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Repurchase Agreements with Negative Interest Rates

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Contrary to popular belief, interest rates can drop below zero. From early August to mid-November of 2003, negative rates occurred on certain U.S. Treasury security repurchase agreements. An examination of the market conditions behind this development reveals why market participants are sometimes willing to pay interest on money lent.

Short-term interest rates fell to their lowest level in forty-five years in 2003. The low rates, coupled with a sharp increase in intermediate-term yields during the summer, gave rise to significant settlement problems in the ten-year Treasury note issued in May. To ease those problems, market participants lent money at attractive rates on investment contracts that provided the note as collateral. From early August through mid-November, such repurchase agreements (“repos” or “RPs”) were sometimes arranged at *negative* interest rates.

This episode of negative interest rates is interesting for several reasons. For one, it refutes the popular assumption that interest rates cannot go below zero because a lender would prefer to hold on to its money and receive no return rather than pay someone to borrow the money. This may be true for uncollateralized loans, but a lender may be willing to pay interest if the securities offered as collateral on a loan allow it to meet a delivery obligation. Researchers (D’Avolio 2002; Jones and Lamont 2002) have reported cases of negative interest rates when equity securities are offered as collateral. The events of 2003 show that negative rates can also occur when Treasury securities are offered as collateral.

The 2003 episode is also interesting because of the specific circumstances that led to negative interest rates. The option of Treasury market participants to fail on, or postpone, delivery obligations with no explicit penalty usually puts a floor of zero on repo rates. In 2003, however, ancillary costs of failing increased as settlement problems in the May ten-year note persisted. The increased costs ultimately led some participants to agree to negative interest rates on RPs that provided the May note as collateral.

Finally, the episode of negative interest rates is interesting because it illustrates how market participants adapt old contract forms to satisfy new needs as economic conditions evolve. In particular, market participants devised “guaranteed-delivery” RPs that allowed for negative interest rates without unduly penalizing a lender of money if a borrower failed to deliver collateral as promised.

This edition of *Current Issues* explores the recent episode of negative interest rates in detail. We begin with a brief review of repurchase agreements. We then describe how market conditions led to an extraordinary volume of settlement fails in the May ten-year note. Finally, we explain how the fails problem became so severe that some

market participants chose to lend money at negative rates in order to borrow the note.

Repurchase Agreements

Repurchase agreements play a crucial role in the efficient allocation of capital in financial markets. They are widely used by dealers to finance their market-making and risk management activities, and they provide a safe and low-cost way for institutional investors to lend funds or securities. The importance of the repo market is suggested by its immense size: dealers with a trading relationship with the Federal Reserve Bank of New York—so-called primary dealers—reported financing \$2.41 trillion of fixed-income securities with RPs in August 2003.¹

An RP is a sale of securities coupled with an agreement to repurchase the same securities on a later date and is broadly similar to a collateralized loan. As shown in Figure 1, a dealer can borrow \$10 million overnight from a corporate treasurer at an interest rate of 3 percent per annum by selling Treasury notes valued at \$10,000,000 and simultaneously agreeing to repurchase the same notes the following day for \$10,000,833. The payment from the initial sale is the principal amount of the loan; the excess of the repurchase price over the sale price (\$833) is the interest on the loan. As with a collateralized loan, the corporate treasurer has possession of the dealer’s securities and can sell them if the dealer defaults on its repurchase obligation.

General Collateral Repurchase Agreements

A general collateral RP is a repurchase agreement in which the lender of funds is willing to accept any of a variety of Treasury and other related securities as collateral. The class of acceptable collateral commonly includes all Treasury securities, but it might be limited to Treasury securities maturing in less than ten years or it might extend to agency

issues as well as Treasury securities. The lender is concerned primarily with earning interest on its money and having possession of assets that can be sold quickly in the event of a default by the borrower. Interest rates on overnight general collateral RPs on Treasury securities are usually quite close to rates on overnight loans in the federal funds market. This reflects the essential character of a general collateral RP as a device for borrowing and lending money.

Special Collateral Repurchase Agreements

A special collateral RP is a repurchase agreement in which the lender of funds designates a particular security as the *only* acceptable collateral.² Dealers and others lend money on special collateral RPs in order to borrow specific securities needed to deliver against short sales. A short sale is a sale of securities that the seller does not own and that it has to borrow to make delivery. Dealers sell Treasury securities short in the expectation that prices will be lower in the future, to hedge the risk of other fixed-income securities, and to accommodate customer purchase interests.

The interest rate on a special collateral RP is commonly called a “special” rate. The owner of a Treasury security that a dealer wants to borrow may not have any particular interest in borrowing money, but can nevertheless be induced to lend the security if it is offered an opportunity to borrow money at a special rate less than the general collateral rate. For example, if the rate on a special collateral RP is 2 percent and the general collateral rate is 3 percent, then—as shown in Figure 2—an investor can earn a 100 basis point spread by borrowing money on the special collateral RP and relending the money on a general collateral RP.

Figure 1
A Dealer Borrows \$10 Million from a Corporate Treasurer at an Interest Rate of 3 Percent on an Overnight Repurchase Agreement

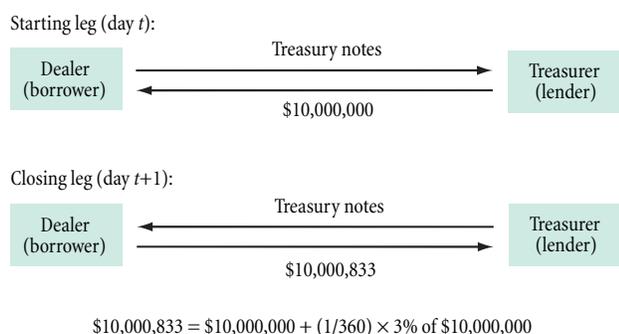
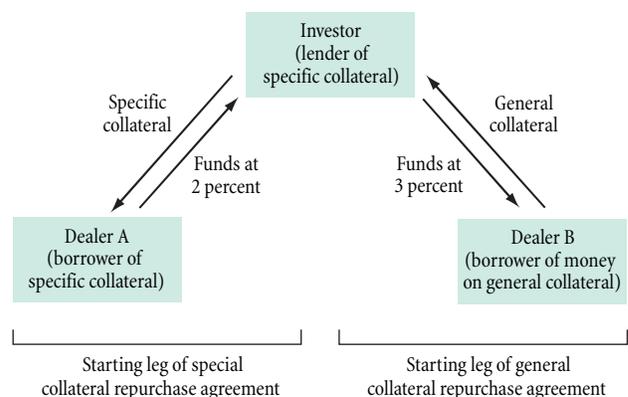


Figure 2
An Investor Lends Collateral (and Borrows Money at 2 Percent) on a Special Collateral Repurchase Agreement with Dealer A and Relends the Money to Dealer B on a General Collateral Repurchase Agreement at 3 Percent



The difference between the general collateral rate and the specials rate for a security is a measure of the “specialness” of the security. If the demand to borrow the security is modest relative to the supply available for lending, a dealer borrowing the security will usually be able to lend its money at a rate no lower than about 15 to 25 basis points below the general collateral rate. If the demand to borrow is strong, or if the supply is limited, the specials rate for the security may be materially below the general collateral rate and the specialness spread correspondingly large.³

A Lower Bound on Special Collateral Repo Rates?

Interest rates on special collateral RPs nearly always stay above zero because, instead of lending money at a negative interest rate to borrow a particularly scarce issue, a short seller can choose to fail on its delivery obligation. In a “fail,” a seller does not deliver the securities it promised to a buyer on the scheduled settlement date and, consequently, does not receive payment for the securities. The convention in the Treasury market is to reschedule delivery for the next day at an unchanged price.⁴ As detailed in Box 1, the cost of failing is about the same as the cost of borrowing a security on a special collateral RP at an interest rate of zero. It follows that failing is usually preferable to borrowing a security at a negative specials rate.

The zero lower bound on specials rates depends on the absence of any costs or penalties for failing other than a delay in the receipt of the invoice price. However, the events of 2003 show that fails can sometimes have significant ancillary costs and that those costs can lead to negative interest rates on special collateral RPs.⁵

Short Sales and Settlement Fails in the Summer of 2003

Intermediate-term Treasury yields rose sharply during the summer of 2003. Yields on ten-year notes rose from about 3.15 percent in mid-June to 3.50 percent at the end of June and to 4.50 percent in mid-August. The rise led to an extraordinary volume of short sales of the on-the-run (or most recently issued) ten-year note (the 3 5/8 percent note maturing in May 2013) as holders of fixed-income securities sold the note short to hedge against the possibility of further rate increases.⁶ Demand to borrow the note (to deliver against short sales) expanded commensurately.

With the general collateral rate at about 1 1/4 percent until late June, and subsequently at about 1 percent, the specials rate for the ten-year note did not have far to fall before it hit zero. Demand to borrow the note drove the specials rate to within a few basis points of zero by June 23 (Chart 1). The rate hit zero on July 10, after which additional borrowing demand spilled over into settlement fails.⁷

Box 1

How Failing Compares with Satisfying a Delivery Obligation by Borrowing Securities on a Special Collateral Repurchase Agreement

Suppose a dealer sells \$10 million (principal amount) of Treasury notes for settlement on Monday, August 11, but does not have the notes available for delivery that day. The dealer can either borrow the notes to make delivery or fail on its delivery obligation. For expository purposes, we assume the price of the notes is \$9.98 million and the specials rate is zero.

If the dealer borrows \$10 million of the notes for one day at a specials rate of zero, the dealer receives the notes from the collateral lender against payment of the current market value of the notes (which, for simplicity, we assume is also \$9.98 million) and redelivers the notes to the buyer against payment of the previously agreed-upon \$9.98 million price. The dealer is then obligated to return the borrowed notes to the collateral lender on August 12 against payment of \$9.98 million. The balance due from the collateral lender on August 12 is the same as the amount of money borrowed on August 11 because the interest rate on the special collateral RP is zero.

Alternatively, if the dealer simply fails on its delivery obligation to the buyer, the delivery is rescheduled for the next day at an unchanged price. Thus, the dealer becomes obligated to deliver the \$10 million of notes to the buyer on August 12 against payment of \$9.98 million.

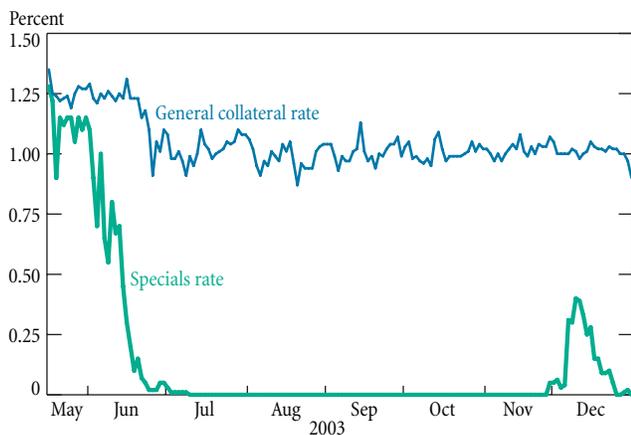
In both cases, the dealer has an obligation to deliver the \$10 million of notes on August 12 against payment of \$9.98 million. Therefore, the dealer may be indifferent between borrowing the notes on a special collateral RP at a rate of zero and failing on its delivery obligation. It follows that, in the absence of any ancillary costs or penalties, failing is preferable to lending money at a negative rate of interest.

In the absence of any evidence that interest rates had stopped rising, hedgers maintained their short positions through July. Demand to borrow the ten-year note remained strong and the specials rate for the note remained at zero. The persistence of the specials rate at zero left sellers with little economic incentive to borrow the note to cure their settlement fails. In late July, one market participant commented, “the issue . . . has totally stopped clearing.”⁸

Strategic Fails

The fails situation worsened when some market participants realized that they could acquire a free (or nearly free) option to speculate against an increase in the specials rate for the ten-year note by contracting to lend the note against borrowing

Chart 1
Overnight Specials Rate on the 3 5/8 Percent Treasury Note
of May 2013 and Overnight Rate on General Collateral
Repurchase Agreements



Sources: Federal Reserve Bank of New York; GovPX.

money at a zero (or near zero) rate of interest for a term of several days or weeks and then intentionally—or strategically—failing to deliver the note. Understanding the nature of this option requires an appreciation of the consequences of failing to settle the starting leg of a repurchase agreement.

Market convention holds that if a collateral lender fails to deliver securities on the scheduled starting date of an RP and thus fails to receive funds from its counterparty, it nevertheless owes the counterparty interest on the principal amount of the borrowing for the full term of the RP. The full amount of interest is owed regardless of whether the collateral lender delivers the securities late or not at all. (The repo contract terminates on the originally scheduled closing date even if the securities are delivered late.) Among other things, this convention provides an incentive for the collateral lender to deliver the securities on the scheduled starting date.

Consider, however, a trader who does not own the ten-year note but who nevertheless agrees to lend the note over the interval from July 15 to July 29, 2003, against borrowing \$10 million at a zero rate of interest. Suppose the trader fails to deliver the note on the scheduled starting date. Regardless of whether the trader delivers the note late or not at all, the trader will not owe its counterparty any interest because the interest rate on the repo contract is zero. Suppose also that the specials rate on the ten-year note for RPs ending July 29 rises to 0.50 percent on July 22. The trader can then borrow the note from July 22 to July 29 against lending \$10 million—thereby earning \$972 interest [$\$972 = (7/360) \times 0.50$ percent of \$10 million]—and deliver the borrowed

note against its original repo contract—thereby borrowing \$10 million at a zero rate of interest for the seven days remaining on that contract. The \$10 million borrowing funds the trader's loan of \$10 million and the trader makes a net profit of \$972.

A similar analysis applies if the specials rate is positive but small. For example, if the fourteen-day specials rate for the ten-year note is 0.05 percent, a trader would pay only \$194 for the implicit option described in the preceding paragraph [$\$194 = (14/360) \times 0.05$ percent of \$10,000,000].

Ancillary Costs of Fails

By early August, dealers were beginning to incur substantial ancillary costs as a result of their fails. Opportunity costs stemming from regulatory capital requirements are one example. The net capital rule of the Securities and Exchange Commission provides that dealers have to maintain additional capital—that is, assets in excess of liabilities—for fails to deliver more than five business days old and for fails to receive more than thirty calendar days old. Additional capital is required because “aged” fails are a source of credit risk. If two parties agree to a securities transaction and the buyer becomes insolvent prior to settlement, the seller will incur a loss if the price of the security has fallen and it has to find a replacement buyer at a lower price. The buyer will incur a loss if the price of the security increases after the trade is negotiated and the seller subsequently becomes insolvent. Capital charges for aged fails soak up capital that would otherwise be available to support profitable risk-taking activities; in this way, they impose opportunity costs on dealers.⁹

By early August, dealers were also experiencing increased labor costs and deteriorating customer relations. Labor costs rose because dealers were forced to divert back-office personnel from their usual assignments to efforts aimed at reducing the backlog of unsettled trades.¹⁰ Customers became unhappy when they did not receive the securities they had purchased, even after long delays. This left them in the position of involuntarily financing dealer short positions and meant that they themselves had nothing to deliver in the event they decided to sell.

Negative Specials Rates

In the strained environment of early August, some dealers became willing to *pay* interest on money lent to borrow the ten-year note. They concluded that it would be less expensive to pay interest to borrow the notes needed to remedy their settlement fails than to continue to incur the capital charges, labor costs, and customer dissatisfaction associated with the fails.

Loan Fees in the Federal Reserve's Securities Loan Auctions

The first indication that the specials market for the ten-year note was undergoing a major change came in the Federal Reserve's securities loan auctions. As described in Box 2, the Fed offers to lend securities that it owns on a daily basis. Dealers who borrow securities from the Fed pay a fee, expressed in percent per annum, which is equivalent to the difference between the rate paid for borrowing money in the general collateral market and the rate earned on lending money in the specials market. When transactions are settling normally, the loan fee that dealers are willing to pay the Fed to borrow a security will not rise above the general collateral rate because the specials rate for the security will not go below zero.¹¹

The average auction loan fee for the ten-year note rose materially above the general collateral rate for the first time on August 5 when it hit 1.25 percent (Chart 2). The general

Box 2

The Federal Reserve's Securities Loan Auctions

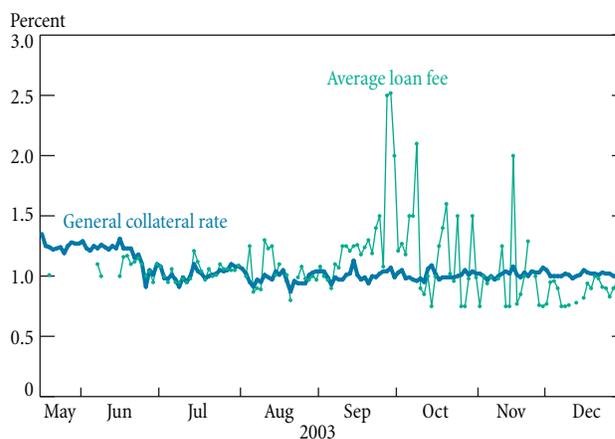
At noon each business day, the Federal Reserve offers to lend for one day up to 65 percent of the amount of each Treasury security that it beneficially owns, subject to an upper limit of the amount of the issue actually in its account, that is, not already out on loan.^a Primary dealers bid for a loan of a specific security by indicating the quantity desired (in increments of \$1 million) and a loan fee (the Fed imposes a minimum fee of 75 basis points). Bids are accepted until 12:15 p.m. Loans are awarded to the highest bidders at their bid rates until all of the securities available for lending have been allocated or all of the bidders have been satisfied. A dealer cannot borrow more than \$200 million of any single issue or more than \$1 billion of securities in aggregate.

Dealers who borrow securities from the Federal Reserve collateralize their borrowings by pledging other Treasury securities of comparable value. This is sometimes described as a "bonds-versus-bonds" borrowing to distinguish it from the "bonds-versus-cash" borrowing effected with a special collateral RP. A bonds-versus-bonds borrowing at a fee of 1 percent is essentially equivalent to borrowing money in the general collateral market at 3 percent and then lending the money to borrow a specific security in the specials market at 2 percent. More generally, the auction loan fee for a security should usually equal the difference between the general collateral rate and the specials rate for that security.

^aThe terms of the Fed's lending program have been amended several times since the program was revised in 1999. This box describes program provisions as of December 2003.

Chart 2

Average Loan Fee for the 3 5/8 Percent Treasury Note of May 2013 in the Federal Reserve's Securities Loan Auctions and Overnight Rate on General Collateral Repurchase Agreements



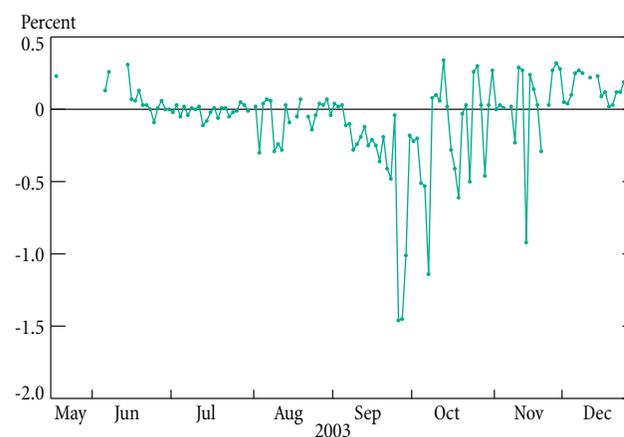
Sources: Federal Reserve Bank of New York; GovPX.

collateral rate was 0.95 percent that day so the implied specials rate for the note was -30 basis points (Chart 3). On August 11, 12, and 13, the loan fee exceeded 1.20 percent and the implied specials rate was less than -20 basis points. Thus, the Fed's loan auctions in the first half of August gave a clear indication of unusual stress in the market for borrowing the ten-year note.

That stress eased a bit following issuance of a new ten-year note (the 4 1/4 percent note maturing in August 2013) on August 15. Average auction loan fees for the

Chart 3

Implied Specials Rate for the 3 5/8 Percent Treasury Note of May 2013 from the Federal Reserve's Securities Loan Auctions



Source: Authors' calculations, based on data from the Federal Reserve Bank of New York and GovPX.

3 5/8 percent note moderated to about 1 percent and the implied specials rate rose to about zero. However, at 11 a.m. on September 8, the Treasury Department announced that it would reopen the 4 1/4 percent ten-year note in an auction on September 11. This quashed any hope that it might reopen the 3 5/8 percent note in order to alleviate the fails situation in that note.¹² On the same day, the loan fee for the 3 5/8 percent note moved back above the general collateral rate and the implied specials rate fell to -11 basis points. The implied specials rate stayed well below zero through the beginning of October, reaching a low of -146 basis points on September 26.

Specials Rates for the 3 5/8 Percent Note

Comparing Charts 1 and 3 raises the question of why the specials rate for the 3 5/8 percent note remained at zero when the implied specials rate for the same note in the Fed's loan auctions was well below zero. Part of the answer lies in the difference between the certainty that the Fed will deliver securities following an auction and the likelihood that a private collateral lender would deliver on a loan of the notes. Dealers were willing to pay a premium to borrow from the Fed because the Fed never fails to deliver securities. (As noted in Box 2, the Fed only auctions securities that are actually in its account at the time of an auction.) In contrast, a private collateral lender may fail to deliver securities on a special collateral RP just as a private seller may fail to deliver securities on an outright sale. This was a material risk in the case of the 3 5/8 percent note because, as explained earlier, specials rates at or near zero created an incentive for market participants who did not already own the note to agree to lend it and then intentionally fail to deliver. The absence of any widely accepted convention for how interest payments would be treated in the event of a settlement fail also contributed to the difference between the zero specials rate in the private collateral loan market and the negative implied specials rate in the Fed's collateral auctions.

Guaranteed-Delivery Special Collateral RPs with Negative Interest Rates

In mid-September, some dealers began to enter into "guaranteed-delivery" repo contracts for the 3 5/8 percent note at interest rates as low as -3 percent.¹³ The guarantee of delivery on these contracts was weaker than a contractual commitment that the collateral lender would bear the costs of any damages caused by its failure to make delivery, but it was stronger than the obligation to deliver collateral against a conventional repo contract. Participants in the guaranteed-delivery market had a common understanding that an offering for guaranteed delivery would be made only if the notes were already in the lender's possession and available for

settlement. Participants also had a common understanding that a negative rate contract would be canceled if the collateral lender failed to deliver the notes on the scheduled starting date. This precluded the use of guaranteed-delivery contracts as vehicles for speculating against an increase in the specials rate for the notes.

Negative rate RPs did not make financing a short position in the 3 5/8 percent notes more expensive than it had been; they merely converted the implicit ancillary costs of failing—including incremental capital charges, higher labor costs, and customer dissatisfaction—into the explicit cost of lending money at a negative rate of interest in order to cure an outstanding fail. Moreover, the negative rates likely provided some additional incentive for holders of the notes to lend their securities.

After mid-October 2003, market stresses in the 3 5/8 percent ten-year note gradually eased and dealers began to make progress in reducing their outstanding fails through industry efforts to identify and net offsetting fails among multiple counterparties.¹⁴ Bids and offers for the note in guaranteed-delivery RPs at negative interest rates disappeared and the frequency with which the Fed's auction loan fee for the note exceeded the general collateral rate declined.

Conclusion

From early August to mid-November of 2003, some market participants lent money at negative interest rates to borrow a particular Treasury note. The episode is instructive because it refutes the popular assumption that interest rates cannot go below zero and demonstrates how the collateral value of a security can lead to negative interest rates. The episode also shows that the ancillary costs of failing on an obligation to deliver Treasury securities can sometimes be significant. Finally, the episode shows that market participants will modify old contract forms to meet new needs—demonstrated in this case by the appearance of guaranteed-delivery repo contracts—as economic conditions evolve.

Notes

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1. *Federal Reserve Bulletin* 89, no. 12 (December 2003): A27, Table 1.43, "U.S. Government Securities Dealers, Positions and Financing." The \$2.41 trillion figure is the sum of lines 33 and 34 in the table.
2. Special collateral RPs are explained by Duffie (1996), Keane (1996), Jordan and Jordan (1997), Fisher (2002), and Fleming and Garbade (2002).
3. Instances of extremely low specials rates are documented by Cornell and Shapiro (1989), Jordan and Jordan (1997, pp. 2058-9), and Fleming (2000, pp. 229-31).

4. See Public Securities Association (1993, chap. 8, sect. C). Settlement fails are discussed in more detail in Fleming and Garbade (2002).
5. Analysts have recognized the possibility of negative specials rates—see Duffie (1996, pp. 504-5) and Jordan and Jordan (1997, p. 2054)—but instances are extraordinarily rare.
6. See “Supply Dries Up Following Fall in Prices,” *Financial Times*, August 27, 2003, p. 27; Shatz and Elders (2003); and “Mortgage Bonds: A Game of Chicken,” *Wall Street Journal*, November 26, 2003, p. C10.
7. See “Bond Officials Step Up Cleanup Effort,” *Wall Street Journal*, August 28, 2003, p. C11; and “Supply Dries Up.”
8. See “FICC Urges Bond Dealers to Net Trades, Curb 10-Yr Fails,” *Dow Jones Newswires*, July 31, 2003.
9. “Report to the Secretary of the Treasury from the Treasury Borrowing Advisory Committee of The Bond Market Association,” November 5, 2003, posted at <<http://www.treas.gov/press/releases/js932.htm>>.
10. See, for example, the special re-nets called by the Government Securities Division of the Fixed Income Clearing Corporation (FICC) and announced in FICC Important Notices GOV92.03 (July 10, 2003) and GOV106.03 (August 4, 2003), as well as the conversions encouraged in FICC Important Notice GOV104.03 (July 31, 2003). (Subsequent re-nets were announced on August 20 and 25, September 18, October 8, and November 24, 2003.) See also “FICC Sees More 10-Yr Fails; Gtd Delivery Market Heats Up,” *Dow Jones Newswires*, October 7, 2003; and “Bond Officials Step Up Cleanup Effort.”
11. Fleming and Garbade (2003) examine the relationship between the Fed’s securities loan auctions and the over-the-counter specials market.
12. The Treasury had twice before alleviated severe scarcity in a ten-year note with a reopening. In November 1992, it reopened the 6 3/8 percent note of August 2002 “to alleviate an acute, protracted shortage” of the note (“Treasury November Quarterly Financing,” *Public Debt News*, Department of the Treasury, November 3, 1992). In October 2001, it reopened the 5 percent note of August 2001 to alleviate a “chronically high fails rate” following the attacks of September 11 (Fleming and Garbade 2002).
13. See “FICC Cleans Up Some Old 10Y Fails; Repo Mkt Sees Trading,” *Dow Jones Newswires*, September 22, 2003; and “FICC Sees More 10-Yr Fails.”
14. See “Old Tsy 10-Yr Note Starts to Clear Amid Lingering Fails,” *Dow Jones Newswires*, October 17, 2003. See also the industry efforts cited in note 10.

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