bill futures contracts. The Treasury was concerned that when-issued contracts and futures contracts on a new bill were such close substitutes for auction awards that a combination of a large award and a concentrated position in when-issued and/or futures contracts could impair the liquidity of post-auction secondary market trading.[b] It defined a net long position to include when-issued contracts, bill futures contracts, and net holdings of previously issued bills with the same maturity date. The maximum award of bills would be reduced (from 25 percent of the amount sold to public bidders) by the bidder's net long position in a bill if that net long position exceeded $200 million. In 1981, the Treasury extended the deduction for a bidder's net long position to note and bond auctions and relaxed the percentage limitation to 35 percent.

In 1985, following the rapid growth of trading in private sector custodial receipts on individual interest and principal payments on Treasury notes and bonds, the Treasury introduced STRIPS. Because a principal STRIP remains identified with the security from which it was derived, and because STRIPS can be reconstituted into notes and bonds, principal STRIPS created a substitutability problem similar to that created by when-issued contracts and futures contracts. In 1993, the Treasury expanded the definition of a bidder's net long position to include purchase commitments for principal STRIPS to be derived from the security being auctioned as well as holdings of principal STRIPS derived from previously issued securities with the same CUSIP number.

In February 2000, the Treasury announced that it would henceforth issue new five-year and ten-year notes semiannually and that it would reopen each new five- or ten-year note in a smaller offering three months after it was first issued. Because the net long position in a security included holdings of previously issued securities with the same CUSIP number, a bidder with a significant position in earlier issued notes was liable to be limited to an unreasonably low maximum auction award. Suppose, for example, the Treasury sold $10 billion of a note in an earlier auction and then reopened the note by auctioning another $8 billion. If an investor held $2.5 billion of the previous issue, it could not be awarded more than $300 million of the new issue ($0.3 billion = 35 percent of the $8 billion new offering, less the investor's net long position of $2.5 billion), even though it would then hold only 15.5 percent of the combined issue ($2.8 billion = 15.5 percent of $18 billion). To relax this constraint, the Treasury provided in November 2001 that a bidder had to include in its net long position only those holdings of previously issued securities with the same CUSIP number that were in excess of 35 percent of the total amount of such earlier issued securities. In the example, the investor's holdings of previously issued notes did not exceed 35 percent of the total earlier issue, so it did not have a reportable net long position and could be awarded up to 35 percent ($2.8 billion) of the new issue.

In light of changes in the size of its auctions, the Treasury has periodically revised the threshold for reporting a net long position. In 1993 it increased the threshold to $2 billion, in 1997 it reduced the threshold for bills to $1 billion, and in 2002 it changed the threshold for all securities to 35 percent of the amount offered.

[a] Federal Reserve Bank of New York Circular no. 8577, May 23, 1979. In the first auction of thirteen-week bills under the new tighter limits, the Treasury offered $2.9 billion of bills but only $1.3 billion went to public bidders (Federal Reserve Bank of New York Circular no. 8589, June 20, 1979).

[b] Treasury officials stated that they were acting to reduce "the potential for undue concentration of ownership in new issues and to contribute to improved distribution." The decision to act was reached "in conjunction with the joint Treasury/Federal Reserve Board study of futures contracts based on Treasury securities" (see U.S. Department of the Treasury and Federal Reserve System [1979]) and "recognizes the rapid expansion of trading in Treasury bill futures as well as 'when-issued' trading" (Federal Reserve Bank of New York Circular no. 8577, May 23, 1979).

Auction Infrastructure

The operational heart of a Treasury auction is a computer application called *TAAPS*® (Treasury Automated Auction Processing System). After the close of noncompetitive bidding, *TAAPS* aggregates the noncompetitive bids and computes the balance of the offering that must be sold to competitive bidders. Once the competitive bidding closes, *TAAPS* ranks the competitive bids in order of increasing yield or discount rate, identifies the stop, and identifies the allocation at the stop. It then prepares a summary data file of the auction results that is made available to news services and a more descriptive text file that is posted on the website of the Treasury Department's Bureau of the Public Debt (<http://www.publicdebt.treas.gov/>). News bulletins reporting the results usually appear within two to three minutes of the close of competitive bidding. *TAAPS* subsequently prepares a notice of award for each successful bid, identifying how many securities were awarded and at what price.

Auction market participants submit bids through a communications system called *TAAPSLink*®. Institutions other than primary dealers[15] (including depository institutions, other dealers, and institutional investors) use an Internet version called *TAAPSLink* v1. Primary dealers—which submit the largest volume of bids in almost every auction—use an alternative version called *TAAPSLink* v2. Retail investors with TreasuryDirect accounts submit bids by mail, telephone, and Internet applications that ultimately reach *TAAPS* through *TAAPSLink* v1.

The last decade witnessed striking advances in bid submission, bid processing, and announcement of auction results. Until 1993, bids were submitted on paper forms by mail or in person at the Treasury Department in Washington, D.C., or at a Federal Reserve Bank or Branch. Dealers had a lot to lose if they tendered bids early at prices that failed to reflect a late-developing rally or market pullback, so on auction days they stationed employees in the lobby of the Federal Reserve Bank of New York and relayed bidding instructions over the telephone immediately before the close of bidding. Other large bidders submitted bids through primary dealers acting on their behalf. Bids were processed manually and announcements of auction results frequently came out in mid or late afternoon.[16] These procedures left auction market participants uncertain—for substantial intervals of time—whether they would be awarded securities. The uncertainty may have led them to enter bids at higher yields than they would have if auction results had been announced more promptly.

The introduction of electronic bid submission and bid processing in the 1990s was stimulated by the 1991 violations of Treasury auction rules noted earlier and resulting demands for a faster, more transparent, and more accessible auction process.[17] Electronic processing dramatically reduced the time between the close of bidding and the announcement of results, thus materially reducing bidder risk exposure. In early 2002, the Treasury announced that it intended to release auction results consistently within two minutes of the close of bidding, and in mid-2003 it achieved that goal.[18] Electronic bid submission was a necessary precondition to electronic processing. It also made it operationally feasible for auction market participants other than primary dealers to bid directly (rather than through a dealer) right up to the close of competitive bidding—auction access that the Treasury believes can help maximize the breadth of the auction market.[19]

Delivery and Settlement

The last part of the auction process is delivering new securities to successful bidders and collecting payment. Participating institutional and retail investors take delivery directly from the Treasury. However, the Treasury makes about three-quarters of all auction deliveries to dealers indirectly, through the Fixed Income Clearing Corporation (FICC), a clearing agency registered with the Securities and Exchange Commission that is the central clearing corporation for the Treasury securities market.[20] In 2003, for example, 89 percent of all four-week bills and 67 percent of all ten-year notes were delivered through FICC.

Direct deliveries. The simplest example of a direct delivery occurs when a bidder is a depository institution and requests that awards be credited to its account in the Federal Reserve book-entry system. At 9:15 a.m. on the issue date, the Fed, acting as fiscal agent for the Treasury, credits the institution's account for the new securities, debits the institution's reserve account for the cost of the securities, and transfers the payment to a Treasury account at the Fed.

If an institutional bidder is not a depository institution, it will usually request that securities be delivered pursuant to an "autocharge" agreement with a depository institution that does a custodial business. The agreement provides that the securities will be credited to the custodian's book-entry account and that payment will be collected from the custodian's reserve account. The bidder reimburses the custodian for the cost of the securities, and the custodian credits the securities to the bidder's account on its internal records.

Retail investors that take delivery in their *TreasuryDirect* accounts commonly pay by check, by a debit entry to a deposit account, or with the proceeds from a maturing security in the same account.

Deliveries through FICC. FICC was organized in the late 1980s to reduce operational costs and enhance risk management practices in settling secondary market transactions in Treasury and related fixed-income securities. Among other things, FICC nets out confirmed purchases and sales, repurchase agreements, and reverse repurchase agreements[21] between its members and, in a legal process known as "novation," steps in as the buyer from every net seller and the seller to every net buyer. Additionally, FICC marks purchase and sale contracts to current market prices every day in order to limit the exposure of its members and itself to credit risk.

Before 1994, the Treasury settled an auction award to a dealer that was an FICC member in the same way that it settled an auction award to any other institutional investor: by delivering securities to the dealer's Federal Reserve book-entry account or to the book-entry account of the dealer's custodian. This process was inefficient because in many cases the dealer had already sold some or all of its award in when-issued transactions. Suppose, for example, that dealer A was awarded $10 million of a new issue and that, in when-issued trading before or after the auction, the dealer sold $10 million of the same issue to dealer B. On the issue date, the Fed would deliver $10 million of the security to dealer A, which would then have to go to the trouble and expense of redelivering the security to dealer B.

In 1991, FICC opened discussions with the Treasury and the Federal Reserve to expand its netting, settlement, and risk management services to include auction awards, or "takedowns." The 1992 *Joint Report on the Government Securities Market* encouraged the effort, noting that "the benefits of netting are greater as more trades are included in the net, because a greater number of receive and deliver obligations are reduced to as small a number as possible" (U.S. Department of the Treasury et al. 1992, p. B-76).

FICC initiated its "auction takedown service" in September 1994. The key idea of the service is that auction awards, when-issued purchases, and the starting legs of reverse repurchase agreements are equivalent for purposes of netting and settlement. Additionally, as shown in the table below, if a new issue reopens an outstanding security, auction awards are also equivalent to conventional purchases of securities with the same CUSIP number, as well as to the closing legs of repurchase agreements. On the issue date, the Fed delivers to FICC securities equal to the aggregate awards of its members. FICC redelivers those securities, along with securities received from members with a net short position, to members with a net long position. Thus, the auction awards lose their separate identities and become part of a consolidated net settlement process.[22]

In addition to enhancing operating efficiency, the auction takedown service has resolved several risk management problems associated with gross settlement of auction awards. First, the unnecessary deliveries to dealers that were not ultimate buyers created risk for FICC because FICC guaranteed settlement of the redeliveries by those dealers. If an "intermediary" dealer became insolvent before redelivering its securities and the price of the securities had risen, FICC, as part of its liquidation of the insolvent dealer's positions, might have to go into the secondary market and buy the securities at a higher price than it would receive upon redelivery. Second, because FICC did not have knowledge of auction awards made to its netting members, it could not guarantee settlement of those awards (as it would for a secondary market trade), thus leaving the Treasury exposed to credit risk. Finally, FICC was unable to assess proper performance guarantees,

Netting Auction Awards and When-Issued Transactions with Repurchase Agreements

For netting purposes, FICC treats the settlements associated with the starting leg of a reverse repurchase agreement (in which the lender of funds has to pay money upon delivery of securities from the borrower of funds) and the closing leg of a repurchase agreement (in which the borrower of funds has to pay money upon delivery of securities from the lender of funds) as long positions. Similarly, the settlements associated with repo starting legs and reverse repo closing legs are treated as short positions. The difference between a member's aggregate long position and its aggregate short position is the member's net settlement obligation.

Long Positions	Short Positions
Purchases (due to when-issued transactions and, in the case of a reopening, transactions in previously issued securities with the same CUSIP number)	Sales (due to when-issued transactions and, in the case of a reopening, transactions in previously issued securities with the same CUSIP number)
Starting legs of reverse repurchase agreements	Starting legs of repurchase agreements
Closing legs of repurchase agreements involving previously issued securities with the same CUSIP number	Closing legs of reverse repurchase agreements involving previously issued securities with the same CUSIP number
Auction awards	

Aggregate long position	*minus*	Aggregate short position	*equals*	Net settlement obligation

or margin, on purchasers and sellers, and it could not mark their positions to market accurately. For example, if dealer A was awarded $10 million of a security in an auction and sold $10 million of the same security in a when-issued transaction to dealer B, FICC viewed dealer A as having a $10 million net short position and collected margin on that position, whereas in fact the dealer was net flat and posed no settlement risk. The unnecessary margin reduced the dealer's liquidity. The auction takedown service allows FICC to margin and mark dealer positions on a true net basis. However, because the Treasury is not a member of FICC, FICC does not mark the Treasury's sales contracts to market. As explained in the appendix, this feature of the auction takedown service complicates marking procedures for auction awards to FICC members.

Conclusion

The process of auctioning Treasury securities has changed substantially in the last quarter century. In 1980, when-issued trading was banned, bids were submitted on paper tenders, a multiple-price format was used, results were announced hours after the close of bidding, and securities were delivered to successful bidders regardless of whether or not a bidder was actually a net buyer for settlement on the issue date. Since then, growing confidence in free markets has fostered when-issued trading, improvements in telecommunications and information processing have led to more equitable bidding and faster bid processing, and net settlement has led to cheaper and safer settlements. These adaptations have contributed, individually and collectively, to the goal of minimizing the cost of financing the national debt.

Appendix: Marking to Market and Settling Auction Takedowns through FICC

FICC limits the exposure of its members and itself to credit risk arising from when-issued trading by marking to market when-issued purchase and sale contracts every day until settlement. The appendix box on page 9 shows how the contracts are marked. Note, in particular, the symmetric consequences of price changes: a buyer pays forward margin when the market price falls below the initial contract price (but makes it back by paying a lower invoice price when the seller delivers the securities) and a seller pays forward margin when the market price rises above the initial contract price (but makes it back by receiving a higher invoice price when delivering the securities).

Because the U.S. Treasury is not a member of FICC, its sale contracts to FICC members are not marked to market and it neither makes nor receives forward margin payments. This feature of the auction takedown service leads to more complicated margining procedures for auction awards to FICC members. To appreciate some of the complexities, consider two cases similar to those described in the appendix box, except that the seller is the Treasury instead of a dealer.

Auction Takedowns

Suppose dealer X receives an auction award at a price of $100. Following novation, the Treasury will be obligated to deliver the security to FICC at a price of $100 and FICC will be obligated to deliver the security to X at the same price:

If the price of the security falls to $95 following the auction, X (the buyer) pays $5 forward margin to FICC and FICC marks the settlement price on X's purchase contract to $95. However, FICC does not revise the settlement price on the Treasury's sale contract and it does not pay the $5 to the Treasury. Instead, it invests the $5. This leaves the contracts as

At 9:15 a.m. on the issue date, the Fed delivers the security to FICC against payment of $100. FICC redelivers the security to X against payment of the same amount and issues a $5 "delivery differential credit" to X. (Invoicing X $100 instead of $95 is important because the higher invoice price paid by X provides FICC with the cash needed to pay the Treasury. FICC always redelivers securities received from the Treasury at the higher of the auction price and the current market price to avoid liquidity strains.) Before 11 a.m. on the same day, FICC uses the $5 received earlier from X to pay off the delivery differential credit. This leaves X as a buyer of the new issue at a net price of $100 ($100 = $100 paid upon delivery of the security, plus $5 forward margin paid when the market price of the security fell from $100 to $95, less $5 received in satisfaction of the delivery differential credit).

If the price of the security rises from $100 to $105 following the auction, FICC marks the settlement price on X's purchase contract to $105. However, because it does not collect any forward margin from the Treasury, it does not have $5 in cash to compensate X for the increase in the invoice price. In lieu of cash, FICC issues X a $5 delivery differential credit. This leaves the contracts as

Marking to Market and Settling a When-Issued Trade between Two FICC Members

Suppose initially that dealer A agrees to sell a security to dealer B in a when-issued transaction at a price of $100. Following novation of the trade, A will be obligated to deliver the security to FICC at a price of $100 and FICC will be obligated to deliver the security to B at the same price:

Suppose first that the price of the security falls to $95 in subsequent when-issued trading. Dealer B then pays $5 forward margin to FICC, FICC pays $5 to A, and the settlement prices on A's sale contract and B's purchase contract are marked to $95. On the issue date of the security, A delivers the security to FICC against payment of $95 and FICC redelivers the security to B against payment of the same amount. Between the delivery payment and the earlier forward margin payment, B pays a total of $100 and A receives a total of $100.

Suppose alternatively that the price of the security rises to $105 after the initial transaction between A and B. Dealer A then pays $5 forward margin to FICC, FICC pays $5 to B, and the settlement prices on the contracts are marked from $100 to $105. On the issue date of the new security, A delivers the security to FICC against payment of $105 and FICC redelivers the security to B against payment of the same amount. Between the delivery payment and the earlier margin payment, B pays a total of $100 and A receives a total of $100.

At 9:15 a.m. on the issue date, the Fed delivers the security to FICC against payment of $100 and FICC redelivers the security to X against payment of $105. Later in the morning, FICC pays off the delivery differential credit issued earlier to X with the difference between what X paid to FICC ($105) and what FICC paid to the Treasury ($100).

Integrating When-Issued Trades with Auction Takedowns

One of the important benefits of FICC's auction takedown service is that, as shown in the table on page 7, it integrates settlement obligations arising out of interdealer when-issued trading with dealer auction takedowns. This integration introduces further complexities into the process of marking dealer commitments to market.

Suppose that dealer X receives an auction award for a security at a price of $100 and that the price of the security falls to $95 following the auction. After X has paid $5 forward margin to FICC and FICC has invested the $5 and marked the settlement price on X's purchase contract to $95, the contracts involving the Treasury, FICC, and X are

Suppose that X now agrees to sell the security to dealer Y in a when-issued transaction at a price of $95. Y replaces X as the buyer from FICC, leaving X with no net settlement obligation. If the market price of the security falls further, to $92, Y (the new buyer) pays $3 forward margin to FICC and FICC marks the settlement price on Y's purchase contract to $92. As before, FICC does not revise the settlement price on the Treasury's sale contract and it does not pay the $3 to the Treasury. Instead, it invests the $3. This leaves the contracts as

At 9:15 a.m. on the issue date, the Fed delivers the security to FICC against payment of $100. FICC redelivers the security to Y against payment of the same amount and issues Y an $8 delivery differential credit. Later in the morning, FICC uses the $5 received from X and the $3 received from Y to pay off the delivery differential credit issued to Y. This leaves Y as a net buyer of the new issue at a price of $95 ($95 = $100 paid upon delivery of the security, plus $3 forward margin paid when the market price of the issue fell from $95 to $92, less $8 received in satisfaction of the delivery differential credit).

Suppose alternatively that dealer X receives an auction award for a security at a price of $100 and that the price of the security rises to $105 following the auction. After FICC has marked the settlement price on X's purchase contract to $105 and issued a $5 delivery differential credit to X, the contracts involving the Treasury, FICC, and X are

Suppose that X now agrees to sell the security to dealer Y in a when-issued transaction at a price of $105. Y replaces X as the buyer from FICC. If the market price of the security rises further, to $108, X (the original auction buyer and the seller to Y on the when-issued contract) pays $3 forward margin to FICC and receives an additional $3 delivery differential credit. (X pays forward margin on its when-issued sale to Y for the same reason that, in the appendix box, A pays forward margin on its when-issued sale to B when the price of the security rises. X does not receive $3 forward margin on its purchase contract because that contract was with the Treasury. Instead, it receives an additional $3

delivery differential credit.) FICC pays the $3 (received from X) to Y and marks the settlement price on Y's purchase contract to $108. This leaves the contracts as

At 9:15 a.m. on the issue date, the Fed delivers the security to FICC against payment of $100 and FICC redelivers the security to Y against payment of $108. Later in the morning, FICC uses the difference between what Y paid to FICC ($108) and what FICC paid to the Treasury ($100) to pay off the $5 and $3 delivery differential credits issued to X.

Notes

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1. Under Secretary of the Treasury Peter Fisher identified lowest cost over time as the goal of Treasury debt management in a speech on March 14, 2002, available at <http://www.treas.gov/press/releases/po1098.htm>.

2. Assistant Secretary for Financial Markets Brian Roseboro observed that secondary market liquidity is important because it encourages "more aggressive bidding in the primary market" ("A Review of Treasury's Debt Management Policy," June 3, 2002, available at <http://www.treas.gov/press/releases/po3149.htm>).

3. Beginning with the first auction of Treasury notes in 1970, the Treasury restricted pre-auction when-issued trading in coupon-bearing securities (Garbade 2004, pp. 38-9). The Treasury removed the restriction in 1975 when it revised the boilerplate language of its offering circulars to eliminate "obsolete" provisions, but reimposed the restriction in 1977 after concluding that when-issued trading "does not contribute to the efficient marketing of new . . . issues and may, in fact, facilitate undesirable speculative activity" (Federal Reserve Bank of New York Circular no. 8147, July 15, 1977). Greater volatility of interest rates after October 1979 and a growing federal deficit led the Treasury to lift the ban a second time in 1981. On this occasion, the Treasury characterized the restriction as "an unnecessary regulation which is believed to hinder the efficient adjustment of market prices" (Federal Reserve Bank of New York Circular no. 9128, August 17, 1981).

4. Treasury auction rules appear in the Uniform Offering Circular (Code of Federal Regulations, title 31, part 356, "Sale and Issue of Marketable Book-Entry Treasury Bills, Notes, and Bonds").

5. All times in this article are eastern times.

6. However, a competitive bidder is limited to an award of no more than 35 percent of the total amount offered less, as described in more detail below, the bidder's reportable net long position in the security.

7. See U.S. Department of the Treasury et al. (1992, p. 14). The Treasury used a single-price format to auction long-term bonds on six occasions in 1973 and 1974, but switched to a multiple-price format in August 1974; it did not state publicly the reason for the change. In 1982, Mark Stalnecker, the Deputy Assistant Secretary for Federal Finance, testified before the House Subcommittee on Domestic Monetary Policy that it "did not appear that there were significant cost savings . . . , so that after selling six securities [with the single-price auction format] with mixed results we ended that experiment" (U.S. House 1982, p. 24). A decade later, Jack Bennett, who had been the Under Secretary for Monetary Affairs in August 1974, recalled that "the Secretary of the Treasury at that time, William E. Simon, made the decision to discontinue the [single-price format] as a result of his judgment, based on his extensive experience in the market for Treasury securities, that the [single-price format] would bring in fewer dollars to the Treasury" (U.S. House 1991, p. 409). Simon (1994b) examines whether the Treasury received more aggressive bids in the six single-price auctions or the ten multiple-price auctions of long-term bonds held between February 1973 and August 1976.

8. CUSIP (Committee on Uniform Securities Identification Procedures) numbers uniquely identify and distinguish most publicly traded securities, including corporate stocks and bonds, municipal bonds, and U.S. government securities.

9. See "Effort to Corner U.S. Bills Hinted," *New York Times*, August 29, 1962, p. 35; "Morgan Guaranty Denies Move to Corner 91-Day-Bill Auction," *New York Times,* August 30, 1962, p. 37; and "Demand Is Heavy for 91-Day Bills," *New York Times*, September 2, 1962, sec. 3, p. 1.

10. See "Unfillable Bids Flood Auction of 7-Year Notes," *Wall Street Journal,* July 12, 1990, p. C1; and "Treasury's Rule Upsets Note Sale," *New York Times*, July 12, 1990, p. D1.

11. Federal Reserve Bank of New York Circular no. 7456, September 16, 1974. The Treasury changed the bidding method for notes and bonds from prices to yields to limit the likelihood of a failed auction (Garbade 2004, p. 39).

12. Federal Reserve Bank of New York Circular no. 9480, April 13, 1983. The Treasury changed the bidding method for bills from prices to discount rates "to conform the bidding in Treasury bill auctions to market pricing conventions and simplify the submission of tenders" ("Treasury Bill Auctions to Use New Bidding Method Effective April 18, 1983," *Treasury News*, March 15, 1983).

13. "Treasury Modifies Competitive Bidding Requirement for Notes and Bonds," *Treasury Bulletin*, June 1995, p. 33.

14. "Treasury Is Altering Format of Bill Auctions," *Wall Street Journal*, August 13, 1997, p. C21.

15. Primary dealers are dealers that have a trading relationship with the Federal Reserve Bank of New York. Information on the primary dealer program is available at <http://www.newyorkfed.org/markets/primarydealers.html>.

16. Before 1984, results were generally announced more than two and a half hours after the close of bidding. By the early 1990s, results were typically announced about an hour after the close. See Cammack (1991, Figure 1), Simon (1994a, p. 46), and Nyborg and Sundaresan (1996, p. 71).

17. U.S. Department of the Treasury et al. (1992, p. 13).

18. "Remarks by Peter R. Fisher, Under Secretary of the Treasury for Domestic Finance, before the Bond Market Association Legal and Compliance Conference," January 8, 2002, available at <http://www.treas.gov/press/releases/po906.htm>; "August 2003 Quarterly Refunding Statement," July 30, 2003, available at <http://www.treas.gov/press/releases/js581.htm>.

19. "Remarks of Under Secretary of the Treasury Peter R. Fisher to the Council of Institutional Investors," March 25, 2002, available at <http://www.treas.gov/press/releases/po2031.htm>.

20. FICC is a subsidiary of the Depository Trust & Clearing Corporation and has two divisions—the Government Securities Division (formerly the Government Securities Clearing Corporation) and the Mortgage-Backed Securities Division (formerly the Mortgage-Backed Securities Clearing Corporation). In this article, "FICC" refers only to the Government Securities Division of FICC.

21. A repurchase agreement involves two separate but related transactions: an agreement by the "seller" to transfer securities in exchange for cash to the "buyer," and a simultaneous agreement by the seller to repurchase the same or equivalent securities from the buyer for a specified price at a specified later date. Market participants discuss repurchase agreements using two additional phrases—"repo" and "reverse repo." A repurchase agreement from the seller's viewpoint is a repo. Thus, the repo party is effectively borrowing money and lending securities. A repurchase agreement from the buyer's viewpoint is a reverse repo. The reverse repo party is effectively lending money and borrowing securities.

22. The auction takedown service has two limitations: it does not cover purchases by a dealer acting as an agent for a customer, and it does not encompass securities (such as some cash management bills) that are issued on the auction date. It should also be noted that the takedown service nets out dealer sales only to participating netting members, so dealers still have to redeliver securities to settle when-issued sales to nonmembers.

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