

Appendix

Clearing and Settlement in the United States

Three clearinghouses and three depositories serve the Nation's seven stock exchanges, National Association of Securities Dealers Automated Quotations System (NASDAQ), and other over-the-counter (OTC) dealers. Nine clearinghouses serve the 14 futures exchanges, and one clearinghouse serves all the equities options markets.¹ The major clearing members, who also clear for non-clearing members of a clearinghouse, tend to be highly automated for lower costs and greater operating efficiency. For safety purposes, U.S. clearinghouses also tend to be financially structured such that a failing clearing member can be isolated quickly and its problems resolved without a ripple effect.

While arrangements between clearinghouses and their clearing firms vary, the general goal is that the clearinghouse maintain adequate resources and commitments to assure settlement if a clearing firm defaults. These protective arrangements include capital requirements for members, claims on items in process, if any, and claims on the defaulting member's remaining assets on deposit with the clearinghouse (e.g., cash, letters of credit, Treasuries, or securities posted as collateral for margin). The clearinghouse also has claims on other assets of the failed clearing member. The clearinghouse's guarantee fund is another resource. Certain major clearinghouses, (e.g., the Chicago Mercantile Exchange and Board of Trade Clearing Corp.), also require the parent entities of their clearing members to guarantee all proprietary trading on the books of the clearing members. Finally, the clearinghouse can make assessments against other clearing member firms. This succession of fallbacks is a buffer against shocks ranging from sudden large price movements

to defaults by members. As a result, there have been few cases of a failure of a clearing member in the United States, and no instances of a failure of a clearinghouse.²

Equities Clearing Organizations

National Securities Clearing Corp. (NSCC)³

NSCC processes 95 percent of all equities trades in the United States. It is jointly owned by the principal equities markets: the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers (NASD). It serves 1,800 brokers, dealers, banks, and other financial institutions, through about 1,100 direct participants.

NSCC's clearance and settlement process normally requires 5 business days. Trade information is received either in the form of locked-in trades already matched by the computer systems of the exchange or market; or, as buy and sell data reported by market participants. The latter still must be compared and buy and sell orders matched. Locked-in trades are entered directly in the NSCC computer system on the same day as the trade. This sharply reduces the need for the matching of buy and sell orders at the clearinghouse level. On a typical day, about 76 percent of the trades on the NYSE are locked-in (a smaller proportion by dollar value).⁴ Figures A-1 and A-2 illustrate the steps in the NSCC's clearing and settlement of retail and institutional customers' trades, respectively.

Securities which are held for NSCC members by The Depository Trust Co. (DTC), and whose ownership can therefore be transferred within DTC via its

¹In preparing this appendix, OTA has relied heavily on a contractor report by Bankers Trust Co., "Study of International Clearing and Settlement" vols. I-V, prepared for the Office of Technology Assessment, October 1989, to which many dozens of institutions and individuals around the world contributed expert papers and/or served on the Bankers Trust advisory panel. Hereafter called Bankers Trust report. OTA has also used the discussions of an expert workshop held at OTA on Aug. 22, 1989. For information on the clearing and settlement of U.S. Treasury and government agency securities, mortgage-backed securities, and municipal securities, see Bankers Trust Report.

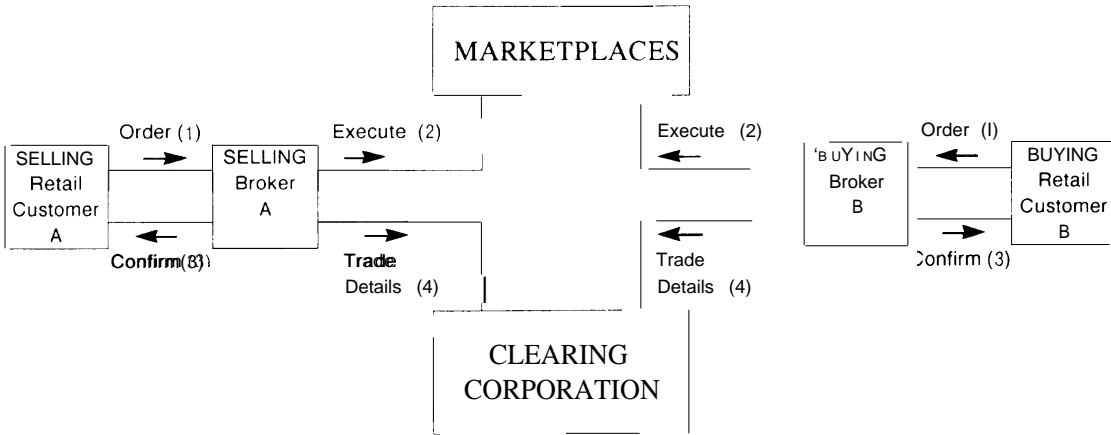
²One expert notes that the only situation he can envision in which the National Securities Clearing Corp. (which clears the vast majority of equities trades in the United States) could fail, would require a major external triggering event, such as the collapse of one or more major U.S. banks causing the failure of one or more NSCC clearing banks or major clearing members. (Robert Woldow, NSCC, at a meeting of experts on clearing and settlement, OTA, Aug. 22, 1989.) The events of October 1987 in the United States-when the payment system began to become clogged-were perceived as potentially disastrous.

³Robert J. Woldow, *Clearance and Settlement in the U.S. Securities Markets. An Overview of the Role of the National Securities Clearing Corp. in Equities Trading*, revised July 1990. Hereafter referred to as NSCC report.

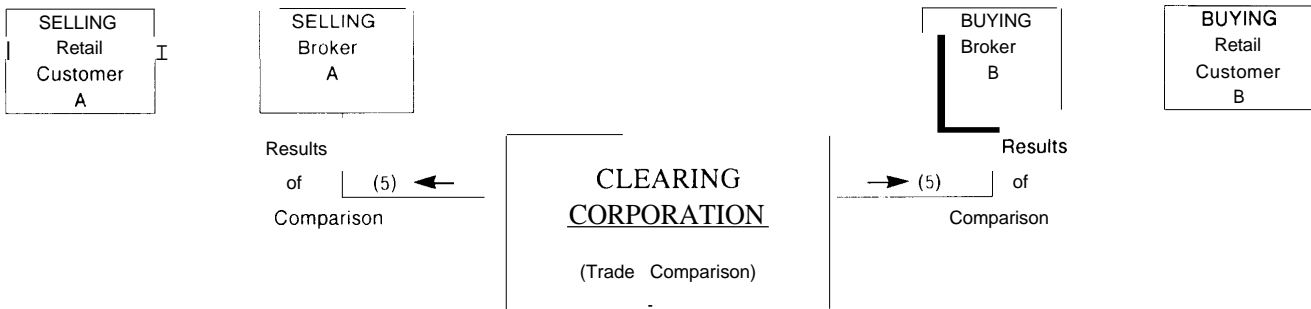
⁴In August 1989, the NSCC began comparing trades that are not locked-in during the early morning hours of T+1. Locked-in trades also include 56 percent of the American Stock Exchange's daily trades, and over 18 percent of OTC trades. *Ibid.*, NSCC report, p. 2.

Figure A-I-Clearance and Settlement of Retail Customer Trades

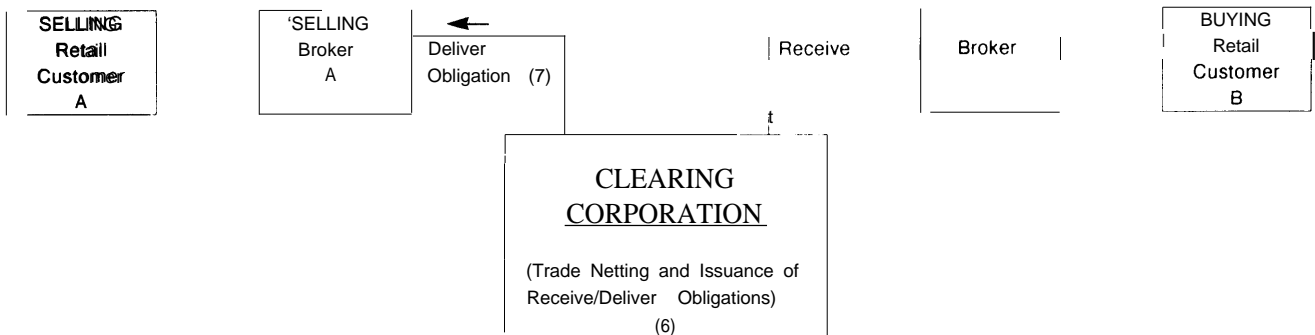
STEP 1. TRADE DATE (T)



STEP 2. TRADE DATE + 1 (T + 1)

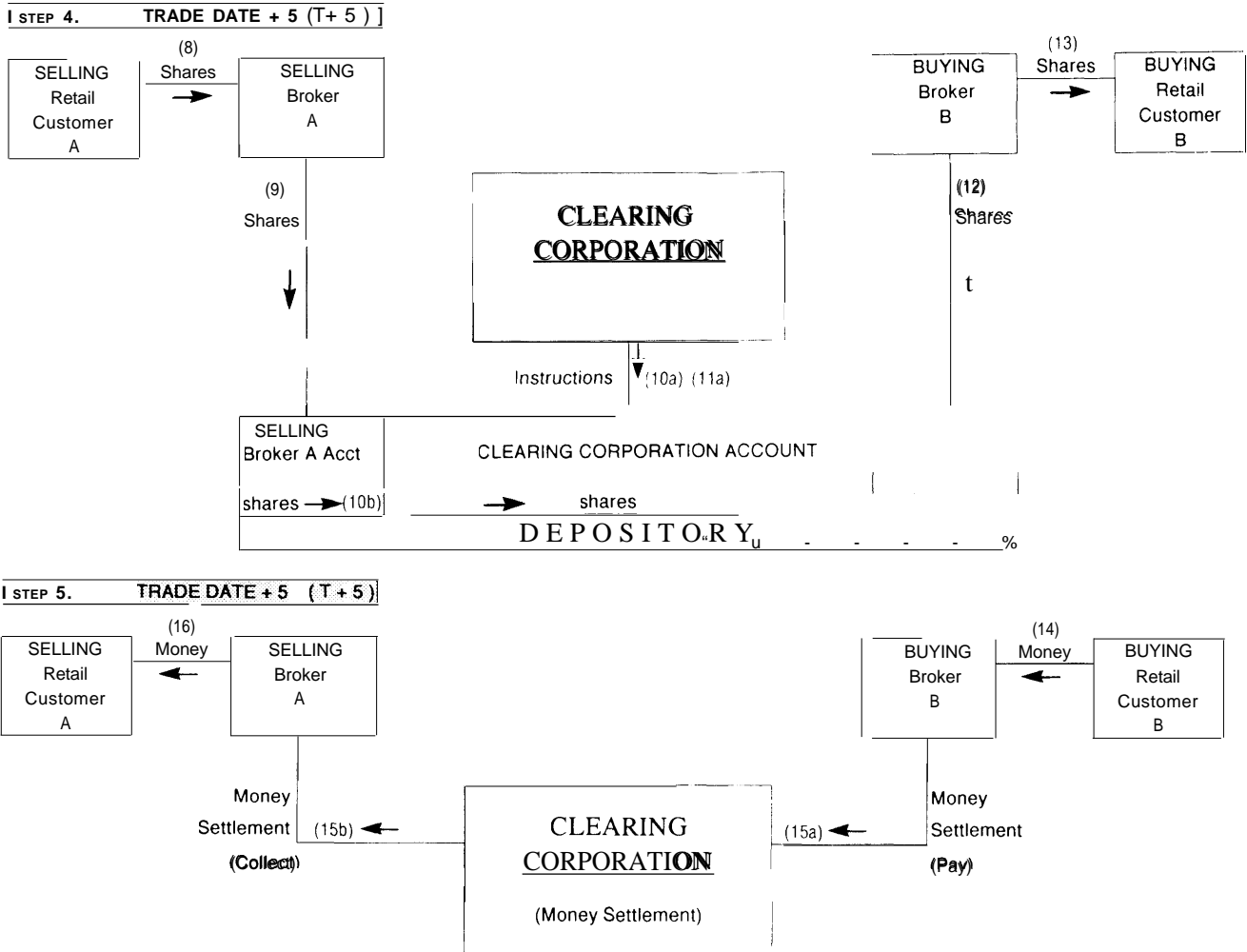


STEP 3. TRADE DATE + 4 (T + 4)



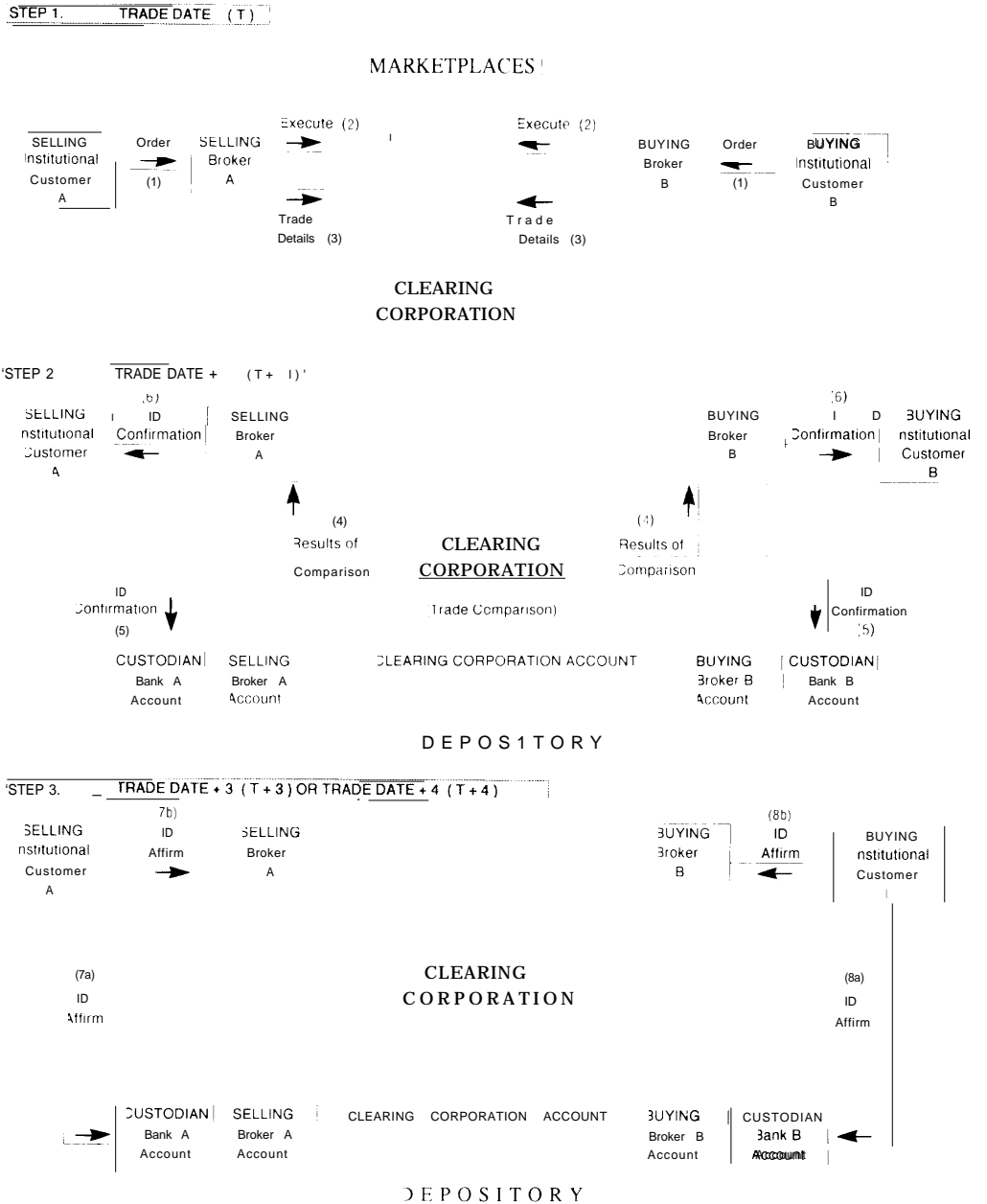
- (1) Retail Customers give orders to buy and sell stock to their respective Brokers
- (2) Brokers execute Retail Customers orders in the Marketplaces.
- (3) Brokers confirm back to their respective Retail Customers that the trades were executed.
- (4) Brokers submit details of trades executed in the Marketplaces to the Clearing Corporation.
- (5) Clearing Corporation generates reports back to the Brokers indicating the results of comparison
- (6) Clearing Corporation nets the trades.
- (7) Clearing Corporation issues projection reports indicating net receive/deliver obligations to the buying and selling Brokers.

Figure A-I--Clearance and Settlement of Retail Customer Trades-Continued



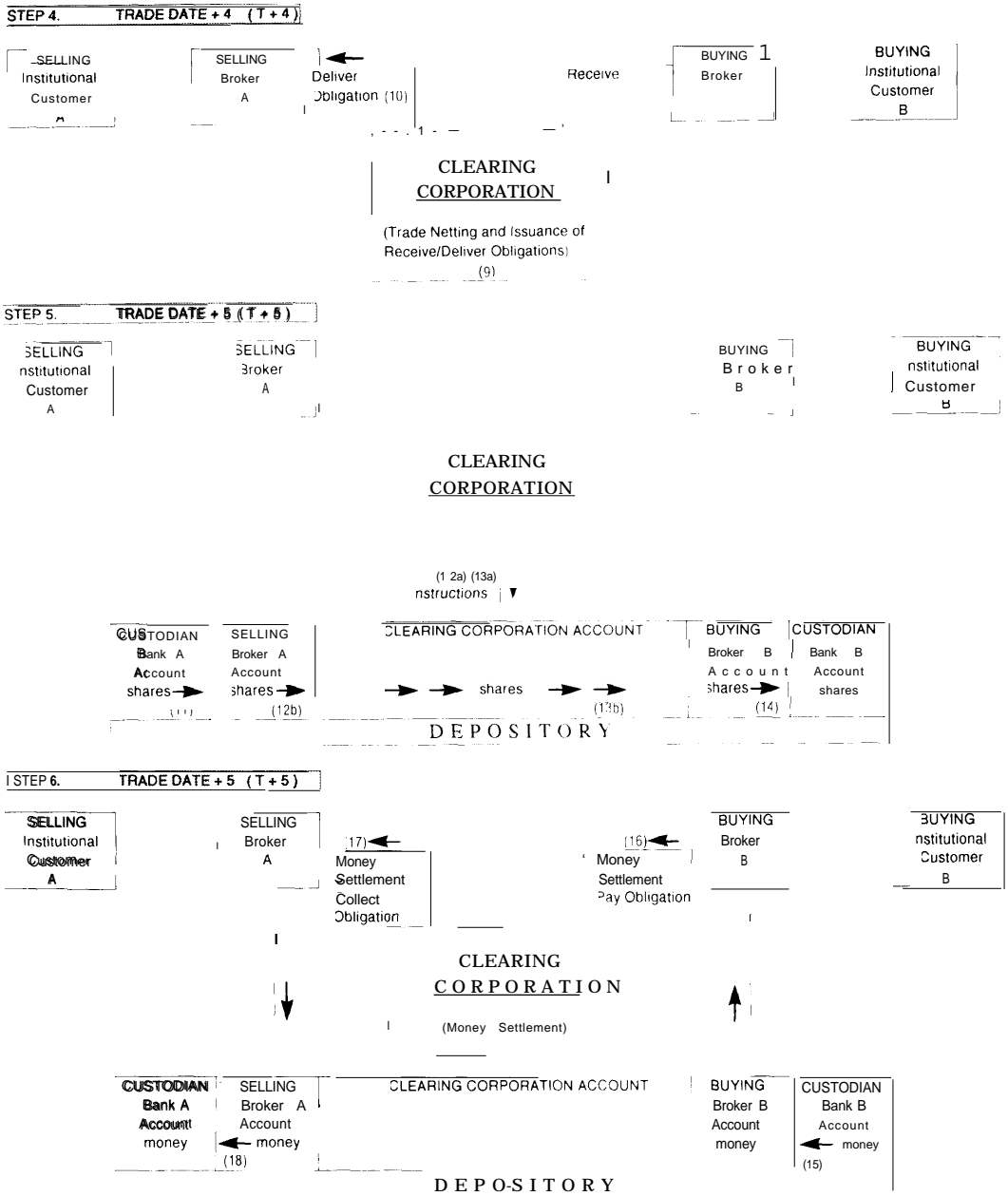
- (8) Selling Retail Customer A gives shares to selling Broker A to satisfy delivery obligation.
- (9) Selling Broker A deposits selling Customer A's shares in its account at the Depository
- (10a) Clearing Corporation instructs Depository to debit selling Broker A's account and credit Clearing Corporation's account with the shares;
- (10b) Depository debits selling Broker A's account with the shares and credits Clearing Corporation's account.
- (11a) Clearing Corporation instructs Depository to debit Clearing Corporation's account and credit buying Broker B's account with the shares;
- (11b) Depository debits the Clearing Corporation's account with the shares and credits buying Broker B's account.
- (12) Buying Broker B requests withdrawal of shares from its account at the Depository in order to deliver to Retail Customer B.
- (13) Buying Broker B delivers the shares to its buying Retail Customer B.
- (14) Buying Retail Customer B pays buying Broker B for shares received.
- (15a) Clearing Corporation advises buying Broker B of net pay amount for shares received; Buying Broker B delivers a check to Clearing Corporation for the requested amount
- (15b) Clearing Corporation advises selling Broker A of net collect amount for shares delivered; Clearing Corporation issues check to selling Broker A for the specified amount.
- (16) Selling Broker A pays selling Retail Customer A for shares delivered.

Figure A-2-Clearance and Settlement of Institutional Customer Trades



- (1) Institutional Customers give orders to buy and sell stock to their respective Brokers.
- (2) Brokers execute Institutional Customers orders in the Marketplaces.
- (3) Brokers submit details of trades executed in the Marketplaces to the Clearing Corporation.
- (4) Clearing Corporation generates reports back to the Brokers indicating the results of comparison.
- (5) Brokers send ID confirmation to the Custodian Banks of their Customers.
- (6) Brokers send ID confirmation to their respective Institutional Customers.
- (7a) Selling Institutional Customer A sends ID affirmation to Custodian Bank A to deliver securities on settlement day (T+5) to its Broker (A)
- (7b) Selling Institutional Customer A sends ID affirmation to selling Broker A indicating that Custodian Bank A Will deliver the securities to it on settlement day
- (8a) Buying Institutional Customer B sends ID affirmation to Custodian Bank B notifying to receive securities on settlement day from its Broker (B)
- (8b) Buying Institutional Customer B sends ID affirmation to Broker B, instructing it to deliver securities to its Custodian Bank (B) on settlement day

Figure A-2-Clearance and Settlement of Institutional Customer Trades-Continued



- (9) Clearing Corporation nets the trades
- (10) Clearing Corporation Issues projection reports Indicating net receive/delver obligations to the buying and selling Brokers
- (11) Custodian Bank A Instructs Depository to transfer shares from its account to selling Broker A's account
Depository debits Custodian Bank A's account and credits selling Broker A's account with the shares
- (12a) Clearing Corporation instructs Depository to debit selling Broker A's account and credit its account
- (12b) Depository debits selling Broker A's account and credits Clearing Corporation's account with the shares
- (13a) Clearing Corporation instructs Depository to debit shares from its account and credit shares to buying Broker B's account.
- (13b) **Depository debits clearing corporation's account with** the shares and credits buying Broker B's account
- (14) Buying Broker B Instructs Depository to transfer shares from its account to Custodian Bank B's account
Depository debits Broker B's account and credits Custodian Bank B's account with the shares.
- (15) Custodian Bank B pays buying Broker B for shares received
- (16) Monies from Custodian Bank B to Broker B are used by Broker B to meet its settlement obligation to the Clearing Corporation
- (17) Clearing Corporation receives monies from Broker B and pays to Broker A
- (18) Monies from Clearing Corporation to Broker A are used by Broker A to meet its payment obligation to Custodian Bank A

computer book-entry system, are also eligible for settlement through the Continuous Net Settlement (CNS) computer system. This includes the preponderance of trades settled through the NSCC. NSCC becomes the counterpart to each trade; it guarantees that the settlement obligations of the trade will be met—both the obligation to deliver securities and the obligation to make payment. For locked-in trades, NSCC'S guarantee takes effect at midnight on the day (T+1) that the counterparties to the trade have been notified that the trades matched.

Trades that do not match begin a reconciliation process that is being shortened and by the end of 1990 will occur on the day following the trade (T+1). Those that remain unmatched by T+3 are returned to their originating marketplace for face-to-face negotiation. With the increasing number of trades locked-in at the marketplaces, and with the availability of on-line reconciliation systems at these marketplaces, the need for this process is being eliminated.

Using the CNS system, the NSCC calculates each day a net long or short securities position for each CNS-eligible security that was traded by the clearing member on that day. The number of settlement transactions and the gross amount of the clearing member's obligation either to deliver securities or to make payment is adjusted by the amount of any securities or payments that it would receive as a result of other trades of the same security. This type of calculation process is known as netting. It reduces the total number of securities to be delivered or received, and the number and size of aggregate cash payments. As a result of this process of offsetting obligations, the NSCC estimates that movement of almost 90 percent of the total daily transactional volume of owed securities and cash payments otherwise required on the settlement date is eliminated. Netting may indirectly increase market liquidity by reducing the gross amount of funds necessary to meet settlement obligations. After netting through CNS, the NSCC then informs the DTC of the net amount that each counterpart owes

in securities on the settlement date, T+5. The DTC, using its book entry system, records the transfer of ownership⁵ by debiting the securities account of the delivering counterpart and crediting the account of the receiving counterparty.⁶ Payment on the settlement date is in the form of a certified check, payable to the NSCC. When settlement cannot be made on the settlement date—e. g., when the securities are not available in the participant's DTC account—these obligations remain in the CNS system and are carried forward and netted with the next day's obligations.

Securities that are not eligible for the CNS system may be settled either through balance order accounting or on a trade-for-trade basis. These other forms of settlement comprise a very small percentage of trades settled through NSCC.

In 1989, the fail rate—the percentage of trades which do not settle on the settlement date—in trades cleared through CNS was 8.13 percent of the total net dollar value of cash and securities due on the settlement date. Since the NSCC takes the counterpart position and guarantees the settlement of all CNS-matched trades, NSCC is exposed to various credit, market, and non-market risks.⁷

NSCC protects against credit risk, first of all, by retaining a lien over securities for which the receiving participant has not paid. For trades not settled by T+5, NSCC uses a mark-to-market procedure to limit its market risk until settlement does occur. Market risk is kept to 1 day's market movement by adjusting members' settlement obligations to current market prices. Members pay or are paid at settlement based on the current value of their open positions (positions for which T+5 has past), rather than the value when they made the trade. In the interim, until the open position settles, members pay or receive the net difference in market price movement. NSCC'S guarantee fund for CNS takes account of potentially adverse movements on trades which have not settled before T+5. It is based on the total size of all positions open. These include those

⁵This description discusses inter-dealer (street-side) and institutional settlement only. Concerning depository functions, a broker can make settlement with his institutional customer through DTC's ID program. A description of customer (retail) settlement is provided by the Securities and Exchange Commission in vol. II of the Bankers Trust report, op. cit., footnote 1.

⁶Stock held by DTC is in nominee name and appears on the books of the transfer agent of the issuing company. In a typical transaction, the transfer agent would not be involved in the change of ownership. The change in ownership between the parties to the transaction would occur solely on the books of DTC. If, however, a broker or his customer wishes to have the shares registered in his own name, he instructs DTC to send the appropriate quantities of stock, currently in street name, to the transfer agent, who would then send the reregistered shares directly to the broker.

⁷Credit risk refers to the possibility that a participant will not pay for delivered securities. Market risk refers to the price changes of the security. Non-market risks include loss of data, human error, systems failure, or any breakdown caused by any factor other than credit or market factors.

pending (before settlement); trades settling on T+5; and trades for which T+5 has passed and settlement has not occurred. In addition, to mitigate the risk that a member may fail to pay for securities when they are delivered to his account, a percentage of their market value is included to the member's clearing fund requirement. In order to protect the NSCC, the required clearing fund amounts must be deposited with it. The calculation, which sets the total clearing fund requirement, is done daily for all members and can be collected more frequently than the monthly norm. All NSCC clearing members are required to contribute to the guarantee fund. NSCC's total funds on deposit, not including NSCC's own lines of credit, totaled over \$400 million in 1989 and 1990.

The NSCC also maintains a full compliance-monitoring system to ensure its continuing ability to judge the creditworthiness of its participants.⁸ It shares risk information with other SEC-registered clearinghouses, both through the SEC's Monitoring Coordination Group and the Securities Clearing Group. NSCC and a number of futures clearinghouses are now discussing proposals for increasing the sharing of risk information; e.g., data on market participants' holdings on various exchanges.

The NSCC is linked to its clearing members by means of the Securities Industry Automation Corp. (SIAC), which operates NSCC's technology base. Most participants now have direct computer links; only about 1 percent of the MI-service members continue to report trades via computer tape.

All payments to NSCC are on a net basis; i.e., the NSCC calculates each clearing member's total credit and debit positions and nets to a single figure that is either owed to NSCC or is owed by NSCC. Payment to NSCC is by certified check. Funds are concentrated in one central clearing bank. If a certified check is not received on the settlement date, then payment via Fedwire is required the next morning. NSCC pays selling members with regular bank checks, but intends to move towards the increased use of electronic payments as one way to improve the settlement process.

The International Securities Clearing Corp.

ISCC is a subsidiary of the NSCC and is an SEC-registered clearinghouse. It was founded in 1985 to assist in clearing and settlement and for providing custody services for securities traded among American brokers and banks and their counterparties across national borders. It has links with clearinghouses and depositories in foreign markets,⁹ including:

- the International Stock Exchange (ISE), in London;
- the Centrale de Livraison de Valeurs Mobilières (CEDEL), in Luxembourg;
- 20 depositories and custodians in Europe and Asia, indirectly linked by means of a conduit provided by CEDEL;
- the Japan Securities Clearing Corp. (JSCC), the Tokyo Stock Exchange's clearing and custody organization;
- the Central Depository subsidiary of the Stock Exchange of Singapore; and
- the Canadian Depository for Securities (CDS), in Toronto, linked through NSCC.

ISCC also serves as the clearing system for the NASD's PORTAL market for foreign private placements exempt from SEC Rule 144A registration.

*Futures Clearing Organizations*¹⁰

The Board of Trade Clearing Corp.

The Chicago Board of Trade (CBOT), which handles the greatest volume of futures contracts trades in the United States, has its own separately incorporated clearinghouse, the Board of Trade Clearing Corp. (BOTCC). With approximately 139 clearing members, the BOTCC is by far the largest clearing organization serving the futures markets.

The Chicago Mercantile Exchange (CME) is the largest U.S. futures exchange when measured by another yardstick, the average total value of open futures and options on futures contracts. CME has a Clearinghouse Division. This system and other U.S.

⁸NSCC's STARS system monitors projected settlement exposures from the time trades are matched until they are ultimately settled. NSCC also employs a series of exception reporting mechanisms to detect security concentration, settlement pattern changes, and security price changes.

⁹The ISCC is also discussing the possibility of setting up other links with the Societe Interprofessionnelle pour la Compensation des Valeurs Mobilières (SICOVAM), the French central depository, and with Societe des Bourses Francais, the broker clearing system at the Paris Bourse.

¹⁰Much of the information in this section is based on Roger D. Rutz, "Clearance, Payment, and Settlement Systems, in the Futures, Options, and Stock Markets," Feb. 24, 1989, a contributed paper in the Bankers Trust report, *op. cit.*, footnote 1.

futures clearinghouses, are similar (although not identical) to that at the BOTCC.¹¹

BOTCC has an on-line trade entry/trade capture system that allows it to receive over 75 percent of its trade information through on-line terminals (with the user keying in data). The remaining 25 percent of trade information is reported by means of computer-to-computer transmissions. In addition, members of the BOTCC that are also members of the CME may use the BOTCC's on-line trade entry/trade capture technology to send trade information to the CME, and CME members may similarly send trade submission data to BOTCC via the CME's on-line trade entry/trade capture technology. About 20 percent of the CME's trade information arrives at the CME clearinghouse through the BOTCC trade entry/trade capture technology.

Once a trade has been captured, BOTCC employs a two-sided matching system in which both the buy and sell sides of a trade are submitted to the trade comparison system for matching. This capability provides the benefits of comparisons on the day of the trade, and a match by broker and by counterbroker as well as a match within the clearinghouse. This is the standard for futures markets in the United States.¹²

BOTCC's guarantee to clearing members that the settlement obligations of the trade will be met begins at the moment a trade has been matched and registered. At that time, typically about 1 hour after the final trade submission, the clearinghouse becomes counterparty and guarantor to every trade.

In all U.S. futures markets, both buyer and seller make a good faith deposit to the clearing member firm; this is "original margin."¹³ The amount required per contract is determined by the exchange, and is due from both parties to the trade on the

morning of the day after the trade (T+1). Most clearing members maintain substantial excess original margin deposits in their clearing account at the BOTCC. The amount of margin a clearing member owes is calculated by the clearinghouse based on the value of his open contracts and an assessment of the amount of risk those contracts involve. The BOTCC uses its risk assessment computer system SAFE (Simulated Analysis of Financial Exposure) to evaluate clearing member firms' credit, and uses the CME's SPAN (Standard Portfolio Analysis of Risk) to determine the amount of margin owed.¹⁴

There are two methods of calculating original margin: gross margining and net margining. Gross margining requires a clearing member to post original margin on all the long and short positions in these accounts; they cannot be used to offset each other in case of a deficiency. By contrast, with net margining the margin owed by each clearing member is calculated on the difference between all the long and short positions, calculated separately for proprietary accounts and customer accounts. The BOTCC figures original margin on a net basis, as do most U.S. futures clearinghouses.¹⁵

The BOTCC's trade-matching process, from the time it guarantees settlement obligations to the posting of original margin by clearing members, may be 7 hours.¹⁶ **During this timelag, the BOTCC carries the full risk.** Clearing members demand that trades become guaranteed as quickly as possible, since this is the point at which counterparty risk should be eliminated.

Besides original margin, futures clearinghouses also calculate and collect variation margin.¹⁷ The amount reflects the changes in the value of a clearing member's open contracts. Variation margin may be collected daily, or more often. The BOTCC routinely issues one morning call and supplemental

¹¹For details on the clearing and settlement processes at the other U.S. futures clearinghouses, see Bankers Trust report, Op. cit., footnote 1.

¹²The exception is the New York Mercantile Exchange (NYMEX), which uses a one-sided trade matching system, in which "sell" information is put into the system and the clearing member with the "buy" information must confirm the data at a later time.

¹³This original margin deposit is a performance bond to protect the financial integrity of the clearinghouse in the event that the clearing firm is unable to meet a margin call or to make or take delivery. Original margin refers to deposit of funds in the form of cash, government securities, or letters of credit. There are two levels of margin: the first is from the customer to the firm; the second is from the firm to the clearinghouse.

¹⁴The CME has its own risk management computer system—SPAN (Standard Portfolio Analysis of Risk)—for determining the amount of margin. The futures industry (with the exception of the Intermarket Clearing Corp. (ICC), which uses the system known as TMS) is moving towards adopting SPAN as the standard for calculating margin.

¹⁵The exceptions are the CME Clearinghouse Division and NYMEX, which figure original margin on a gross basis.

¹⁶Payment of margin must be in same-day funds—e.g., those provided by the Federal Reserve's Fedwire electronic payment system.

¹⁷Variation margins are the cash flow required to mark positions to market. They flow through the clearing organization to the clearing member on the other side of the trade.

intra-day variation margin calls (usually around 2 p.m. c.s.t.).¹⁸ The major purpose of routine intra-day variation margin calls (and payments to clearing members with profitable trades) is to remove same-day price risk while the banking system is open. It also reduces the magnitude of the following morning margin call, which is always made by the CME and BOTCC at 6:40 a.m. c.s.t. on the day following the trade date (T+1). As a result of this system, the BOTCC typically collects (and pays out) by about 2:30 p.m. c.s.t. on the date of the trade between 60 and 95 percent of the final settlement calls that would otherwise have been made at 6:40 a.m. c.s.t. on the following day. This reduces the clearinghouse's risk because the shorter the period of time between trade execution and settlement, the more certain it is that a clearing member will be able to meet its obligations. In general, the more frequently a clearinghouse settles (marks-to-market) trades each day, and requires its clearing members to post margin, the greater is the financial integrity of the clearing system.

Lines of Defense

In the futures markets, the maximum potential default liability represents at most only one business day's market movement. Along with monitoring clearing members' positions, this is the first line of defense for the clearinghouse. The BOTCC segregates and nets proprietary and customer open positions of each clearing member across commodity futures and options contracts to calculate the amount of both the original and variation margin of each clearing member. The BOTCC's SAFE system calculates each clearing member's potential exposure to an adverse move in prices.

Margin deposits are the second most important line of defense in protecting the clearinghouse from a default by a clearing firm which could affect other clearing members. The Commodity Futures Trading Commission (CFTC) requires that all clearing members maintain two bank accounts for settlement and two safekeeping accounts for original margin. One set of bank and safekeeping accounts is for original and variation margin for customer positions, while

the other set is for original and variation margin for proprietary and non-customer (affiliated firm) positions.¹⁹

Another line of defense for the clearinghouse is its net capital requirements for clearing members. In addition, all U.S. futures clearinghouses share certain types of "risk information"-data on amounts paid and collected by clearing members in the form of both original and variation margin, reflecting their overall exposure, and amounts paid by clearinghouses to clearing members, representing reductions in the amount of risk faced by a clearing member.

Still another line of defense in protecting the clearinghouse from default by a clearing firm is its authority to issue a "super" margin call if the clearinghouse determines that a customer or proprietary position represents a clear and immediate danger (i.e., a particular market condition could cause a substantial amount of a clearing member's capital to be depleted because of customer defaults). The clearing member would then be required to deposit the additional super margin (in the form of cash, U.S. Treasury securities, or letters of credit) within 1 hour of receiving the call. Finally, the segregation of customer funds, clearing member net capital requirements, and ongoing financial surveillance, each contribute to bolstering the integrity of these markets.

If, despite margin calls, a clearing member nevertheless defaults on the settlement obligations of the trade, the clearinghouse has several protections against liability for the default. The clearinghouse may liquidate the clearing member's positions and original margin, sell his exchange membership, use his contributions to the clearinghouse guarantee fund, use the clearinghouse guarantee fund and its committed lines of credit, assess all clearing members, where permissible, and finally, use the clearinghouse's capital.

All U.S. futures clearinghouses have funds available to protect themselves against default by their members; these are primarily made up of mandatory

¹⁸The CME Clearinghouse Division, the COMEX Clearing Association, and the Coffee, Sugar and Cocoa Clearing Corp. also issue routine daily intra-day variation margin calls. The others have the capability of doing so on an as-needed basis; e.g., in times of severe market volatility.

¹⁹The segregation of customer and proprietary funds is a requirement of the Commodity Exchange Act, Section 4d(2).

contributions from clearing members.²⁰ They fluctuate in size. Most U.S. futures clearinghouses, but not the BOTCC²¹ and Kansas City Board of Trade Clearing Corp., also have the power to assess their members, if the amount of a clearing member default cannot be covered by capital funds and the guaranteee fired.

The BOTCC uses four settlement banks, all based in Chicago. The BOTCC's morning payment process (6:40 a.m. c.s.t.) precedes the opening of the Fedwire system and hence requires the settlement bank to extend credit on behalf of some clearing members. At times, this credit extension may not be fully collateralized, and thus is a risk for those settlement banks.

Clearing members must maintain accounts at settlement banks for the payment of original and variation margin, including final settlement payment. When the clearinghouse determines the amount of margin owed, the clearinghouse notifies the clearing member's bank of this amount. The bank then examines the clearing member's assets (cash, government securities, lines of credit), gathers incoming payments from the clearing member (via Fedwire, if it is available at the time the bank is making the decision), and makes a commitment to the clearinghouse as to whether it will honor the margin call by forwarding the funds to the clearinghouse.

If the clearing member does not have sufficient assets to meet its margin obligations, the bank's decision is whether to extend credit to the clearing member. When a settlement bank decides that it cannot meet the financial obligations of a market participant, the participant will ask his credit banks for credit. This process generally works well, but it depends on two assumptions: first, that the market participant will be able to reach the account officers at the credit banks within the permitted time; and second, that the credit banks (which do not always

coordinate a market participant's various lines of credit) will not extend more credit than a clearing member is worth. Generally, these assumptions are sound, as firms usually have a predetermined credit line. But, if a firm is having difficulty and the firm's needs come during a period of market stress, a settlement bank may decide not to honor a margin call. The clearinghouse would first attempt to transfer the customer's positions to another clearing member.²² **Any customer position** not transferred would be subject to liquidation.

Clearinghouses, in respect to intra-day margin payments batch process trades rather than processing each trade as it is executed. Thus, a clearinghouse may not be able to eliminate its risk instantaneously by shifting it to clearing members. One reason the clearinghouses are forced to do batch processing is that the banking system moves too slowly to accommodate any other method. For instance, Chicago banks generally use paper-based processes to move money among clearing members.

The working interface between the clearinghouses and the banks survived with difficulty under immense strain in October 1987.²³ In further improving this interface, there are cost-benefit tradeoffs. The existence of a Clearing Organization and Banking Roundtable that provides settlement bankers, clearing organizations, and regulators with a forum for regular discussion of these tradeoff issues, is some evidence that the system is moving towards a more secure, less volatile, but still competitive, state.

Options Clearing Organizations

The Options Clearing Corp.

OCC is the common entity serving all securities options exchanges in the United States²⁴ The OCC clears and settles options trades for the Chicago Board Options Exchange (CBOE); the American

²⁰The BOTCC does not have a guarantee, or clearing fund, but does require clearing members to purchase its capital stock when they are admitted to membership, which is similar to a guarantee or clearing fund. The relative number of shares of stock that a BOTCC clearing member must purchase is adjusted semi-annually to reflect its open positions and trading volume. Other futures clearinghouses have guarantee funds based on capital, trading volume, or open positions. Rutz, *op. cit.*, footnote 10, pp. 23-27.

²¹In mid-1989, the BOTCC estimated as \$325 million the total value of its available trust fund lines of credit, and clearinghouse capital.

²²For additional information, see Andrea M. Corcoran and Susan C. Ervin, "Maintenance of Market Strategies in Futures Broker Insolvencies: Futures Position Transfers From Troubled Firms," *Washington and Lee Law Review* 44:849, 1987, pp. 849-915.

²³There is disagreement among participants themselves as to whether these systems "survived with difficulty," "barely managed," or performed otherwise. Nevertheless, many improvements have been, and are, being implemented to strengthen the clearing and settlement process.

²⁴The OCC clears all exchange-traded securities options. For details on clearing and settlement of options on futures contracts, see *Bankers Trust report, op. cit.*, footnote 1.

Stock Exchange (AMEX); the Philadelphia Stock Exchange (PHLX); the New York Stock Exchange (NYSE); the Pacific Stock Exchange (PSE); and the National Association of Securities Dealers (NASD).

Unlike the clearinghouses already discussed, the OCC does not do trade comparison, since it receives locked-in data on compared trades from each of the exchanges. The exchanges have chosen to keep their own trade-matching systems as a means of competitive differentiation. The data on matched trades is sent to the OCC by computer on the day of the trade. The OCC then must calculate the amounts of money that are owed and due the next day (T+1) by the buyer and the seller. In the case of the buyer, the entire amount of money owed to the OCC is called the “premium obligation,” or “premium,” and is paid in cash. The premium, while paid to the OCC, is passed onto the writer of the option. To the buyer of the option, the premium is the amount he pays to lock in the possibility of an advantageous movement in the price of the underlying security. To the writer of the option, the premium is the maximum amount of profit he can expect. If the market moves against the writer, the premium might, at best, offset only a small portion of the option writer’s losses.

Customer margin is set by the exchanges, subject to review by the SEC and regulation by the Federal Reserve Board (FRB). Clearinghouse margin is set by the OCC and is subject to review by the SEC and oversight by the FRB, as with customer margin.

The writer of the option always owes margin to the OCC, each day that the option contract is in effect but has not been exercised by the holder. This margin²⁵ to the margin owed by the buyer or seller of a futures contract, essentially “good faith” money which serves as an assurance to the OCC that the writer of the option has the financial ability to meet the potential obligations of the option that he has sold. The amount of margin owed reflects changes in the market price of the option as well as a portion of the total amount that he would have to pay if the option were exercised.

On the day after the trade (T+1), the OCC notifies the buyer of the amount of cash premium which is owed; at the same time, the writer of the option is notified by the OCC of the amount of margin that is owed. Both amounts are due on T+1. On the next day (T+2), and each day thereafter until expiration, exercise, or closeout²⁶ of the option contract, the OCC calculates and then collects margin from the option writer.

Margin on long option positions thus reflects the adjusted daily value of the option writer’s open positions (the total amount of money which he could be forced to pay if the options he sold were to be exercised by the holders). The OCC marks-to-market (determines the adjusted value and liability of each member’s open positions) at the end of each trading session. If the options contract loses value, the OCC reduces the amount of margin required. When the holder of an option contract decides to exercise it and actually buy or sell the underlying product of the option, the person who originally sold the option is not necessarily the same person that OCC will require to fulfill its terms. Instead, the OCC randomly assigns a clearing member to honor the delivery or purchase obligations of the option, from the pool of all clearing members who sold options with identical contract terms.

For example, when an IBM option is exercised, the OCC assigns a clearing member with a short position and then sends delivery instructions to an equities clearinghouse such as the NSCC, which incorporates instructions to deliver or receive into its Continuous Net Settlement (CNS) system. Any obligations not netted out through normal CNS procedures are settled by instructions to a depository (e.g., the DTC). Delivery of the IBM stock is then made by transferring it from the seller’s account into the buyer’s account at the depository, subject to the CNS system.²⁷

When a foreign currency option is exercised, the foreign currency underlying the option contract is delivered to the OCC’s cash account at a designated overseas bank, and then transferred to the account of the market participant who is buying the foreign

²⁵For margin payments, the OCC accepts cash and collateral including: bank letters of credit, U.S. Treasury obligations, the actual equities underlying particular option contracts, and various other stocks. Additionally, margin obligations can be reduced through corresponding long positions in other options which have the effect of reducing net exposure.

²⁶The “closeout” is when a writer or holder of an option contract enters into another option contract, creating an offsetting position.

²⁷When NSCC incorporates delivery instructions into its CNS system, NSCC rather than OCC assumes responsibility for, and guarantees, deliveries and payments.

currency. The designated foreign exchange delivery bank may be any bank designated by the parties involved in the transaction, not necessarily one of the OCC's settlement banks.

The OCC provides its clearing members with a guarantee on the morning of the day following the trade (T+1), after the buyer of the option has paid the premium obligation.²⁸ The OCC guarantee protects the holder of an option against the possibility that the option writer might default on the payment or delivery obligations of the option.

Lines of Defense

The OCC's first line of defense against the potential for clearing member default is its continuing monitoring of the creditworthiness of its clearing members. The OCC, exchanges,²⁹ and the Securities and Exchange Commission (SEC), also monitor market participants in respect to capital adequacy and other financial requirements. The OCC is apart of the information-sharing arrangement among all seven SEC-registered clearing entities, as well as a participant in the pay-collect risk information system operated by BOTCC.³⁰ The OCC uses a monitoring system to quantify the potential risk of each clearing member under different market scenarios, including large price movements. The system evaluates the risk in participant's stock, options, and futures positions.

The OCC's second line of defense against clearing member default is the margin that the clearing members have on deposit. If this is insufficient to cover the default, the OCC can turn to its guarantee fund, made up of cash and government securities.³¹ In the event of a default by a clearing member, after closing out the defaulting clearing member's positions, the OCC follows five steps to cover any residual liability from a default:

- First, any margin that the defaulting clearing member has on deposit with the OCC is applied towards the liability of the default.
- Second, if that amount is insufficient, the OCC takes the defaulting clearing member's contribution to the guarantee fund and applies it toward the liability of the default.
- Third, if that amount is still insufficient, the OCC may use its guarantee fund to cover whatever portion of the liability is outstanding.³²
- Fourth, if that still isn't enough to cover the full liability, the OCC has the right to assess its members for the remaining amount of the liability.³³
- Finally, the OCC, like the NSCC and futures clearing organizations, may also take legal action as a creditor to recover any sums that are owed by the defaulting clearing member. The amount that can be recovered in this way is limited by bankruptcy law.

At the end of each trading day, the OCC has an overnight processing cycle during which it calculates the net amount which each member either owes or is owed. The net figure reflects, among other things: a) the cash premium obligation due on each new long position; and b) the margin due for each new short position. The OCC then sends payment instructions to the settlement bank. The netting is done on a multilateral basis; i.e., the status of all of a clearing member's holdings in the options market is taken into consideration in arriving at the daily net payment obligation to the OCC.

The OCC has two different methods for calculating margin—one for options on equities and another for all other types of options (foreign currency, government securities, or stock indexes). In both cases, the margin required from the writer of an

²⁸OCC has filed a rule change with the SEC, currently pending approval, which would provide OCC clearing members with an unconditional guarantee on the morning of T+1.

²⁹The options exchanges have limits on the aggregate amount of open positions that any one market participant may carry at any one time. These are net limits—i.e., the market participant's short positions are offset by his long positions. The clearing members' positions are monitored daily by the exchanges in respect to these position limits.

³⁰Robert Woldow, "Clearance and Settlement in the U.S. Securities Markets," February 1989, expert paper contributed to Bankers Trust report, op. cit., footnote 1.

³¹The total amount required in the guaranteed fund is recalculated monthly. As of December 1989, the guarantee, or clearing fund, plus a 100 percent minimal additional assessment for which OCC clearing members are unconditionally liable, was about \$450 million. The amount of the fund varies in proportion to the amount of clearing members' liability. It is always equal to 7 percent of the average daily aggregate margin requirements of all clearing members in the previous month. Each clearing member must contribute an amount equal to his pro-rata share of outstanding contracts in the previous month.

³²The OCC has recently amended its rules to include using its own retained earnings at the discretion of its Board of Directors.

³³Not all U.S. clearinghouses, however, have these assessment powers. See Bankers Trust report, op. cit., footnote 1, vol. 1, p. 137.

option is equal to the current market price of the option, plus a cushion to cover the risk of a change in the current market price. But for all non-equity options, as well as all options and futures contracts cleared by the Intermarket Clearing Corp., the OCC uses the Theoretical Intermarket Margin System (TIMS). TIMS evaluates each clearing member's overall risk profile and then sets the total margin owed. The OCC was the first clearing organization in derivative markets to change from a fixed or flat rate of margining (per contract) to sophisticated computational methods. Rules have been submitted to the SEC to expand the use of TIMS to include setting the margin on equity options.

The CFTC and the SEC have approved applications from the OCC and the CME to allow cross-margining of stock index options, futures, and options on futures for proprietary trading accounts of clearing members. Cross-margining between the CME and OCC started in October 1989.³⁴ OCC also offers cross-margining through an agreement with its affiliate, the Intermarket Clearing Corp. (ICC). The ICC clears trades for the New York Futures Exchange, the Philadelphia Board of Trade, Amex Commodities Corp., and the Pacific Futures Exchange; therefore, OCC members can use their holdings on those exchanges to offset the status of their open positions at the OCC.

The extent to which OCC and ICC offer cross-margining is however limited. The CFTC, concerned about safety, market stability, and liquidity, has not approved expansion of cross-margining beyond proprietary accounts of market-makers.³⁵

The OCC has approximately 190 clearing members. The clearing member brokerage firms transact business for their proprietary accounts, other brokers who are not clearing members, and institutional and retail customers. The link between OCC and its clearing members is automated: OCC requires that all members submit post-trade information through OCC's on-line Clearing Management and Control System (C/MACS).³⁶

The OCC allows its members to choose from a selection of designated settlement banks. There are currently 16, but the OCC is flexible and may designate a member's primary banking institution (concentration bank) as an approved settlement bank. The OCC maintains accounts at each of these settlement banks, and instructs the banks on each trading day as to the debits and credits that are to be made to the OCC's accounts and those of the clearing members.

³⁴See John Watt and James M. Kustus, "Clearance and Settlement of Derivative Financial Instruments," April 1989; and John P. Behof, "Issue Summary: Inter-market Cross-Margins for Futures and Options," The Federal Reserve Bank of Chicago, May 1989. Both are expert papers included in the Bankers Trust report, *op. cit.*, footnote 1.

³⁵Based on interview by OTA staff with senior CFTC officials, October 1989.

³⁶Hiatt and Kustus, *op. cit.*, footnote 34.