Naked Short Sales and Fails to Deliver: An Overview of Clearing and Settlement Procedures for Stock Trades in the US

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ABSTRACT

This article outlines the process of clearing and settlement for stock trades in the US. It pays particular attention to what happens when the seller of a stock fails to deliver that stock at settlement and describes the mechanisms to resolve delivery failures. Fails to deliver can occur for a number of reasons, such as human error, administrative delays and the controversial practice of naked short selling. This article helps understand the implications of naked short selling for trade counterparties and, more generally, the effects of naked short selling on the clearing and settlement system.

Keywords: clearing, settlement, fail to deliver, naked short selling, National Securities Clearing Corporation (NSCC), Depository Trust Company (DTC).

INTRODUCTION

Naked short selling, i.e., selling a stock short without borrowing it and subsequently failing to deliver the stock at settlement, has recently caused much sensation. Critics claim that naked short selling is used in abusive trading strategies and manipulative attacks on companies. Disgruntled Wall Street veterans, company directors and shareholders have blamed naked short sellers for the collapses or near collapses of several companies and gone so far as to establish organizations to campaign against naked short selling (e.g., National Coalition Against Naked Shorting (NCANS)). Regulators such as the US Securities and Exchange Commission have responded with a frenzy of additional rules and temporary bans, on several occasions stating their concerns about naked short selling.[1]

Despite the widespread criticism, not all naked short selling is abusive. Some naked short selling occurs unintentionally when a short seller, in line with current regulation, locates shares to borrow (or has reasonable belief that shares can be located and borrowed), but for some reason is unable to borrow the stock in time for delivery. Further, some naked short selling is due to market making.[2]

A fail to deliver (FTD) occurs when the seller of a security does not deliver that security to the buyer within the standard three-day settlement period. Naked short selling is one way that this can occur. FTDs can also arise from various processing errors, delays in obtaining physical stock certificates or human error in entering the incorrect stock symbol. Figure 1 plots the aggregate number of FTDs and daily trade volume for stocks listed on the New York Stock Exchange, the American Stock Exchange and Nasdaq from 2004 to 2009. As one might expect, the number of FTDs is correlated with overall trade volume, but also exhibits some meaningful deviations.[3] Fail volume decreases between 2004 and 2007, increases rapidly during 2007 and 2008 and declines substantially at the end of 2008. For most of the period between 2004 and 2009 the number of FTDs for stocks listed on the main US exchanges is between 1.5% and 5% of average daily trade volume.[4]

< FIGURE 1 HERE >

The purpose of this article is to provide an overview of the clearing and settlement procedures for stock trades in the US, with a focus on what happens when market participants fail to deliver stock at settlement. This information helps understand the implications of naked short selling for trade counterparties and, more generally, the effects of naked short selling on the clearing and settlement system. First this article highlights the differences between naked short selling and traditional short selling. Next it describes: (i) the organizations involved in clearing and settlement; (ii) the procedures for trades that settle successfully and trades in which the seller fails to deliver stock at settlement; and (iii) the mechanisms to reduce FTDs once they occur. Finally, this article draws some conclusions about the clearing and settlement procedures in relation to delivery failures.

TRADITIONAL VS NAKED SHORT SELLING

Traditional short selling

Traditional short selling involves a seller borrowing stock they do not own from a broker or institutional stock lender and selling it. The buyer receives the stock previously owned by the lender and is usually unaware that they transacted with a short seller. Often, short selling is a bet that the stock's price will fall and the stock will be able to be bought back at a lower price and returned to the lender, earning the short seller the amount of the price decline less the cost of borrowing the stock.

When a short seller borrows a stock, whether it is from their broker or from an institutional lender, they typically leave the proceeds of the sale (and often a certain percentage more) with the lender as collateral for the borrowed stock. The lender can invest the cash collateral, earning interest. The borrower usually also pays a fee to the lender that depends on the availability of the stock. This fee is often only about 10 basis points per annum for easy to borrow stocks. In a competitive lending market such as that of the US, institutional lenders often pay institutional borrowers interest on the cash collateral (known as a short interest rebate) in order to obtain their business.

Naked short selling

In "naked" short selling the seller does not borrow the stock and as a result fails to deliver the stock to the buyer at settlement.[5] The fail to deliver (FTD) typically occurs three business days after the naked short sale due to the "T+3" settlement used in the US.

Two possible reasons for intentionally engaging in naked short selling are: (i) to short sell stocks that are difficult or impossible to borrow; and (ii) to conduct manipulative "bear-raids" on stocks. When borrowing costs are high, market makers sometimes choose not to borrow and instead naked short sell.[6] In such cases naked short selling, then failing to deliver is economically equivalent to borrowing shares at a zero-fee zero-rebate equity loan plus the expected cost of being forced to buy back the stock and deliver it (a process called "buying-in"). In difficult-to-borrow stocks, this amount can be less than the cost of borrowing. Critics of naked short selling, and many companies that claim to have been targets of manipulative selling attacks argue that naked short selling can be used to conduct "bear-raids" because naked short sales artificially increase the supply of shares in the market.[7] Because naked short sellers do not borrow the stock they can theoretically sell an unlimited volume of stock into the market, driving down a share price. Traditional short sellers, on the other hand, are limited by the amount of stock they can locate to borrow, which can become limiting as the level of short interest becomes large.

ORGANIZATIONS INVOLVED IN CLEARING AND SETTLEMENT

Through its subsidiaries, the Depository Trust and Clearing Corporation (DTCC) provides clearing, settlement and information services for equities and other securities traded on US financial markets. One of its key roles is to reduce counterparty risk by guaranteeing obligations will be fulfilled. It centralizes, automates, and standardizes the clearing and settlement processes. Two DTCC subsidiaries that play important roles in these processes are the National Securities Clearing Corporation (NSCC) and the Depository Trust Company (DTC).

The NSCC fulfills the clearing role (computation of the obligations to be settled) and serves as the central counterparty for trades in the US securities markets. In doing so, the NSCC guarantees completion for virtually all broker-to-broker trades involving equities.[8] In its clearing role, the NSCC is responsible for multilateral netting of trades and payments among its participants, thereby reducing the number of payments and securities that are exchanged. This function also serves to reduce counterparty risk.[9] Trades are netted in the Continuous Net Settlement (CNS) system. The NSCC has roughly 4,000 participants and is regulated by the SEC.

The DTC, in fulfilling its role facilitating settlement (the actual transfer of securities and cash between buyers and sellers), maintains a centralized store of stock ownership records. Today these are largely electronic records (although the DTC is also a store of physical certificates) and cover a large proportion of all US listed stocks. The DTC is responsible for transferring stock ownership, usually by making electronic book-entry changes, to reflect NSCC's net settlements (or instructions from other trade matching services or participants), as well as transferring money between participants (brokers and broker-dealers). The DTC does this by debiting and crediting participants' securities and money settlement accounts held at the DTC. The DTC is registered as a clearing agency with the SEC and monitors its participants to ensure compliance with DTC's Rules and Procedures. The SEC conducts an annual inspection of DTC's data processing areas and has conducted an inspection of selected operating areas every other year.

If a participant fails to settle with the DTC, the DTC may cease to act for that participant and terminate their membership. Such events are notified immediately to the SEC via a filing and to other clearing agencies via DTC's Participant Terminal System (PTS). The participant is expected to continue to meet all its settlement obligations. The DTC has resources of $2.35 billion, consisting of an all-cash Participants Fund of $600 million (collateral deposited by participants) and a committed bank line of $1.75 billion credit, in order to complete settlement and cover any losses from participants' failure to settle. The NSCC also has a Participant Fund that it holds as collateral to cover losses from participant defaults. This serves as a form of mutualized default risk-sharing.

Clearing participants include brokers, broker-dealers, banks and insurance and investment companies. They are bound by the rules of the NSCC and DTC[10] and pay fees to the clearing organizations, which participants in turn may pass on to their clients. Figure 2 illustrates simplified interactions between key parties in a typical stock transaction.

< FIGURE 2 HERE >

PROCEDURES

Trades that settle successfully

Most US equity trades are cleared and settled through NSCC's Continuous Net Settlement (CNS) system. Each trading day, stock exchanges electronically transmit details of trades that have taken place. For a trade that is executed on day T, NSCC's guarantee of settlement begins midnight between T+1 and T+2, at which time NSCC steps in the middle of the trade and assumes the role of counterparty for both the buyer and seller. NSCC multilaterally nets trades by stock and on T+2 notifies participants of their net positions in each stock (net long or net short) due to be settled, as well as summaries of all their trades.[11] Netting includes not only trades that are due to settle on T+3 but also open positions that were due to settle previously, such as positions resulting from fails. Netting is done to minimize the amount of stock and cash transfers. Because the NSCC is the counterparty to each trade, a participant with a short position in a particular stock can be thought of as owing the NSCC the short amount of that stock and a participant with a long position can be thought of as being owed the long amount of that stock by the NSCC.

On the third business day following the trade (T+3) instructions are sent to the DTC containing net securities positions to be settled, and the DTC makes the transfers of stock and cash. This occurs in two cycles. In the "night cycle" (early morning of the settlement day) CNS short positions, i.e., stock owed to the NSCC by participants, are transferred from the participants' stock accounts at the DTC to the NSCC's stock account at the DTC.[12]

An algorithm run by the NSCC determines which of the participants with long positions (participants that are owed stock by the NSCC) due to be settled that day will receive stock. The algorithm works by allocating shares in the following order: priority groups in descending order, age of position within a priority group and random numbers within age groups. Participants can request that they be given priority to receive stock on a standing or override basis. Also, participants that submit buy-in notices (requests to receive stock owed to them) receive priority with buy-ins due to expire that day given priority over buy-ins due to expire the following day, which in turn are given priority over priority requests and priority overrides. Each member's random number is different in each security and is generated daily by a computer. The results from the algorithm are sent to the DTC and subsequently during the second phase of the settlement (the continuous "day cycle") the DTC transfers stock from the NSCC's account into the stock accounts of the participants with long positions selected by the algorithm.

For CNS deliveries, cash transfers do not occur simultaneously with stock transfers. Cash credit/debit entries are made to participants' money settlement accounts, netted at the end of the day (known as settlement netting, this differs from the exposure netting done by the NSCC) and finally, any net credit balance is transferred to the participant and any net debit balance is transferred from the participant through the Federal Reserve's money transfer system (Fedwire). The transfers occur between DTC's account at the Federal Reserve Bank of New York and the participants' settling banks.

If no participants fail to deliver on their short positions, i.e., the DTC is able to transfer all the stock owed by participants to the NSCC account, and there are no open failed positions from previous days, then all participants receive the stock they are owed by the NSCC. In this case there would be no open long or short positions carried forward in time.

What happens when a fail occurs?

If a participant is unable to deliver on their net short position (stock owed to the NSCC), the position is called a "fail to deliver" (FTD) and the short position remains open. The failure to deliver may be because the seller does not own the stock or simply because of an administrative delay in obtaining the stock ownership records, for example, when physical certificates have to be found. When participants fail to deliver stock, the NSCC receives less stock than it owes and consequently may not be able to deliver stock to all participants with long positions. The long positions for which the NSCC is unable to deliver stock remain open long positions called "fail to receive" (FTR). This can be thought of as an IOU from the NSCC to the participant with the long position and similarly the FTD can be thought of as an IOU from the participant with the short position to the NSCC. Dividends are automatically debited from participants with FTD positions and credited to those with FTR positions. However shareholder voting rights are distorted because FTR holders (participants with stock IOUs from the NSCC) do not receive the usual voting rights that they would had the stock been delivered. They are also unable to lend the stock until they actually receive it.

Most often, the clients of participants with FTR positions are not aware they have been credited an IOU (as opposed to actual stock) because their stock holding account does not distinguish between the two. Only the NSCC and the participant are aware of the difference. Participants with FTRs are able to sell them just as if they were ordinary shares because the buyer is also not aware that the seller is yet to receive the stock owed to them by the NSCC. When this occurs the FTR is simply passed on in the CNS system as an IOU of stock from the NSCC. The buyer does not necessarily end up with the IOU due to the randomization in the algorithm that allocates stock from the NSCC.

When a participant receives an FTR (the IOU from the NSCC) cash is still debited from their account even though they have not yet received the stock. However, instead of being paid to the participant with the FTD it is held by the NSCC as collateral until such time as the stock is delivered and the FTD is cancelled. The amount of cash collateral held is not the cash value of the stock bought/sold but, rather, is the marked-to-market value of the stock, reset daily with cash adjustments.[13] The cash adjustments are made from the money settlement account of the participant that failed to deliver the stock. As a result of the daily marking-to-market, the cash collateral approximately tracks the cost to the NSCC if it had to purchase the stock to deliver to the participant with the FTR.

Critics of the NSCC claim that a potential danger of this system of marking-to-market the cash collateral is that in the case of fails caused by naked short sellers conducting "bear raids", as the price of the stock falls, the naked short seller is able to withdraw the cash adjustments and leave the NSCC heavily under-collateralized for the true value of the stock. However, this is not possible because the level of collateral held by the NSCC cannot decrease when prices fall, it can only increase when prices rise.[14]

The Stock Borrow Program

A mechanism the NSCC has in place to reduce the number of FTRs (but does not reduce FTDs) is the Stock Borrow Program. Under this program participants are able to lend excess stock in their DTC accounts to the NSCC so that the NSCC can satisfy delivery requirements not filled via normal deliveries. Each day, participants submit a list of stocks they own that they would like to have participate in the Stock Borrow Program. Once the NSCC determines the open long positions (stock it owes participants) that are due to become FTRs, it attempts to satisfy these obligations by borrowing from participants in the Stock Borrow Program. If there are more potential lenders than the NSCC's borrowing requirement, the NSCC determines which lenders it will borrow from using an algorithm that takes into account participants' average loans and clearing fees.

When the NSCC borrows stock from a participant it credits the participant's money settlement account with the marked-to-market value of the borrowed stock. Recall this is the same as the collateral held from the participant that failed to deliver the stock (the purchase price from the buyer and mark-to-market cash adjustments from the failing participant), so effectively the NSCC is simply acting as a facilitator of lending between the participant failing to deliver and the participant lending their stock. The participant lending stock may invest this cash collateral to earn interest overnight and does not have to pay a rebate on the interest as in normal competitive lending markets, thus making participation in the program attractive. The process is reversed when the NSCC returns the borrowed stock.

Although the NSCC states that the purpose of the Stock Borrow Program is to cover temporary shortfalls in CNS, there is no time limit on how long NSCC may borrow stock from its participants. The use of the Stock Borrow Program does not eliminate the delivery obligation of participants with FTDs. In 2005 the Stock Borrow Program was able to resolve approximately 20% of FTRs.[15] In the remaining approximately 80% of cases the FTRs persist in perpetuity and are passed on from one participant to another as stocks are traded.

For FTDs caused by naked short selling, the situation resulting from the Stock Borrow Program is equivalent to the naked short seller borrowing stock from the Stock Borrow Program participants at a zero-fee zero-rebate loan and sort selling the stock to the participants that would have received FTRs in the absence of the Stock Borrow Program. The Stock Borrow Program has been criticized for allowing naked short selling to persist.

Buying-in

"Buying-in" is the process in which a seller that has failed to deliver stocks is forced to purchase and deliver the stocks to the buyer. This process is initiated by a buyer that fails to receive stocks and occurs with the mediation of the NSCC. Any participant with an FTR at the end of a day may submit a Notice of Intention to Buy-In (a "Buy-In Notice") specifying the quantity of securities it intends to buy-in (the "Buy-In Position"). For the purpose of this description, the day the Buy-In Notice is submitted is referred to as N, and N+1 and N+2 refer to the succeeding days. The Buy-In Position is given high priority in the allocation algorithm that determines which participants will receive shares on a settlement day. This high priority lasts from the "night cycle" (early morning) of N+1, through to completion of the CNS day cycle on N+2. The high priority in the algorithm that allocates shares is likely to result in the Buy-In position being filled, without the FTD being resolved. When this occurs, the FTR is passed on to a participant with lower priority in the allocation algorithm, for example, a participant that has just bought the stock.

If the Buy-In Position (or a portion thereof) remains unfilled after N+1, the NSCC issues CNS Retransmittal Notices on the morning of N+2 which specify the participant requesting the buy-in and the total amount called for in the Buy-In Notice. The CNS Retransmittal Notices are issued to participants in order of the age of their FTD positions with the oldest FTD positions being first. In aggregate, the Retransmittal Notices issued make up a quantity at least equal to the Buy-In Position. The buy-in liability for any failing participant does not exceed the size of their FTD position. If several participants have short positions with the same age, all such participants are issued CNS Retransmittal Notices, even if the total of their FTD positions exceeds the Buy-In Position.

If the Buy-In Position is not satisfied by 3:00 PM on N+2, the participant may submit a Buy-In Order to the NSCC instructing the NSCC to buy-in the remaining position. In such a case the NSCC would: (i) buy the shares from whatever market it chooses; (ii) deliver to the originator of the Buy-In Order (cancelling out the bought-in FTRs); (iii) cancel the FTDs corresponding to the bought in shares; and (iv) debit/credit any difference between the cash collateral held by the NSCC and the purchase costs including fees to the money settlement accounts of the participants with the bought-in FTDs. NSCC allocates buy-ins and associated costs to participants (as mentioned previously, oldest fails first) and participants in turn allocate the buy-ins to their clients at their own discretion. Anecdotal evidence suggests participants use this discretion to allocate a disproportionately small number of buy-ins to protected clients.[16]

Two aspects of this process that are most often misunderstood are as follows. First, Buy-In Notices do not necessarily force a participant with an FTD position to close out that position by buying stocks. This is because, as a first step in the buy-in process, putting the participant with the FTR on a high priority in the delivery algorithm makes it likely that they will receive their shares and the FTR position will be passed on to another participant. Second, when a buy-in does force a participant with an FTD to purchase the stock, it is not necessarily the participant that the originator of the Buy-In Notice initially traded with. This is because in the delivery process positions are netted and the NSCC assumes the role of counterparty to each transaction. Instead, it is the participant with the oldest fails that is forced to buy the stock.

Buy-ins are rare. Evans et al. (2009) find that out of a total of 69,063 failed transactions of a market maker in 1998-1999 only 86 were bought-in. Boni (2006) argues that one reason why buy-ins are rare is that firms are unwilling to earn a reputation for forcing delivery in the hope that other firms will be equally lenient towards them when they fail to deliver.

This overview of the clearing and settlement procedures suggests an alternative reason why buy-ins are rare. Multilateral netting in CNS includes not only trades that are due to settle that day but also existing open positions such as FTRs. The algorithm that determines which long positions will receive stocks, allocates shares to the oldest positions first, within a priority group. This means that on any day in which the number of normal priority trades due to settle exceeds the number of FTRs, all existing FTRs will be passed on to the more recent long positions due to settle that day. Given the earlier finding that FTDs represent approximately 1-5% of daily traded volume, it is only in rare circumstances or in very infrequently traded stocks that a participant would be left with an FTR for long enough to go through the Buy-in process.

While the open FTD and FTR position lasts, this arrangement is effectively an involuntary zero-fee zero-rebate equity loan from the buyer to the seller. If a naked short seller is forced to buy-in, then in order to maintain a short position they must buy the stock, deliver it to the initial counterparty and then naked short sell the stock again, together costing them the roundtrip transaction costs. The NSCC may also charge a fee to the participant that fails to deliver, however, the fee is insignificant in relative terms. Because the incidence of buy-ins is low and penalties for failing are small, naked short selling effectively is a way of short selling difficult or impossible to borrow stocks.

CONCLUSIONS

This article has outlined the process of clearing and settlement for stock trades in the US. It has paid particular attention to what happens when the seller of a stock fails to deliver at settlement and has described the main mechanisms in place to resolve delivery failures.

Fails to deliver can occur for a number of reasons, some of which are uncontroversial, such as human error or administrative delays. However, one important cause of delivery failures, naked short selling, has recently caused much sensation among stock issuers, regulators, shareholders, company directors and the media. This article helps understand how naked short selling is dealt with in clearing and settlement.

A few conclusions can be drawn from this overview. First, from a naked short seller's perspective, naked short selling is economically equivalent to a zero-fee zero-rebate loan to the naked short seller from a participant that involuntarily fails to receive shares. The algorithm that allocates shares to participants after multilateral netting passes existing FTRs to participants with more recent long positions. Therefore, the participants that effectively act as involuntary stock "lenders" in this arrangement change as shares are traded. When the Stock Borrow Program resolves a naked short seller's FTD, the situation that arises is economically equivalent to a zero-fee zero-rebate loan from the Stock Borrow Program participant to the naked short seller.

Second, from the buyer's perspective, buying from a naked short seller does not necessarily result in failing to receive the stock at settlement. The algorithm that allocates shares is equally likely to allocate the resultant FTR to any of the other participants that bought the same stock on the same day (assuming normal priorities).

This further suggests that a buyer may fail to receive shares at settlement even though the seller delivered the shares at settlement. Buyers that receive an FTR during settlement rather than the actual shares are unlikely to be aware of this. They have most of the rights of buyers that receive shares during settlement (e.g., entitlement to dividend payments and right to sell the stock), but not all of the rights (e.g., no voting rights and no entitlement to lend the stock).

Thirdly, this overview suggests an alternative to the reason put forward by Boni (2006) to explain why buy-ins are rare. Given the way in which the settlement procedures reallocate FTRs and the finding that FTDs represent approximately 1-5% of daily traded volume, only in rare circumstances or in very infrequently traded stocks would a participant have an FTR for long enough to initiate the Buy-in process, let alone complete it. Further, if a buy-in is completed, the participant forced to purchase the stock is not necessarily the same participant with which the Buy-In Notice originator traded.

Finally, the US clearing and settlement system does not provide any significant disincentives for naked short selling. The Buy-in procedure, on the rare occasions that it is used, is unlikely to force a naked short seller to close out the FTD; the Stock Borrow Program effectively facilitates a zero-fee zero-rebate loan to the naked short seller; and the fees for failing are insignificant.

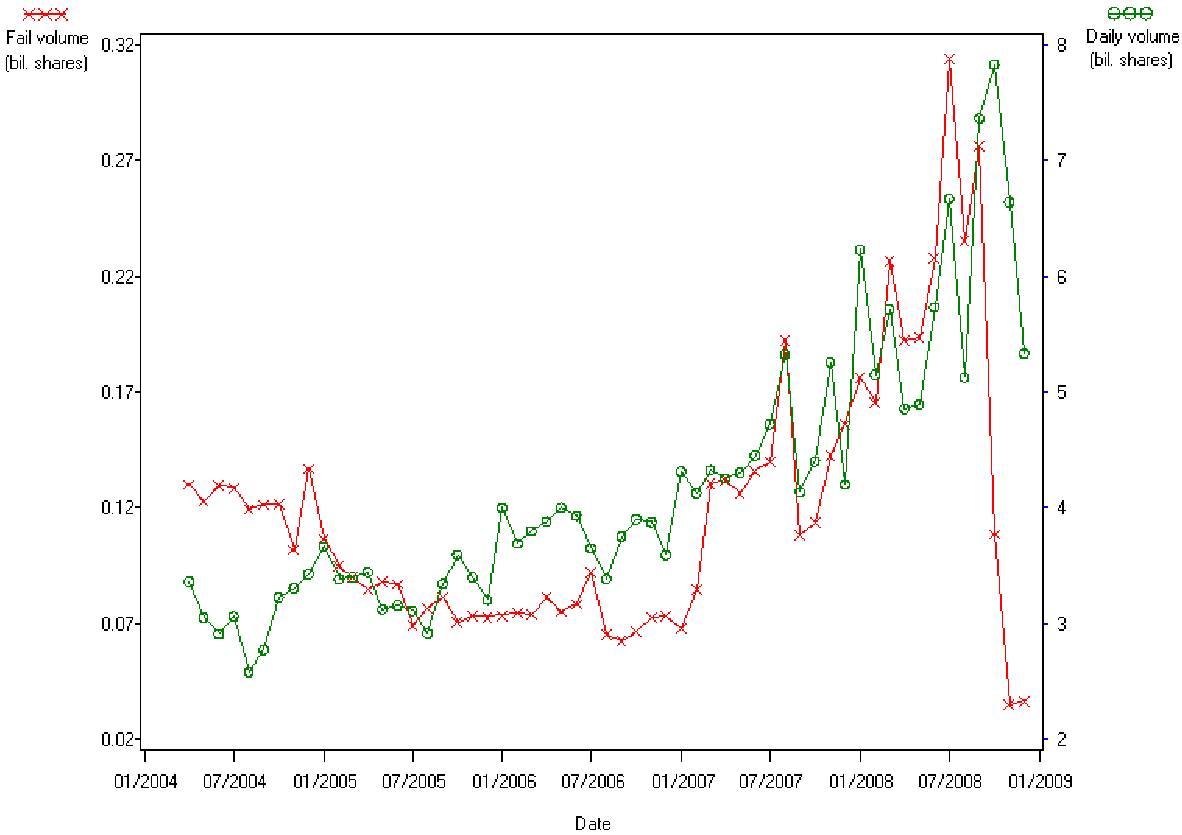

Figure 1. Volume of fails to deliver and daily trade volume for stocks listed on the New York Stock Exchange, the American Stock Exchange and Nasdaq.

Fail volume is the number of fails to deliver (FTD) in the Continuous Net Settlement system (consisting of new fails on the reporting day and existing fails), aggregated over all stocks with an FTD balance of 10,000 shares or more. Because stocks with an FTD balance less than 10,000 shares are not included in this aggregate, *Fail volume* is a lower bound for the actual number of FTDs at any point in time. *Daily volume* is the average number of shares traded per day, aggregated over all stocks. The data are from the Centre for Research in Security Prices and the US Securities and Exchange Commission.

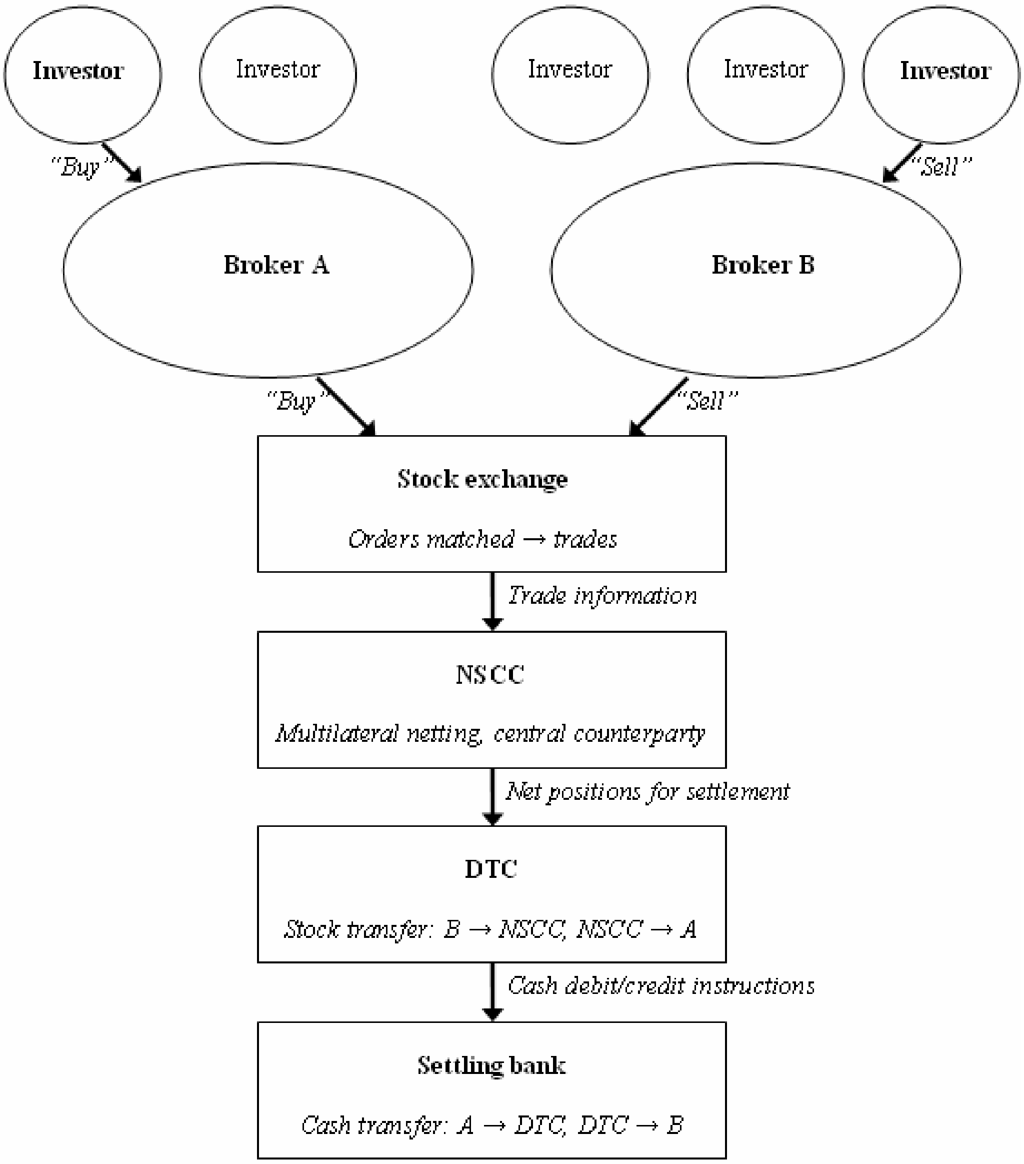

Figure 2. Simplified schematic of a broker-to-broker trade, clearing and settlement.

Cited Literature

Boni, L., 2006, Strategic delivery failures in U.S. equity markets, *Journal of Financial Markets* 9, 1-26.

Depository Trust Company, 2008, Rules, by-laws and organization certificate, Effective August 2008.

Evans, R., C. Geczy, D. Musto and A. Reed, 2009, Failure is an option: Impediments to short selling and options prices, *Review of Financial Studies* 22, 1955-1980.

Green, E., 2001, Clearing and settling financial transactions, Circa 2000, in: Challenges for central banking, A. Santomero, S. Viotti and A. Vredin (eds.), Kluwer Academic Publishers, Boston.

National Securities Clearing Corporation, 2008, Rules and procedures, Effective September 2008.

Schwartz, R.A. and R. Francioni, 2004, Equity markets in action: The fundamentals of liquidity, market structure and trading, Wiley Hoboken.

Stokes, A.B., 2009, In pursuit of the naked short, *Journal of Law and Business* 5, 1-61.

Notes

[1] For example, in the SEC's July 27, 2009, announcement about "making permanent a rule to curtail naked sort selling", the SEC states "Sellers sometimes intentionally fail to deliver securities as part of a scheme to manipulate the price of a security … We have been concerned about reducing fails to deliver and addressing "naked" short selling, in particular, abusive "naked" short selling for some time."

[2] Under Regulation SHO, since January 2005, all short sellers except stock and options market makers are required to have either borrowed the stock, made an arrangement to borrow it, or have reasonable grounds to believe that the stock can be located, borrowed and delivered by the date delivery is due.

[3] Some of the variation in fail volume can be attributed to regulatory changes concerning naked short selling and failing to deliver. For example, the introduction of Regulation SHO (January 2005), the elimination of the market maker exemption from the Regulation SHO close-out requirements (September 2008), prohibition on short selling for brokers failing to deliver securities (September 2008), naked short selling anti-fraud rule (September 2008) and short selling bans (September/October 2008).

[4] Because stocks with an FTD balance less than 10,000 shares are not included in the fail volume, this estimate represents a lower bound for the actual amount of FTDs.

[5] This article uses the SEC's definition of naked short selling, i.e., "In a 'naked' short sale, a seller does not borrow or arrange to borrow securities in time to make delivery to the buyer within the standard three-day settlement period. As a result, the seller fails to deliver securities to the buyer when delivery is due" (SEC Release No. 34-58774, "'Naked' short selling antifraud rule"). Other articles use more narrow definitions involving intent, for example, "In a naked short sale, the investor … sells shares of that stock that he does not own or borrow and does not intend to own or borrow" (Stokes, 2009). The SEC refers to intentional naked short selling as "abusive" naked short selling, for example, "abusive 'naked' short selling … refers generally to selling short without having stock available for delivery and intentionally failing to deliver stock within the standard three-day settlement cycle" (SEC Release No. 34-58774, "'Naked' short selling antifraud rule").

[6] Evans et al. (2009), Boni (2006).

[7] See for example Emshwiller, John R., and Kara Scannell (July 5, 2007). "Blame the 'Stock Vault'?", *The Wall Street Journal*, and Drummond, Bob (September, 2006). "Games Short Sellers Play", *Bloomberg Markets*.

[8] In the year 2000, 99% of all US equity trades were cleared and settled through the NSCC and DTC respectively (Green, 2001).

[9] Green (2001).

[10] See Depository Trust Company (2008) and National Securities Clearing Corporation (2008).

[11] Multilateral netting is a system of cancelling offsetting transfers in each stock between multiple parties. For more information see Green (2001) or Schwartz and Francioni (2004).

[12] Participants, under certain conditions, are able to prevent their stock held at the DTC from being transferred to the NSCC account by placing an exemption. This is another way that a fail to deliver can occur.

[13] See NSCC (2008), p. 45, p. 252.

[14] NSCC (2008), p. 253.

[15] Source: DTCC First Deputy General Counsel (available at http://www.dtcc.com/news/newsletters/dtcc/2005/mar/naked_short_selling.php).

[16] Evans et al. (2009).