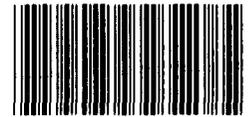


July 1990

FINANCIAL MARKETS

Oversight of Automation Used to Clear and Settle Trades Is Uneven



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Information Management and
Technology Division

B-238887

July 12, 1990

The Honorable John D. Dingell
Chairman, Committee on Energy
and Commerce
House of Representatives

The Honorable E (Kika) de la Garza
Chairman, Committee on Agriculture
House of Representatives

The Honorable Henry B. Gonzalez
Chairman, Committee on Banking, Finance
and Urban Affairs
House of Representatives

The Honorable Patrick J. Leahy
Chairman, Committee on
Agriculture, Nutrition, and Forestry
United States Senate

The Honorable Donald W. Riegle, Jr.
Chairman, Committee on Banking, Housing,
and Urban Affairs
United States Senate

This report is a follow-up to the work we did immediately after the October 1987 market crash.¹ It assesses the role played by federal regulators and financial organizations in developing and maintaining a strong foundation of oversight for automated systems vital to the post-trade processing of stock, options, and futures transactions.² Generally speaking, post-trade processing activities—referred to as the clearance and settlement process—encompass everything from double-checking and confirming the terms of a transaction to paying for and delivering the traded financial instrument. Organizations, commonly referred to as clearinghouses, clear and settle trades and rely extensively on automated systems to do so. These automated clearinghouse systems are essential to the daily processing of transactions worth billions of dollars and play a critical role in ensuring that market participants receive

¹See *Financial Markets: Preliminary Observations on the October 1987 Crash* (GAO/GGD-88-38, Jan. 26, 1988).

²The term "options" is used in this report to mean stock options, not options on futures contracts.

timely clearance and settlement services. Serious problems with automated systems could disrupt a clearinghouse's operations severely enough to threaten the integrity and stability of the financial markets.

This review includes an assessment of the automated systems' oversight role played by the following three federal regulatory agencies—the Securities and Exchange Commission (SEC) for stock and options clearinghouses, the Commodity Futures Trading Commission (CFTC) for futures clearinghouses, and the Federal Reserve System for stock clearinghouses that act and are referred to as depositories. We also reviewed certain systems oversight practices used by five major clearinghouses that account for at least 80 percent of the transactions in the stock, options, and futures markets. The five clearinghouses were the National Securities Clearing Corporation and the Depository Trust Company for stocks; the Options Clearing Corporation for options; and the Board of Trade Clearing Corporation and the Chicago Mercantile Exchange Clearing House Division for futures contracts.

Specifically, this report evaluates the level of regulatory oversight provided to automated clearance and settlement systems (1) at the time clearing organizations register with a regulator seeking authority to perform clearinghouse functions; (2) when clearing organizations seek regulatory approval of proposed rules that implement or modify operating policies and procedures; and (3) during periodic regulator inspections or examinations of clearinghouse operations. In addition, this report assesses whether clearinghouses' self-review practices include performing systems and facilities risk assessments,³ conducting comprehensive internal audit reviews of automated systems and operations, and utilizing annual external audit reviews of clearinghouse data processing. Details of our objectives, scope, and methodology are included in appendix I.

Results in Brief

To maintain orderly and properly functioning markets, automated clearance and settlement systems must operate smoothly. In this connection, the automated systems of the five clearinghouses in our review performed reasonably well in processing trades during the October 1987 and 1989 market declines. However, given the important role clearing

³A risk assessment is an analysis of the weaknesses associated with operating a computer system and its facilities. It is performed to determine how security resources can be cost effectively deployed to minimize potential loss. Such analyses should be conducted prior to approval of a system's design specifications, whenever a significant installation change occurs, and at periodic intervals established by the organization.

organizations play in the financial markets and the extent to which they rely on automation, strong systems oversight is needed by the federal regulators and the clearinghouses to ensure that these automated clearance and settlement systems are continuously able to process trades in a prompt and accurate manner.

We found that the Federal Reserve System has established and followed reasonable procedures for overseeing automated clearinghouse systems. Conversely, we found that the primary federal regulatory agencies—SEC and CFTC—have not established strong oversight practices to help ensure that automated clearance and settlement systems provide timely and reliable services. Specifically, neither SEC nor CFTC performed technical assessments of clearinghouse computers during registration, rule review, and inspection processes. We also found that SEC has established detailed registration standards designed to ensure the soundness of automated clearinghouse systems, but has not enforced one of its standards requiring clearinghouses to perform risk assessments of their automated systems and facilities. CFTC has not issued such systems oversight standards for the futures clearinghouses. In this regard, both regulators attribute their inadequate level of oversight in this area to having insufficient staff with the requisite expertise to review automated systems. Since the close of our review, each regulator has taken steps to increase its oversight of automated clearinghouse systems.

SEC and CFTC officials believe their insufficient systems oversight is mitigated by the clearinghouses' oversight of their own systems. However, we also found, to varying degrees, gaps in this "self-regulatory" oversight. For example, none of the five clearinghouses we reviewed performed formal, fully documented or complete assessments of the risks associated with operating their computer systems and facilities, even though three of these clearinghouses are required by SEC to do so. In addition, one futures clearinghouse we reviewed lacked an internal audit function to assess the clearinghouse's data processing operations and controls. Another futures clearinghouse had an internal audit function, but lacked staff with the requisite skills to conduct computer system reviews.

Limited federal oversight of these systems, coupled with gaps in the self-regulatory oversight provided by the clearinghouses, indicates that the regulators and clearinghouses are not doing all they should to detect and avoid problems associated with operating automated systems. Consequently, there is increased and unnecessary risk that these systems will not be consistently able to process trades promptly and accurately,

which reduces the integrity of the nation's stock, options, and futures markets.

Accordingly, this report contains recommendations that (1) SEC and CFTC increase their oversight of automated clearinghouse systems in the stock, options, and futures markets; (2) SEC ensure full compliance with its risk assessment standard for stock clearinghouses; (3) CFTC establish standards for the futures clearinghouses to follow in implementing comprehensive systems review programs; and (4) CFTC follow-up to ensure that weaknesses at the futures clearinghouses are resolved.

Background

Clearance and settlement takes place after trades have been executed on an exchange. Clearance involves collecting and matching data from traders who buy and sell financial instruments. Clearance is important because, after buyers' and sellers' trades are successfully matched, they are guaranteed by the clearinghouse in the event parties to the transactions do not honor their financial obligations. Settlement is the process whereby the parties to a trade exchange funds for stock, options, or futures contracts.

Clearinghouses perform the clearance and settlement functions. They rely heavily on computers, using them to: (1) receive trade information from buyers and sellers via computer-to-computer links; (2) match certain information from traders—such as price and quantity—to confirm the terms of each trade; (3) calculate the amounts owed by and due to the traders and net these amounts to arrive at one total amount traders owe or should receive; and (4) transfer, in the case of stock, these instruments from the selling traders' accounts to buying traders' accounts via a computerized book-entry system. Clearinghouse computers handle on a daily basis hundreds of thousands of trades, worth billions of dollars. For example, in 1988, the National Securities Clearing Corporation—which clears 95 percent of the stock transactions in this country—processed on an average daily basis over 250 million shares of stock worth approximately \$13 billion.

Three federal agencies—SEC, CFTC, and the Federal Reserve System—have responsibilities for regulating and overseeing clearinghouse activities. Specifically, the Securities Exchange Act (15 U.S.C. 78a-78ll) directs SEC to oversee the activities of the stock and options clearinghouses. Under the act, the Federal Reserve System serves as the primary regulator of a small number of stock depository clearinghouses, such as the Depository Trust Company, that are organized and operated

as banks. As a result, the Federal Reserve System and SEC coordinate their oversight of stock depositories; the Commission generally handles registration and rule reviews while the Federal Reserve inspects depository operations. For futures contracts, CFTC under the Commodity Exchange Act (7 U.S.C. 1 et seq.) oversees the futures clearinghouses. The oversight responsibilities of these three federal regulators includes automated systems to the extent that such systems are used to process the clearance and settlement of stock, options, and futures transactions.

In accordance with these laws, the three federal regulators have established procedures to oversee the operations of the clearinghouses. The Federal Reserve System's primary means of overseeing the depositories consists of annual examinations of each depository's financial and computer operations. SEC oversight efforts consist primarily of (1) requiring clearinghouses to register with the Commission so that SEC can ensure that each clearinghouse has the capacity to act as such an organization; (2) conducting reviews of proposed operating procedures—called rules—to ensure their consistency with applicable regulations and laws; and (3) inspecting periodically selected clearinghouse operations and controls to ensure they are efficient, safe, and designed to detect weaknesses that could cause financial loss to the organization, its members, or the public. CFTC oversight primarily includes rule reviews and periodic inspections, which are similar in form to those performed by SEC.

Federal Regulators' Oversight Is Incomplete

Active federal oversight of the stock, options, and futures clearinghouses' use of computers is critical in assessing whether clearance and settlement can be accomplished in a prompt and accurate manner. In this connection, it would be prudent and consistent with their oversight responsibilities for the regulators to include technical assessments of clearinghouse automated resources as an integral element in established oversight activities. Such assessments could include providing assurances that (1) systems have the capacity to support timely operations under normal and high-volume conditions; (2) controls are in place to prevent unauthorized access and the misuse of automated systems; (3) systems are able to provide continuous service in the event of equipment and software failures, natural disasters, and intentional malicious acts; and (4) controls are established to ensure that the systems' hardware, software, and communications perform as intended.

Results of our review show that regulatory oversight in the above-mentioned areas is incomplete. While the Federal Reserve System includes technical computer assessments as part of its examinations of stock

depository operations, we found a lack of direct systems oversight provided by SEC and CFTC during their established registrations, rule reviews, and inspections. This inadequate level of SEC and CFTC oversight hampers their ability to effectively oversee clearance and settlement in these financial markets.

Registration Process Weaknesses

By law, SEC is required to ensure that stock and options clearing organizations have the capacity to facilitate the prompt and accurate clearance and settlement of securities transactions.⁴ Our work disclosed, however, that during the registration process SEC does not directly perform technical assessments of the computer systems the organizations have in place or propose to use. Instead, responsible SEC officials informed us that they rely on (1) written representations provided by the prospective clearinghouse describing the capability of its computer systems, and (2) assessments performed by external, independent auditors employed by the clearinghouse to review its operations.

We also found CFTC does review clearinghouse operations when the Commission considers futures exchanges' requests to trade new contracts, and has certain financial standards the clearing organizations must adhere to in order to operate in this capacity. However, the Commission has provided no formal guidance to those organizations detailing the need for management controls over the use of automated systems. CFTC also does not conduct technical assessments of the clearinghouses' automated systems prior to authorizing the entities to commence operations.

Gaps in SEC's and CFTC's Rule Reviews

From time to time, clearing organizations submit proposed rule changes to SEC and CFTC for approval, including related processing changes affecting clearance and settlement systems. Although both SEC and CFTC have established procedures for approving clearing organizations' proposed rule changes, neither organization directly performs technical assessments of rules involving the use of automated systems to perform clearance and settlement functions. Rather, SEC and CFTC generally review the financial and legal consequences, as opposed to the technical ramifications, of using such systems. CFTC, because it uses information provided by clearinghouse computer systems for regulatory purposes, does perform limited software testing of certain automated systems during rule reviews to ensure the accuracy of the data produced.

⁴15 U.S.C. 78q-1(b)(3).

Over the past 3 years, 59 rules (48 by SEC and 11 by CFTC) involving computer systems or enhancements have been approved by SEC and CFTC without complete technical assessments of the computer-related implications of these rules. The 48 rules approved by SEC represent over 40 percent of the three securities clearinghouses' rules SEC processed during this period. The 11 rules approved by CFTC account for approximately 10 percent of the 2 futures clearinghouses' rules processed by CFTC over this same period. The rules approved by SEC involved, for example, the use of systems to (1) enhance the National Securities Clearing Corporation's trade comparison system, and (2) automate the Depository Trust Company's process for settling trades between financial institutions in this country and abroad. The rules approved by CFTC, for example, included the use of automated systems by the Chicago Mercantile Exchange to compare trades upon execution and determine funds required to secure futures contracts. These automated systems and the clearance and settlement processes they support are critical to the prompt and accurate processing of transactions in these financial markets.

Weaknesses in the Regulators' Inspections

Regarding the extent to which the federal regulators included reviews of computer systems in their inspections, we found that the Federal Reserve System assessed computer systems, and SEC and CFTC did not. During its past three annual examinations at the Depository Trust Company, the Federal Reserve System evaluated the depository's computer systems in such areas as data integrity, information resources management, teleprocessing, physical security over systems and programming, computer operations, and contingency and disaster recovery planning. Further, the Federal Reserve System examiners also reviewed audits conducted by the depository's internal audit staff and external independent auditors to identify possible computer system weaknesses and to assess the status of corrective actions. Such efforts have helped to strengthen the depository's data processing activities.

With regard to SEC and CFTC, we found that the inspections conducted by the commissions rarely included automated systems in the scope of the work performed. Rather, we found that their inspections generally covered areas involving the financial and legal risks associated with operating the clearinghouse, such as the adequacy of risk management procedures, the sufficiency of clearing fund contributions, and the appropriateness of procedures for the financial surveillance of clearinghouse members.

Effect of Incomplete Federal Systems Oversight

Responsible SEC and CFTC officials stated that their agencies generally exclude computer systems from oversight because they lack sufficient staff with the expertise to perform technical assessments of these systems. This inadequate federal oversight of the automated systems used by the clearinghouses impairs their ability to effectively oversee clearance and settlement in these three markets. It also increases the risk that system weaknesses will not be consistently detected or will go undetected.

Gaps Exist in the Clearinghouses' Self-Oversight Efforts

We examined clearinghouse operations to identify whether these organizations used certain critical management control practices to oversee the use of automated clearance and settlement systems. While oversight may include numerous steps, we evaluated the following three basic practices: (1) the performance of periodic risk assessments of automated data processing (ADP) systems and facilities; (2) the establishment of an adequately and competently staffed internal audit department capable of reviewing computer systems and acting as an independent level of review over the clearinghouse's internal accounting controls; and (3) the use of independent external reviews of an organization's system of internal controls, including a review of general and application controls.⁵ During our review, we found that SEC has issued thorough and detailed standards requiring stock and options clearinghouses to institute and maintain such practices over their operations and computer systems.⁶ These standards provide a good framework for clearing organizations to follow in proactively identifying and correcting computer weaknesses.

Our review disclosed, however, that the clearinghouses did not always use these critical management controls. Specifically, table 1 shows the stock, options, and futures clearinghouses in our review and their use or lack of certain management controls over automated systems.

⁵Internal controls used to protect and safeguard computer systems are categorized as general and application controls. General controls are those that are normally applicable to all data processing being performed within an installation. Application controls apply to individual computer systems and are designed to, among other things, ensure the reliability of information to be processed, the accuracy of data input, the integrity of data processing, and the verification and distribution of data output. An evaluation of application controls should be integrated with an evaluation of general controls to ensure that weaknesses in general controls do not adversely affect any applications processed.

⁶See Securities Exchange Act of 1934 Release No. 16900, June 17, 1980, Announcement of Standards for the Registration of Clearing Agencies.

Table 1: Stock, Options, and Futures Clearinghouses' Computer Oversight Practices

Clearinghouse	Critical Systems Oversight Practices				
	Formal ADP risk assessments	Internal Audit Function		External Audits	
		Function exists	Has ADP expertise	General controls	Application controls
Stock and Options					
National Securities Clearing Corporation	No	Yes	Yes	Yes	Yes
Depository Trust Company	No	Yes	Yes	Yes	Yes
Options Clearing Corporation	No	Yes	Yes	Yes	Yes
Futures					
Board of Trade Clearing Corporation	No	No	No	Yes	No
Chicago Mercantile Exchange	No	Yes	No	Yes	No

Stock and Options Clearinghouse Compliance With Critical Oversight Practices

As shown in table 1, the stock and options clearinghouses had, in compliance with SEC standards, (1) established internal audit functions with ADP expertise that conduct clearinghouse computer reviews and (2) engaged external auditors to perform independent reviews of the clearinghouses' systems of internal controls, including general and application controls. However, we found that none of the clearinghouses performed formal or complete assessments of the risks associated with operating their computer systems and facilities. In addition, we found that SEC did not determine whether these clearinghouses were performing these ADP assessments.

Stock and options clearinghouse officials informed us that they are comfortable with their current ADP risk assessment processes. Specifically, the Depository Trust Company, which most closely adheres to federal risk assessment standards, reviews ADP risks as part of its day-to-day operational and audit activities and also performs an annual review of its financial, operational, and ADP risks. The Options Clearing Corporation relies primarily on its internal audit department; the department conducts an assessment of the company's audit areas and ranks and documents them to identify high-risk areas that it plans to review during the upcoming year. The National Securities Clearing Corporation informally assesses on an ongoing basis the risks associated with using their computer systems. We found, however, that these clearinghouse efforts do not always include certain risk assessment components such as (1) evaluating all threats and contingencies clearinghouse systems and facilities are exposed to; (2) estimating the dollar value of potential losses associated with such threats and contingencies; and (3) having a

formal process for conducting such assessments, documenting work results, and reporting them to management.

Futures Clearinghouse Compliance With Critical Oversight Practices

Likewise, the futures clearinghouses did not perform formal risk assessments and also lacked the use of other basic management control practices. Specifically, the Board of Trade Clearing Corporation does not have an internal audit function, while the Chicago Mercantile Exchange's internal audit staff does not have the requisite expertise to perform audits of its automated systems. Further, while both futures clearinghouses had financial audits performed by independent auditors, the scope of these reviews only covered general controls over their computer systems, and excluded reviews of the adequacy of application controls. Without assessing application controls, clearinghouses have less assurance that controls critical to the recording, processing, and reporting of essential data are working.

Futures clearinghouse officials stated that CFTC does not require them to adhere to or implement such oversight measures but that they do voluntarily assess ADP risks on an informal, ongoing basis without formally documenting work results. Regarding their lack of internal ADP audits, futures clearinghouse officials told us they have other units within their operations perform this function. Specifically, the Chicago Mercantile Exchange has one staff person in its computer operations division that performs audits of computer backup and recovery processes, while the Clearing Corporation uses staff from its quality assurance function to perform reviews of automated systems under development. With regard to external systems reviews, these officials acknowledged that their financial auditors do not review all application controls but noted that they had external auditors perform periodic reviews of selected areas which they believe enables them to sustain a strong internal controls environment.

Effect of Incomplete Clearinghouse Systems Oversight

Without performing complete assessments of ADP risks and formalizing the review process for such assessments, the clearinghouses have incomplete assurance that their management and boards are receiving the necessary information to select adequate, cost effective controls commensurate with the organizations' ADP risks. In addition, the futures clearinghouses' use of computer operations personnel as internal ADP auditors impairs the ability of such staff to act as an independent, objective level of review in evaluating the clearinghouses' automated systems and controls. In this regard, at both futures clearinghouses the computer

operations personnel were not independent of the officials responsible for the operations they reviewed, and the scope of their work was limited in that it excluded critical data processing areas such as capacity planning and physical security. To be of maximum usefulness, internal auditors should be independent of the officials whose activities they review, and the scope of their work should extend to all clearinghouse activities and related management controls. Further, the futures clearinghouses' practice of using external auditors to review only general controls provides these organizations with limited assurance that systems and controls are adequate.

These existing gaps in the clearinghouses' oversight increase the risk that automated system weaknesses will not be consistently detected or will go undetected. In this connection, at each of the five clearinghouses in our review, we conducted a limited assessment and tour of the automated systems and facilities. At four of the clearinghouses, we did not uncover any material problems. However, at one clearinghouse we did identify some weaknesses in such areas as physical security and continuity of operations. These included weak access controls to the computer room and a lack of an uninterruptible power supply to the computer room. Weaknesses such as these reduce the strength of the clearinghouse's system of internal controls. Officials of this organization have already taken action to correct some of the weaknesses and are looking at ways to address the others.

Conclusions and Recommendations

Proactive oversight by the federal regulators and the clearinghouses is essential to (1) assess whether these systems have sufficient capabilities and controls in place to process trades in a prompt and accurate manner, and (2) keep these organizations and their computer systems free of problems, especially during volatile market activity. The limited federal oversight of these systems, coupled with gaps, to varying degrees, in the self-regulatory oversight provided by the clearinghouses, indicates that these parties are not taking all necessary steps to detect and avoid problems associated with operating automated systems. Such actions are critical to ensure these systems will be able to process trades promptly and accurately, especially during stressful market periods.

Accordingly, to strengthen systems oversight in this area, we recommend that the chairpersons of SEC and CFTC implement the following actions:

- Both should allocate the necessary resources to establish the capability to assess the efficient and safe use of automation in the clearance and settlement process. This capability could be included within the agencies' existing oversight processes, such as inspections and rule reviews.
- SEC should strengthen enforcement of its clearinghouse registration standards by ensuring that clearinghouses, as part of their annual risk management programs, perform risk assessments of their automated systems and facilities.
- CFTC should establish regulatory standards for the futures clearinghouses detailing prudent management practices to be used in developing and implementing comprehensive and thorough systems review programs, and the Commission should ensure that the clearinghouses adhere to such guidance.
- CFTC should follow up on the weaknesses identified at the futures clearinghouses to ensure they are satisfactorily resolved.

Agency Comments and Our Evaluation

We orally discussed the contents of this report with senior officials from the three regulatory agencies and the five clearinghouses. Two regulatory agencies—SEC and CFTC—also provided formal written responses to our report which are contained in appendixes II and III, respectively. As a whole, these eight organizations generally agreed with the facts and contents of our report, and we have incorporated their comments where appropriate. In this regard, CFTC and SEC have recently taken steps to increase their oversight of the automated systems used by the futures and securities clearinghouses.

Since the close of our review, CFTC established an interagency task force of computer experts in May 1990 to advise the Commission on how automation assessments should be incorporated into its oversight efforts. This task force will also address the need to provide automated systems oversight standards to the futures clearing organizations. Further, CFTC has recently authorized staff from its Office of Information Resources Management (OIRM) to perform technical assessments of automated systems as part of the Commission's established inspections of clearinghouse activities, and OIRM staff recently began to conduct such reviews. With regard to improved systems oversight by SEC, the Commission has established an automation review group and is planning to staff it with personnel with the expertise to provide technical assistance in identifying clearinghouse system weaknesses during registration, rule review, and inspection processes.

We believe the recent initiatives by SEC and CFTC represent good first steps in strengthening the commissions' oversight processes for reviewing automated systems used by stock, options, and futures clearinghouses. However, because these initiatives have been recently implemented, it is too early to assess their effectiveness.

We are providing copies of this report to other interested members of Congress, executive branch agencies, and the public. We will also make copies available to others upon request.

This work was performed under the direction of Howard G. Rhile, Director, General Government Information Systems, who can be reached at (202) 275-3455. Other major contributors are listed in appendix IV.



Ralph V. Carlone
Assistant Comptroller General

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Table 1: Stock, Options, and Futures Clearinghouses' Computer Oversight Practices

Abbreviations

ADP	automated data processing
CFTC	Commodity Futures Trading Commission
GAO	General Accounting Office
IMTEC	Information Management and Technology Division
OIRM	Office of Information Resources Management
SEC	Securities and Exchange Commission

Objectives, Scope, and Methodology

We undertook this study to determine the extent of oversight provided to computer systems used to clear and settle trades made in the U.S. stock, options, and futures markets. Specifically, we assessed the oversight provided by the federal regulators and clearinghouses to reduce the risks associated with operating such systems. These topics were selected for review for three reasons. First, computers form the backbone of the clearance and settlement processes in that they are essential to the orderly clearance and settlement processing of the large number of stock, options, and futures trades executed daily in these markets. Second, clearance and settlement plays a major role in these markets—financial and operational problems in this area during the October 1987 stock market crash threatened the entire U.S. financial system, according to a presidential task force established to study the event.¹ Third, during our review of the 1987 stock market crash, we found a lack of federal oversight of the automated trading systems.

We conducted our audit work at five clearance and settlement organizations: the National Securities Clearing Corporation; the Depository Trust Company; the Options Clearing Corporation; the Chicago Mercantile Exchange's Clearing House Division; and the Board of Trade Clearing Corporation. These organizations were selected for review because they clear and settle a large majority of the stock, options, and futures transactions in this country.

The objectives of our review were to assess (1) the role of federal regulators in reviewing the use of computer systems in the clearance and settlement processes, and (2) the adequacy of management control practices that the clearinghouses use to review their own automated clearance and settlement systems. For our first objective, we determined the level of oversight provided by the three federal regulators—SEC, CFTC, and the Federal Reserve System—in established regulatory and oversight processes: registration, rule reviews, and inspections. We also ascertained whether the regulators had issued systems oversight guidance to the clearinghouses, and if so, whether compliance with such guidance was routinely enforced. For our second objective, we identified three generally accepted management control practices in order to have effective system oversight, and reviewed clearinghouses' operations to determine the extent of their compliance. These critical management controls are (1) conducting risk assessments of computer systems and facilities; (2) establishing an internal audit function capable of

¹See Presidential Task Force on Market Mechanisms, Report to the President of the United States, [Brady Report], Jan. 1988.

reviewing computer systems and controls; and (3) engaging external, independent reviews of clearinghouse data processing activities.

To understand the role that the responsible federal regulators play in overseeing automated clearance and settlement systems, we obtained supporting documentation and interviewed federal regulatory officials at SEC, CFTC, and the Federal Reserve System headquarters to determine their responsibilities, including how they review the clearinghouses' use of computers. We also held discussions with those staff at SEC and CFTC regional offices in New York and Chicago, and at the Federal Reserve Bank in New York, who participate in overseeing the stock, options, and futures clearinghouses included in our review. In addition, we reviewed the inspections and examinations that the federal regulators performed at the clearinghouses over the past 3 years to determine the extent to which computer-related areas are included in their oversight.

During our assessment of the oversight provided these systems by the clearinghouses, we interviewed the organizations' internal auditors, if the entity had such a group, and external certified public accountants. We also reviewed the internal and external auditors' reports to determine, among other things, the extent of oversight provided to these systems. The audits we reviewed were from the period 1986 to 1988. The public accounting firms we met with included Price Waterhouse for the National Securities Clearing Corporation and the Depository Trust Company; Deloitte Haskins and Sells for the Options Clearing Corporation; Arthur Andersen and Company for the Chicago Mercantile Exchange's clearing division; and Touche Ross and Company for the Board of Trade Clearing Corporation. In addition, we reviewed and analyzed the clearinghouses' risk assessments, in those cases where they had been performed, to determine the extent to which the assessments addressed the risks associated with their computer systems and facilities used for clearance and settlement purposes. We also toured the clearinghouses' computer operations centers. Finally, we performed a limited assessment of the controls used to safeguard the automated systems and facilities, and interviewed responsible officials concerning the extent of oversight afforded these systems.

Our audit work was performed between November 1988 and February 1990, and was conducted in accordance with generally accepted government auditing standards.

Comments From the Securities and Exchange Commission



DIVISION OF
MARKET REGULATION

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

May 29, 1990

Ralph V. Carlone
Assistant Comptroller General
General Government Programs
General Accounting Office
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Re: Draft Report on Automation Used to Clear and Settle
Trades

Dear Mr. Carlone:

This is in response to a request for comments on a report ("Report") of the General Accounting Office ("GAO") entitled Improved Oversight Needed for Automation Used to Clear and Settle Trades. Generally, the Report finds that the automated systems of the five clearinghouses under review performed satisfactorily in processing trades during the October 1987 and 1989 market declines. The Report also notes that the Securities and Exchange Commission's ("SEC" or "Commission") thorough and detailed registration standards provide a good framework for clearing organizations to follow in proactively identifying and correcting computer weaknesses. We expect that rigorous enforcement of these standards, in conjunction with recent initiatives by the SEC in the area of automation, will enhance our ability to oversee clearinghouse automated data processing ("ADP") systems and will further increase the safety and efficiency of these systems. Nevertheless, the Report contains a number of recommendations of additional actions which the GAO believes the SEC or securities self-regulatory organizations ("SROs") should take to detect and avoid problems associated with operating ADP systems.

As it relates to the Commission, the Report recommends that the Commission perform directly technical assessments of clearinghouse computer systems during established registrations, rule reviews, and inspections. In reviewing an application for registration as a clearing agency, the Division of Market Regulation ("Division") applies the requirements of the Securities Exchange Act of 1934 as well as the regulatory

Appendix II
Comments From the Securities and
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standards referred to in the Report. 1/ These standards require, among other things, that the clearing agency have an internal audit department adequately staffed with qualified personnel. In addition to sufficient technical training and proficiency in accounting and auditing, qualified personnel must possess expertise in the ADP application of accounting and auditing necessary to perform the internal audit functions. It is the responsibility of this department to act as a separate level of control in reviewing and evaluating the clearing agency's system of internal accounting control, which includes ensuring the integrity and accuracy of its ADP operations, both during development and thereafter. In addition, the standards require an annual opinion report prepared by an independent public accountant based on a study and evaluation of the clearing agency's system of internal accounting control for the period since the last such report. As the Report notes, the stock and options clearing agencies have established internal audit functions and have engaged independent accountants to review the adequacy of their systems of internal controls, including general and application controls, in compliance with SEC standards. Indeed, the standards clearly contemplate that technical assessments be conducted by internal and external auditors, not the SEC. We question, therefore, whether it is an efficient allocation of resources to devote SEC staff to performing a third technical assessment when at least two other entities (one of which is independent) are charged with performing this function. Moreover, as a general practice, in connection with registrations and rule filings, the Division reviews, and assures itself of the adequacy of, the clearing agency's systems capacity and security, as well as contingency plans the clearing agency has established relating to systems failure or sabotage.

In addition, although the Report acknowledges that the Commission has established detailed registration standards designed to ensure the soundness of automated clearinghouse systems, the Report states that clearing corporations do not perform periodic risk assessments of their ADP systems as contemplated by the standards. We strongly agree that clearing corporations should perform periodic risk assessments of their automated systems. It should be noted that, in addition, although the registration standards initially served as guidelines for review of clearing agency registration applications, each of the clearing agencies that was the subject of the Report must continue to satisfy the requirements

1/ See Securities Exchange Act Release No. 16900 (June 17, 1980), 45 FR 41920.

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set forth in the standards. 2/ It is our understanding, however, based on the considerable number of rule filings refining and enhancing clearing corporation ADP systems, that clearing corporations do, in fact, monitor and evaluate their ADP systems on a continuing basis. Nevertheless, we believe there is merit in GAO's suggestion that a formalized, scheduled review of ADP systems as contemplated in the standards be performed. Accordingly, the Division has reminded each of the subject clearing agencies of their obligation to review ADP systems and related controls as a part of the annual review and report process. The Division will review, in conjunction with the Commission's clearing agency inspection program, implementation of this objective.

The report also finds that the Federal Reserve System ("Fed") assesses computer systems during the inspection process, but that the SEC does not. It should be noted that, although depositories are registered clearing agencies under the Securities Exchange Act of 1934, as members of the Federal Reserve System, the Fed is the appropriate regulatory authority with primary oversight responsibility. Again, we believe it is appropriate to avoid duplication of regulatory effort wherever possible, so long as the financial and operational integrity of the clearing agency and its participants is not endangered as a result. We agree, however, that formalization of the ADP risk assessment at the non-depository clearing agencies would be beneficial and we will include a review of such assessments as they relate to computer systems as part of our routine inspection procedures. Given the level of required internal and independent review already in place, however, we do not believe that the Commission should expend scarce resources by hiring a large number of ADP examiners as replacement for existing examination staff qualified to review compliance with the Commission's anti-fraud, sales practice and financial responsibility regulations.

In connection with the increasingly important role of automation in the securities industry, the Commission has created a new Office within the Division of Market Regulation that will produce guidelines for, and oversee, automation review at the SROs. 3/ Priorities dictate that the focus of

2/ See Securities Exchange Act Release No. 20221 (Sept. 23, 1983), 48 FR 45167.

3/ Prior to the establishment of this new office the Commission published for comment an Automation Review Policy ("ARP") which states that SROs should, on a voluntary basis, establish comprehensive planning and
(continued...)

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Ralph V. Carlone
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this Office, at least initially, be on market execution and information systems. Nevertheless, we expect that the Office will provide technical assistance to the Division on an as-needed basis and will increase our ability to oversee effectively clearing agency systems by providing the technical expertise necessary to identify systems weaknesses in connection with the registration, rule review, and inspection processes.

In conclusion, the Commission appreciates the critical role that automated clearinghouse systems play in ensuring that market participants receive timely clearance and settlement services. We believe that the SEC's oversight of automated systems in the clearance and settlement area, in combination with the oversight of the SROs, is adequate to detect and resolve problems associated with operating automated systems. Moreover, with the assistance provided by the Office of Automation and International Markets, we are confident that our oversight in this area will be strengthened.

We appreciate this opportunity to comment on the Report and request that a copy of this letter be appended to the Report when it is issued.

Sincerely,



Richard Ketchum
Director

3/(...continued)

assessment programs to determine systems capacity and vulnerability. See Securities Exchange Act Release No. 27445 (November 16, 1989), 54 FR 48703. Although the Commission did not extend the ARP to clearinghouse automated systems, the Commission stated that in the future it may suggest expansion of the Policy to other SRO computer-driven support systems for, among other things, clearance and settlement, if it finds it necessary to ensure the maintenance of fair and orderly markets. See 54 FR 48703 at note 27.

Comments From the Commodity Futures Trading Commission



COMMODITY FUTURES TRADING COMMISSION

2033 K Street, N.W., Washington, D.C. 20581
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June 1, 1990

Wendy L. Gramm
Chairman

Mr. Ralph V. Carlone
Assistant Comptroller General
Information and Technology Division
General Accounting Office
441 G Street, N.W., Room 6915
Washington, D.C. 20548

Re: Draft Report Entitled "Improved Oversight Needed for
Automation Used to Clear and Settle Trades"

Dear Mr. Carlone:

The Commission appreciates the opportunity to comment on the draft report ("Report") of the General Accounting Office ("GAO") entitled "Improved Oversight Needed for Automation Used to Clear and Settle Trades."

The Commission fully recognizes the need to review and assess transaction-related automated systems and has made the development of effective regulatory oversight of such systems a Commission priority. This is reflected in a number of recent Commission actions. The Commission recently created an inter-agency task force to assist the Commission in addressing current developments concerning the review and assessment of automated systems. The Commission also recently issued an interpretative rule regarding the retention of documentation with respect to such automated systems. 55 Fed. Reg. 17932 (April 30, 1990). In addition, the Commission's Division of Trading and Markets has begun the background work necessary to commence rulemaking to seek public comments on issues related to a review and assessment policy regarding automated systems.

As these actions reflect, the Commission agrees that oversight standards are appropriate for clearing organization automated systems and, as GAO has acknowledged, has begun a process to formulate such standards. However, we do not believe that it is appropriate from a regulatory standpoint to insist on detailed management practices nor to specify rigid technical or systems criteria. Rather, we would incorporate compliance with overall program standards into our existing rule enforcement review programs. The Commission believes that the industry self-regulatory organizations ("SROs"), which include the futures exchanges and the National Futures Association, should have some flexibility to determine the mix of measures for review

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and backup of systems consistent with the number and types of transactions cleared, the processing design, and the applicable timeframes for clearing and settling transactions. The GAO's comments in this area will be given careful consideration as we continue to enhance existing procedures and at the same time carefully analyze the cost, benefits and risks associated with the regulatory process.

With respect to allocating resources to assess the SROs' use of computers in the clearance and settlement process, as the Report acknowledges, the CFTC has authorized its Office of Information Resources Management ("OIRM") to perform technical assessments of automated systems as part of the Commission's regular exchange oversight program and OIRM staff have begun conducting such reviews. We believe, however, that issues concerning the scope of such reviews and the extent of the resources allocated to conduct them are ones that must be addressed by the Commission in the context of its overall oversight program and applicable resource constraints. Decisions concerning resource allocation in this context will necessarily entail close assessment of the relative priorities of all programs administered by the Commission.

We further note that seven of the rules referred to in the Report at page seven relate to clearing and settlement with respect to the Chicago Mercantile Exchange ("CME") Globex System, which was approved in February 1989 but is not yet operational. At the time the rules were approved, the Globex system was still in development. Over the last year, Commission staff has reviewed Globex system documentation, visited the central computer site to investigate the physical and logical security measures undertaken to protect the system, observed system testing, and held numerous discussions with CME technical staff concerning the system, including the interface with the existing clearing system. These discussions have included such matters as security features, capacity planning, performance characteristics, and backup and recovery procedures. Additional oversight activities currently are underway with regard to the Globex system.

The Commission is sensitive to the GAO's concerns in this area and we believe that the Commission's actions referred to herein demonstrate the Commission's commitment to enhancing the oversight of automated systems. We appreciate the opportunity to provide comments on the draft and we would be happy to discuss these comments with your staff.

Very truly yours,


Wendy L. Gramm
Chairman

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