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**Contracting Innovations and the Evolution
of Clearing and Settlement Methods at
Futures Exchanges**

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by

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Contracting Innovations and the Evolution of Clearing and Settlement Methods at Futures Exchanges

Abstract

Defining futures contracts as substitutes for associated cash transactions enables a discussion of the evolution of controls over contract nonperformance risk. These controls are incorporated into exchange methods for clearing contracts. Three clearing methods are discussed: direct, ringing and complete. The incidence and operation of each are described. Direct-clearing systems feature bilateral contracts with terms specified by the counterparties to the contract. Exchanges relying on direct clearing systems chiefly serve as mediators in trade disputes. Ringing is shown to facilitate contract offset by increasing the number of potential counterparties. Ringing settlements reduce counterparty credit risk by reducing the accumulation of dependencies as contracts are offset. Ringing settlements also lower the cost of maintaining open contract positions, chiefly by lowering the amount of required margin deposits. Exchanges employing ringing methods generally adopted a clearinghouse to handle payments. Complete clearing interposes the clearinghouse as counterparty to every contract. This measure ensures that contracts are fungible with respect to both the underlying commodity and counterparty risk.

I. Introduction

This paper studies innovations in futures contracting before 1926. Early that year the Chicago Board of Trade Clearing Corporation (BOTCC) began intermediating futures contracts. As more than 80 percent of US futures contracts traded at the Chicago Board of Trade, this step established complete clearing as the standard for clearing and settling derivatives contracts. In the hundred years preceding the BOTCC, clearing and settlement methods moved from bilaterally negotiated arrangements to practices, though now automated, very similar to those used today. This paper explores how contract terms evolved to conform to the ways they were cleared.

The paper uses a broad definition of futures contracting. The definition recognizes the force of contractual obligations in two distinct regions of the state space: contract performance and contract nonperformance. In performance states one counterparty, the short position, delivers the underlying asset to its counterparty, the long position. At delivery, the long position pays the short position according to contract terms. This portion of the definition conforms to the standard definition of a futures contract as an obligation between counterparties to make a future-dated exchange at a price determined at the contract's inception. The standard definition is insufficient in two senses. First, it omits the counterparty's choice not to perform the contract. This choice will be optimal to one side of the contract in nonperformance states. Rights to exercise such choices are usefully construed as nonperformance options. These options have value. Contract counterparties recognize that the cost of absolute performance assurances can exceed the value of trading benefits and act as

barriers to trade. Mutual provision of nonperformance options substitute for absolute performance assurances overcoming these barriers to enable realization of trading benefits. Second, the standard futures definition obscures institutional incentives to innovate contract design. These incentives stem from needs to reduce credit-risk exposures by reducing probabilities for nonperformance states and mitigating loss amounts when nonperformance occurs. Further, the paper develops connections between loss-sharing arrangements and innovations in contract terms. Exchanges adopting complete clearinghouses internalize nonperformance losses increasing their incentives to innovate in ways that reduce these exposures.

Definitions of futures contracts that omit the nonperformance option are common. Emery (1896, p. 46) defines a futures contract "as a contract for the future delivery of some commodity, without reference to specific lots, made under rules of some commercial body, in a set form, by which the conditions as to the unit of amount, the quality, and the time of delivery are stereotyped, and only the determination of the total amount and the price is left open to the contracting parties." This definition is typical in that it defines futures contracting based on contractual details.¹ I define futures contracts as enforceable substitutes for transactions in cash commodities or assets.

The definition serves two purposes. First, it broadens the category of contracts called futures. Williams (1982), for example, argues that contracts traded at the Buffalo Board of Trade during the 1840s might be classed as futures because their terms were

¹ For a recent example of the standard definition see Kolb (1991, p. 4). In contrast see Edwards (1984, p. 225) who takes a position consistent with that taken here stating that the clearinghouse "transforms what would otherwise be forward contracts into highly liquid futures contracts."

similar to those later adopted by the Chicago exchanges. The success of the Buffalo contracts developed from shared commercial interests in lessening nonperformance costs. Chicago merchants, having similar interests, adopted similar contract terms. Both the New York merchants and the Chicago exchange members faced the potential for nonperformance loss and responded by adapting their contract terms to control loss exposures. For purposes of this paper, the relevant commonality is the economic interest to limit losses.

The second purpose served by this definition follows from the first. Many futures contract terms are best understood as efforts to minimize nonperformance costs subject to available loss-sharing arrangements. The specific measures adopted to control losses are determined by the extant legal environment. Contracts traded at the Buffalo Board of Trade rapidly developed use of performance bonds (margins) and delivery standards.² However, enforcing contract performance beyond this point proved costly. Subsequent changes in commercial law enabled the Chicago exchanges to surpass the Buffalo precedent, ultimately offering performance guarantees. In this sense, the contracts traded at the Buffalo exchange served the same commercial purposes as the futures contracts exchanged in Chicago. Differences in contract details stem more from differences in legal environment than to more fundamental differences in economic purpose.

Nonperformance issues are often ignored because failures are infrequent. An

² See Williams (1980, p. 140-145) for a discussion of early margin rules. Hill (1990) reviews the literature on grade standards.

understanding of the economic principles determining success is useful. This paper follows Coase (1937) in arguing that the record of successfully managed nonperformance risk is largely due to the internalization of information and incentives obtained when exchange-affiliated clearinghouses guarantee performance.

II. A modern context for understanding clearinghouse operations

A general description of modern clearing and settlement operations puts the early procedures into a meaningful context. Clearing is the process of reconciling and resolving obligations between counterparties. This section develops clearing and settlement in two subsections. First, clearing is examined absent consideration of nonperformance. Second, the problem of nonperformance is further developed.

A. Clearing absent nonperformance

Clearing of futures contracts is done in three steps. Clearinghouses initiate the process with registration of traded contracts. Registration identifies the contractual counterparties and records their respective liabilities. Contract standardization simplifies registration. Registration of contracts is by type of contract and delivery month. At futures exchanges, registration occurs as the buy and sell sides of traded contracts are matched. Futures clearinghouses require nonmember futures commission merchants (FCMs) to "give up" their trades to member FCMs.³ A "give up" occurs when the nonmember FCM relinquishes the trade to a member FCM. Paralleling the correspondent

³ I use the term "give up" to demonstrate the functional equivalence between present usage of the term "give up" and the relationship between clearing members and their associated nonmember firms. In present usage, a "give up" occurs when a thinly capitalized FCM noted for good order execution is engaged to handle a large order. The FCM's thin capitalization prevents him from taking the order. Under a give-up arrangement, he executes the order, then gives it up to a better capitalized member.

services offered by banks, the nonmember "gives up" contracts to its clearing member who clears the contract through its clearing arrangements and then adjusts the nonmember's accounts.

Registration at a central clearinghouse enables offsetting, the second stage in the clearing process. Aggregation of the related transactions of each clearinghouse member identifies offsetting commitments. Offset occurs when the aggregated claims against any member are netted against the aggregate of the member's claims against all other members. The current liabilities of the clearinghouse and its members are the net of these obligations. Thus, clearing reduces the number of liabilities by relying on the fungibility of individual contracts.

In the third step, contract settlement extinguishes the current payment liabilities of contract counterparties. In bank clearinghouses, settlement occurs when member accounts are adjusted to reflect amounts paid. On payment, the obligations of all parties are satisfied.⁴ In futures markets, outstanding contracts are settled periodically by marking them to market. Generally, marks are either the most recent market-determined price for each contract or, at the contract's termination, the cash-market price of the underlying asset.⁵ All outstanding contracts are marked to the settlement price. As contracts are marked to market, payments are determined by the netted obligations. Increases in settlement prices produce gains for long positions and losses for short

⁴ The practice of using offsets rather than cash settlements dates to banking practice in early Florence. See Lane and Mueller (1985, p. 81).

⁵ Marks are determined by settlement committees that generally follow the rules outlined here. In exceptional circumstances, these committees can determine marks by substituting their assessed valuations for market-determined prices.

positions. Conversely, decreases in settlement price result in losses to long positions and gains to short positions. Settlement occurs when payments owed to clearing members are made.

Like bank clearings, settlements set currently payable amounts between counterparties to zero. Unlike the operations of bank clearinghouses, cleared futures contracts generally remain outstanding following a settlement. This means that credit risk, the risk that one counterparty will fail to meet its obligations, is not extinguished; periodic settlement reduces this risk to the uncollateralized portion of the price change realized at the next settlement.

B. Nonperformance problems

The nonperformance problem is well illustrated by the experience of several Peoria, Illinois grain elevators offering forward contracts to local farmers. Quoting from the Federal Trade Commission's *Report on the Grain Trade*:

Contracting for grain at a fixed price has proven an unsatisfactory practice with many elevators. The principle objection thereto is that if prices are in advance of those stipulated in the contract when the time of delivery arrives the farmer becomes dissatisfied and often refuses to fulfill the contract. If the elevator then attempts to enforce it the usual result is that the farmer transfers his business to another elevator. His dissatisfaction easily spreads to other farmers, especially if the elevator in question is an independent or one of a line company and may result in serious loss of business.⁶

Forward contracting is motivated by expectations of benefits. In the Peoria case, the beneficiaries are farmers and grain elevators. Irrespective of motivations to contract forward, subsequent performance is conditional on prices realized at delivery dates. In

⁶ FTC (1920), Volume I, p. 113.

some states, counterparties find nonperformance is preferred to losses realized by fulfilling contract terms. Recognizing this, counterparties have incentives to restrict their nonperformance opportunities. Doing so improves their access to benefits from contracting forward. Along similar lines, Smith and Warner (1979) show how bond covenants lower debt costs by lessening the default risk of corporation-issued bonds. These restrictions lessen both the likelihood of nonperformance and the extent of losses should nonperformance become unavoidable. However, modifications assuring contract performance are costly. When these costs exceed benefits derived from further performance assurances, it becomes optimal for counterparties to exchange non-performance options.⁷

Edwards (1984) distinguishes between bank and futures clearinghouses. Bank clearinghouses settle by netting payments between members, collecting payments, then crediting or debiting member accounts. They are obligated only to the extent of a member's account balance. Futures clearinghouses guarantee performance of cleared contracts. They extinguish current liabilities and take steps to lessen exposure to future defaults, but performance guarantees imply that some residual exposure remains. The contention of this paper is that the evolution of clearing arrangements was importantly influenced by the needs of members to control their risk of losses from nonperformance. Thus, exchange policy on contract details like margin and marking contracts to market stems from its interest in the clearing mechanism.

III. The evolution of contracts and clearing systems

⁷ This is the incompleteness referred to in Kane (1980).

Three clearing methods developed before formation of the BOTCC. These are clearing by direct settlement, clearing through rings, and complete clearing. The section describes the methods, identifies certain credit risk problems and the contract specifications adopted to address these problems.

A. Direct Settlement

Direct settlement is a bilateral reconciliation of contractual commitments obtained through delivery or by offset between original counterparties. For example, A contracts with B to sell 5,000 bushels of wheat in May at \$1.00 per bushel. There are three categories of possible outcomes for a direct settlement system.

First, the specified terms of the contract can be performed. Thus, the contract is settled when A delivers 5,000 bushels of wheat to B in May and B pays \$5,000 to A. This is settlement by direct delivery. Second, parties can settle the contract before May by agreeing to a price at which both are willing to extinguish the liabilities of the other. This is called direct offset.

The previous example is extended to illustrate direct offset. Let A and B agree to a second contract in March as follows: B commits to deliver 5,000 bushels in May to A and A commits to pay B \$0.95 per bushel, or \$4,750. The two contracts could be settled in May as follows: Fulfilling the initial contract A delivers 5,000 bushels to B and B pays A \$5,000. The second contract requires that B deliver 5,000 bushels to A and A pay B \$4,750. Because wheat deliveries cancel, the net from settling both contracts is a \$250 payment by B to A. Alternately, both parties benefit by recognizing in March that the earlier contract has been offset on payment by B of \$250. This is called a pay-

ment of the difference. Both A and B benefit by offsetting because each avoids title-transfer costs and reduces recording-keeping expenses.

It might be objected that the present value of \$250 paid in March is greater than \$250 paid in May, thus B would refuse to settle on these terms. However, recall that the price for the March settlement is mutually agreeable. B agrees to settle early provided the difference amount paid in March is less than the price change expected to be realized in May. A is willing to take an amount smaller than her expected price change because the payment amount can be invested. Thus, a mutually agreeable settlement price in March can be based on the present value of a settlement occurring in May. Alternately, B could be compensated by a payment of interest from A on the profit realized by A in March. Some exchanges required interest payments on profits.⁸ Both approaches are equivalent provided the rate used to calculate interest payments equals the market rate over the same term for equal-risk investments.

As a last outcome, one party can fail to perform leaving contract settlement to standing enforcement procedures. As this contract is described, nonperformance can only occur in May. Before May, neither party has a duty to perform. Accurate inferences might be made about counterparty ability to perform; nevertheless, until a contract term goes unperformed, the contract stands. This aspect of the contract elevates risk in two ways. First, the possibility of accumulating substantial losses increases as time remaining in the contract increases. Second, a failing counterparty has incentives

⁸ Forrester (1931) says the rules of the Liverpool Cotton Association required payment of interest on profits. As of 1882, the General Rules of the New York Produce Exchange also specified payment of interest on profits.

to gamble in hopes of resurrecting net worth. Such gambling increases credit risk. Recognizing these risk sources motivates adoption of contract terms that impose periodic demonstrations of continued performance capability. Including these provisions curtails loss buildups and reduces incentives to gamble for resurrection.

Direct settlement is the oldest clearing arrangement. Emery (1896, p. 35-36) describes trading in the warrants of the East India Company in 1733. These were bearer instruments transferring title to a warehouse receipt for a quantity of metal on a future date. Endorsement signified sale of the warrant. Thus, transfers were directly settled at the time of sale. The earliest of these warrants were for specific lots of a metal, later "general warrants" transferred title for specified quantities and grades.⁹

These warrants did not trade on exchanges. Thus, resolution of legal disputes arising from trading in warrants was obtained in courts. This proved costly. Obtaining a less costly route to handle trade disputes served as an impetus for the formation of exchanges and trading associations.¹⁰ Most often exchange membership bound members to accept the arbitration decisions made by an appointed committee.

Ellison (1905, p. 15) records that trading in Liverpool began shortly after 1781. Indications are that contracts were directly settled in the early years of that exchange. Ellison describes the market before 1860 as follows: "The merchant sold his cotton through a selling broker; the spinner purchased it through a buying broker. There were

⁹ Nevin and Davis (1970, p. 17-19) suggest that assignability of contracts developed much earlier. Thus, it would not be surprising to find similar contracts trading well before 1733.

¹⁰ For similar instances, see Powell's (1984) description of the development of arbitration in England. Milgrom, North and Weingast (1990) describe earlier developments.

brokers who bought and sold, but they were an exception to the rule, and comparatively few in number."¹¹ The Liverpool Association actively sought to improve contract performance. The earliest measures left contract negotiation to counterparties, the exchange intervening only to arbitrate disputes. Negotiations could be complex. Ellison describes a 1825 transaction involving the placement of "two letters of credit of \$50,000 each" on a contract for 6,000 bales of cotton estimated to be worth \$500,000.

The effectiveness of Liverpool clearing methods is shown by rule changes adopted at that exchange. Ellison (1905, p. 292-295) describes settlement problems as "numerous disputes arising out of the gigantic speculative transactions developed by the occurrences incidental to the American [Civil] War." Dumbell (1927, p. 196) says that "the confusion of the war years forced the Association to prescribe for itself a constitution and a gradually increasing number of rules and bye-laws." Williams (1982, p. 306, fn. 2) describes a vote on the adoption of Association rules on June 17, 1864. Ellison (1905, p. 325-326) states that lack of grade standards created bargaining situations that contributed to contract-settlement problems: "At other times the importer would discover that his property had been sold 'short', in which case he would refuse to part with it except at a smart premium on current prices." These comments suggest that direct settlement of individually arranged contract terms used in the earlier years proved unwieldy in the volatile markets of the 1860s. The members of the Association responded by standardizing contract terms, particularly grade standards, to increase contract fungibility. For transfers of the underlying commodity, contracts became close

¹¹ Ellison (1905, p. 244).

substitutes for one another, increasing the ability to offset positions. By 1871, the earlier system of voluntary performance bonding was replaced by a rule stipulating performance bonds for all contracts, suggesting that voluntary bonding was proving inadequate.

Contracts traded at the Buffalo Board of Trade may be the first instance of extensive futures contracting in the United States. These contracts arose as grain traffic in the Great Lakes increased. Early transactions were for cash financed by bank advances. Williams (1982, p. 310) describes the Buffalo Board of Trade organized in 1844 as having developed an extensive futures market by 1847. Williams quotes a contemporary: "most often the forward sales considerably outnumbered sales of flour on the spot." Settlements were direct, described as "between pairs of parties."

The Buffalo Association adopted measures to ensure performance. Contracts were most often settled by payment of differences rather than delivery. Contract offsets were obtained via bilateral negotiation because "individual traders were themselves adept at enforcing the terms of contracts and keeping them comparable to others ..."¹² Contract offset was helped by standardizing deliverable grain by stipulating sources of deliverable grain or flour. Market participants understood the quality implied by these locations, enabling them to substitute contracts for one another; i.e., contracts were made fungible.

The measures proved effective. Williams (1982, p. 313) quotes Buffalo newspaper descriptions of that market's response to late-Spring ice on the Great Lakes. The

¹² Williams (1982, p. 315) and see Williams (1986, p. 125).

ice prevented delivery on May contracts. Prices were high " ... as contracts are interested in having high prices maintained that the damages for nonfulfillment of contracts may be corresponding." In other words, long positions expected full compensation for late deliveries. Apparently, this expectation was justified as a subsequent news account stated: "All the houses which contracted to deliver breadstuffs have so far settled without litigation or delay, except one, though the balances in many cases have been very heavy ... "

Futures contracts for oil traded at several exchanges before formation of Standard Oil.¹³ The rules of these exchanges show that settlements were exclusively direct. A *Petroleum Age* article describes contracting at the Oil City Exchange, stating "futures were regulated to suit the convenience of either party."¹⁴ Lack of uniformity would have limited offsets to contracts between original counterparties.

Rules of the petroleum exchanges sought to control nonperformance risk. Rules of the Oil City exchange allowed counterparties to "call for mutual deposit on margin of not more than ten percent of the contract price." The Titusville and New York Petroleum Exchange had similar provisions. Similarly, contract nonperformance could result in suspension of trading privileges or expulsion from the exchange.

The New York Petroleum Exchange, the most active of the oil exchanges, engaged Seaboard Bank as its clearinghouse agent. Its agreement with Seaboard, re-

¹³ Weiner (1991) attributes the decline of petroleum futures to the development of the Standard Oil Trust in the mid-1890s. I am indebted to Rob Weiner who provided copies of most of the petroleum-futures references which are used here.

¹⁴ "Speculative Halls--The Oil City Oil Exchange," *The Petroleum Age* IV, no. 4, May, 1885.

quired exchange members to complete daily statements of "all Oil coming in and going out." Statements were sent with a certified check "if the difference is against the sheet, or with the Oil, if the sheet shows more going out than coming in." Members not fulfilling these requirements were in default of their contracts and faced fines or expulsion from the exchange.

Exchanges using more advanced clearing mechanisms generally permitted direct offset. The New York Produce Exchange required clearing through designated trust companies acting as its clearinghouse only for contracts held overnight. Traders could offset directly contracts made during the day.¹⁵ Chicago Board of Trade rules permitted direct settlements even after incorporation of its clearinghouse. Morris Townley, CBOT counsel, in an opinion to the exchange's board of directors, states " ... it is entirely lawful and proper for members to make trades, stipulating as between themselves that such trades are not subject to clearance through the Board of Trade Clearing Corporation. Such trades would be ex-clearing house and would be settled by direct delivery between buyer and seller."¹⁶ Similarly, the Italian Bourse made complete clearing optional. Counterparties submitting contracts to the clearinghouse within three days of the trade obtained guaranteed performance. Otherwise, settlement was left to the original counterparties.¹⁷

¹⁵ Emery (1896), p. 66.

¹⁶ Chicago Board of Trade, Board of Directors meeting 1-1-1926. Hereinafter cited BOD and the date. Williams (1986, p. 307) also concludes clearing through the clearinghouse was not mandatory until the 1920s.

¹⁷ I am indebted to Giorgio Szegö who described these aspects of early practices at the Italian Bourse to me.

B. Settlement by Ringing

Direct settlements are limited to the original counterparties. This is important because direct offsets depend on the mutual assent of counterparties. Contract fungibility simplifies these joint interests. The simplification means that many counterparties can settle contracts simultaneously. Ring settlements are relatively informal arrangements between three or more counterparties with interests to settle. Incentives to enter a ring are: reduced exposure to counterparty risk and reductions in the cost of maintaining open positions. To achieve these benefits, ring participants must accept substitutes for their original counterparties. Exchanges adopted rules and practices that helped ringing settlements to enable access to those benefits.

To illustrate settlement by ringing, consider four parties having positions in a contract requiring delivery of 5,000 bushels of wheat in May. A sold to B at \$1.00; B sold to A at \$.95; C sold to B at \$.97; and D sold to C at \$.93. The following table details these positions.

Table 1 Summary of Contracts and Counterparties			
Counterparty	Buy Price	Sell Price	Profit (Loss)
A		1.00	
	0.95		0.05
B	1.00		
		0.95	(0.05)
	0.97		
C		0.97	
	0.93		0.04
D		0.93	

Long positions are shown by entries under buy price. Entries under sell price denote short positions. Profits (losses) based on direct settlements are listed for each transaction reversing a previously listed transaction.

The three possibilities previously examined are available here; that is, contracts can be settled between original counterparties through deliveries, offset, or by standing rules for governing nonperformance. Thus, the two contracts between A and B can be directly settled through delivery or offset. A fourth possibility, settlement by ringing, becomes available provided each party regards the contracts as fungible. Clearly, the contracts are fungible with respect to the commodity delivered and the delivery date and, as demonstrated before, settlements can accommodate differences in contract prices. However, complete fungibility requires acceptance of substitutes for original counterparties. Thus, B must regard the exposure stemming from a substitute contract

with D as no worse than the exposure from the original contract with C. Given equivalence of nominal contract terms and credit-risk exposure, the contracts are fungible and a ringing settlement is possible.

Standardizing contracts achieves the needed level of equivalence. The literature on contract standardization emphasizes the early development of standard deliverable grades. Standardization was in the interest of market participants because it created benchmark contracts. Absent nonperformance concerns, individual commercial interests can be restated in the benchmark contract. Trades in the benchmark contract substitute for trades in specific-but-similar commodities. Transactions in these separate and often illiquid markets for specific commodities are replaced by transactions in a liquid benchmark commodity.¹⁸ However, like the standard definitions for futures contracting, the contract standardization literature ignores the nonperformance option.

Working through a ringing settlement establishes the importance of counterparty credit risk. A ring formed by the counterparties A, B, C, and D must agree to a price for settling all contracts.¹⁹ This price must produce payoffs identical to those obtained using the present value of the expected settlement in May. The most recent futures price

¹⁸ The significance of the ability to transact in futures markets is demonstrated by a 1923 letter from a J.C. Wood. Wood compares transacting in the cash markets and the futures markets: "In other words, the service performed by the broker in the execution of orders for 'seller the month' or 'future month delivery' in the pit is an entirely different service than the service performed by the cash broker, whose work is largely specialized and carries with it technical knowledge and represents an expensive activity." BOD 11-23-1923.

¹⁹ Counterparty D, having no contracts to offset, has no incentive to enter this ring. D's inclusion demonstrates that his interests are not damaged by the settlements arrived at within the ring.

provides this.²⁰ Taking the trade between C and D as the most recent price, the ring's settlement price is .93. Reconstructing the previous table based on this price gives:

Table 2				
Illustration of Clearing Through a Ring				
Counterparty	Buy Price	Sell Price	Profit (Loss)	Net Profit
A	0.93	1.00	0.07	
	0.95	0.93	(0.02)	0.05
B	1.00	0.93	(0.07)	
	0.93	0.95	0.02	
	0.97	0.93	(0.04)	(0.09)
C	0.93	0.97	0.04	
	0.93	0.93	0.00	0.04
D	0.93	0.93	0.00	0.00

Shaded cells denote settlement prices. An odd number of rows for a counterparty denotes an open position after ringing. Thus, after ringing A and C have offset their contracts, and B and D become counterparties to one open contract with B long and D short.

Applying settlement prices to the contracts of ring participants gives the profit (loss) on that contract and netting the profits (losses) of each counterparty gives that individual's net profit. Hence, A records a net profit of .05. The contract with A accounts for 0.05 of B's loss amount (0.09). Thus, regarding profits and losses from

²⁰ This is because arbitrage restricts futures prices to the cost of acquiring and financing a position in the underlying asset. Thus, the most recent futures price provides the current "cost of carry" for the underlying commodity. This price gives then the present value of a May settlement.

their two contracts, A and B are indifferent between settling directly and settling through the ring.²¹ C opts to offset its contract with B, while B remains long in the contract. Recall that a direct settlement system requires that both counterparties be willing to offset. To obtain a direct settlement, C might find it necessary to give up part of the .04 profit per unit to obtain an offset of the contract with B. A ring settlement enables C to avoid this bargaining problem, establishing a weak preference for settling through the ring compared with a direct settlement.²²

The interests of counterparty B in the contract with C deserve special attention. Note that B loses its bargaining position with C upon agreeing to the ring's settlement price. In addition, B's participation hazards greater counterparty risk. B's decision regarding counterparty risk has two additional dimensions. First, since C has an unrealized gain of .04, prices must rise .04 before B has any loss exposure. Replacing C with a substitute counterparty of equivalent creditworthiness at the current settlement price increases B's loss exposure. B will prefer a ring settlement only if the new counterparty poses less credit risk than presently posed by C and its unrealized gain. This first dimension of B's decision dictates a preference for direct settlement.

The second dimension of B's decision compares counterparty risk absent C's unrealized gain. B's present counterparty risk is subject to the performance of D in that

²¹ This is true despite settling the contracts at .93 rather than at .95 as in the direct-settlement example. As long as all contracts are settled at the same price and payments are netted, the payoffs are the same for all closed contracts regardless of settlement price. Use of the most recent price eliminates carrying forward losses and gains for open contracts. Cox, Ingersoll and Ross (1981) show that investment of nonzero carryover amounts affects the price of a futures contract.

²² The preference is weak because at a profit of .04 from direct settlement C is indifferent.

D's failure to perform can lead to C being unable to complete its obligations with B.²³ Thus, the loss that B may suffer is conditional on losses that C may incur from its other open contracts. An informed decision by B requires information on all of C's positions, especially positions potentially affecting C's ability to perform. The exposure from directly contracting with D may be less than the exposure from a contract with C whose performance is dependent on the contract between C and D. To see this, consider two alternative contracts each having no performance dependencies. In a contract between B and C, C fails if state one occurs but performs in all other states. In a separate contract between B and D, D fails if state two occurs but performs in all other states. To obtain an upper bound on B's current risk, add the condition that C's performance on the contract with B depends on the performance of D. With these conditions, B suffers a loss on occurrence of states one or two. In contrast, directly contracting with D reduces B's exposure to only state two's occurrence. Thus, B's upper bound is decreased from its present level. This dimension of B's decision is determined by the extent and importance of these dependencies. As they increase, B's preference for a ringing settlement increases.

Besides affecting counterparty risk, ringing affects costs for maintaining open positions.²⁴ Maintaining margin deposits is a significant part of this cost. To illustrate, assume each counterparty maintains a margin deposit of .05 per bushel; that is, \$250

²³ Counterparty D will also be concerned with counterparty substitution. As his concerns are the same as B's, the discussion which follows focuses on B's concern only.

²⁴ These arguments for the cost of maintaining open futures positions closely follow Baer, France, Moser (1998).

per contract. From Table 1: A and C have two contracts each, B has three and D has one. Margin deposits while these contracts remain open are: \$500 for A and C, \$750 for B and \$250 for D. With direct settlements, A and B would recognize that their cross exposures are nil so under direct settlement rules, A deposits no margin and B deposits \$250 for his open position with C. Direct settlement does not reduce the deposits of C because his two contracts remain open. D maintains a \$250 deposit for his one open position with C.

In a ring settlement, D is substituted for C so that margin deposits are \$250 each for B and D and zero for A and C. Thus, absent ringing, C incurs the cost for maintaining deposits of \$500. With respect to their costs of maintaining margin deposits, A, B and D are indifferent between settling directly or through rings. C, on the other hand, prefers ringing.

Summarizing, A is indifferent between direct and ringing settlements. B's preference is determined by comparing the value of bargaining power over C with an assessment of the effect that ring entry will have on credit risk. Because C avoids a weak bargaining position and reduces the cost of maintaining open positions, C strongly prefers a ringing settlement. Finally, D shares counterparty substitution risk with B. So, the interests of B and C can be in conflict. An optimal ringing rule should enable C to improve its position without imposing costs on B or D. The exchanges obtained this result by making ring entry voluntary, stipulating that once a ring was entered, its results were binding on its participants. From the above, B's minimum condition for entry into the ring is reduced loss exposure after a ring settlement. On satisfying this condition, B

enters the ring and becomes bound by its settlements.

Rules enabling settlement through rings must provide finality for all offsets arranged through rings. Referring to the above example, finality is obtained when neither B or D can enforce a claim against C should their substituted counterparty fail to perform. Exchange practice clearly intended finality.²⁵ The courts upheld the principle of offset finality in *Oldershaw v. Knoles*. Referring to the 1879 decision of this case in which a commission merchant arranged for a substitute counterparty who later failed, *Bisbee and Simonds* (1886, p. 158) state:

The customer was held bound by this similar transaction on the part of his commission merchant; because, in employing the merchant, the customer was taken as intending that the business should be done according to the custom or usage of that market, whether or not he knew of such custom or usage.

Thus, counterparty C could offset an original contract with B assured that the liability was terminated. The decision established that finality was independent of whether counterparties were original or not. As ringing benefitted customers by easing contract trading, these customers could not invalidate their contracts when ringing resulted in losses.²⁶

To facilitate ring settlements, exchanges adopted centralized mechanisms for

²⁵ A 1920 FTC report observed that counterparty substitution was implicitly "recognized in the rules of various exchanges, only in Chicago and St. Louis is it set up as a right of traders executing contracts." FTC II, p. 284.

²⁶ *Oldershaw v. Knoles* (4 Bradwell 63-73 and 6 Bradwell 325-333) built on two prior cases: *Horton v. Morgan*, 19 NY 170, a 1859 case in New York involving transfers of stock; and *Bailey v. Bensley* 87 Ill 556, a 1877 case involving CBOT futures.

payments and deliveries. These arrangements performed like bank clearinghouses.²⁷

A counterparty entering a ring with contract losses submitted a record of their offset contracts along with a suitable draft to the clearing facility. Offset contracts were confirmed by matching against the offset contracts submitted by other ring members. The clearing facility credited member accounts in the amount of drafts received and debited accounts on disbursing payments to counterparties realizing gains. Deliveries were cleared by passing warehouse receipts to the clearing facility. The receipts were then passed to parties taking delivery. Members were charged fees for contracts settled through the clearing facility.²⁸

Clearinghouse operations originated in banking and their operations probably were an important influence in the development of futures clearinghouses. Spahr (1926, p. 70-71) dates the London Clearing House to 1773. Gorton (1985) and Gorton and Mullineaux (1987) study the economic forces motivating formation of the New York clearinghouse in 1853 as drafts on individual bank deposits replaced bank-issued claims on specie. Timing suggests that clearing of stock transactions inspired formation of a clearinghouse for a futures exchange. The London Stock Exchange adopted a clearinghouse in 1874. Emery (1896, p. 69, fn. 1) says the Liverpool clearinghouse was adopted in 1876 and describes it as the first clearinghouse for a produce market.

²⁷ Nevin and Davis (1970, p. 6) indicate that similar clearing systems were employed by the French in the 13th century. Merchandise was bought and sold at fairs with transactions debited or credited accordingly by an on-the-spot banker. At the close of the fair, all transactions were cleared with settlement made in a single payment as needed between the banker and each merchant.

²⁸ A case described by Parker (1911) suggests that demand for clearing services can be substantial. The membership of a German exchange in 1908 sought to avoid government regulation by moving the membership to another building and dropping its clearing house arrangements. Soon after, a private firm offered to clear settlements for those who chose to patronize it.

Like direct settlement, ringing leaves resolution of nonperformance to individual counterparties. A 1923 letter from the CBOT Rules Committee describes the position of a trader with respect to the CBOT, stating:

That part of the regulation referring to the financial standing of a correspondent should be understood to mean that the principal should keep himself well informed, as business transactions between the two would warrant, as to the financial condition of his correspondent, so as to protect himself and the trade in general against any losses which might occur through the correspondent becoming insolvent.²⁹

This was generally understood as illustrated in a letter by T.P. Newcomer describing his position with the CBOT. Newcomer wrote: "We understand your Board is not a collecting agency and do not expect you to get us our money..."³⁰ Thus, counterparties retained responsibility for monitoring the financial condition of counterparties and to collect from them any payments due. The exchange did not take on this responsibility.

The exchanges did provide members with routes for controlling nonperformance risk. The first of these was margin. Like direct-settlement clearing systems, exchange rules enabled counterparties to call for margin. Two forms of margin deposit could be required of contract counterparties. The first, original margin, was generally limited to no more than ten per cent of the value of the contract at its most recent futures price. This established an upper limit on the liquid assets that an exchange member could be required to maintain. The limit curtailed calls for excessive amounts of margin to force a counterparty into default. Margin amounts were reciprocal; members calling for mar-

²⁹ BOD 10-2-1923.

³⁰ BOD 9-18-1900.

gin were required to post like amounts.³¹

The second form of margin, sometimes called variation margin, was based on the amount of the difference between the contract price and the current settlement price. This amount applied only to the counterparty with an unrealized loss from the contract. Amounts paid as variation margin were also kept on deposit. They were paid out only when the contract was offset.

The right to assess margin was well recognized by the courts. The Illinois Supreme Court in *Denton et al. v. Jackson* held that absent an agreement between counterparties on margin, then the transaction was governed by the rules of the exchange. If the rules of the exchange enabled a call for margin, a member not fulfilling a margin call was in default.³²

Exchange rules generally provided that margin moneys must be held in accounts agreed to by the counterparties or with an exchange-approved bank. A 1915 amendment to CBOT rules permitted members to fulfill margin requirements with cash or securities.³³ The rules stipulated the timing of these deposits with an expectation of rapid compliance. Rules often stipulated that margin amounts called for in the morning had

³¹ The CBOT attitude toward margin determination is expressed in a letter from a special committee which considered exchange-determined margin: "mandatory rules are impossible and that anything else would operate simply in the nature of a suggestion and would not only be unenforceable but ill-advised, because of the fact that each member of this exchange governs his transactions with his customers by his own ideas of credits." BOD 9-17-1912.

³² Bisbee and Simonds, p. 150. Common law also provided a right to call for margin. Under common law, a reasonable period had to be provided to meet the margin requirement before the contract could be regarded in default.

³³ Determining securities allowable for margin purposes was left to the counterparties.

to be deposited by early afternoon.³⁴ During this period the form used for customer-trade confirmation by Edwards, Wood & Co. Stock Brokers and Commission Merchants included a preprinted notice that customer positions can be closed out "when margins are running out without giving further notice." This firm was leaving no doubt that it could close out positions as it deemed necessary.

Failure to make a required margin deposit was a contract default. Margin rules enabled members to determine financial ability by calling counterparties for margin. Failure to post the margin was nonperformance, enabling members to curtail the accumulation of further losses and prevent gambles to resurrect net worth.

Rules requiring margin deposits were also facilitated by the clearinghouse. The ability to offset contracts and, by that, substitute counterparties required notification rules. The clearinghouse kept track of contract counterparties, enabling their identification. However, because principals often confidentiality, commission merchants obligated themselves to fulfill contract terms.³⁵ Thus, exchange rules generally regulated calls for margin between commission merchants and not their customers, the actual principals. The commission merchants, in turn, arranged for margin deposits from actual principals. Margin called from actual principals who were not members of the exchange were not subject to exchange limits on margin requirements.

Periodic contract settlement, today called marking to market, was not generally adopted by the exchanges. An exception was the Liverpool Cotton Association.

³⁴ The CBOT adopted a one-hour rule in 1887. It required members to meet calls for margin within one banking hour. Prior to that date three banking hours were allowed.

³⁵ See Bisbee and Simonds (1886, p. 182-183).

Ellison (1905, p. 354-356) suggests that periodic settlements were adopted by that exchange in 1883 because of heavy broker losses incurred during a corner. Forrester (1931, p. 196-207) states: "Liverpool has weekly settlements; all outstanding contracts are reduced to a weekly settlement price and all differences must be cleared." Liverpool's periodic settlement adoption followed that of the London Stock Exchange. Forrester (1931, p. 196-207) says the motivation for both organizations was the same: "to prevent plungers without capital and unduly optimistic speculators from proceeding so far as to hurt the market before a check is applied." Periodic settlement curtailed nonperformance losses in two ways. First, it lessened the probability of incurring a loss by imposing repeated demonstrations of financial ability to perform. Second, it curtailed loss accumulations.

Standards for the financial integrity of exchange members give another route for controlling nonperformance risk. The CBOT took early steps to lessen credit risk by regulating membership based on financial ability. On March 27, 1863, its membership adopted a rule stating

Any member of the association making contracts either written or verbal, and failing to comply with the terms of such contract, shall, upon representation of an aggrieved member to the Board of Directors, accompanied by satisfactory evidence of the facts, be suspended by them from all privileges of membership in the association until such contract is equitably or satisfactorily arranged and settled.³⁶

Thus, failure to comply with the terms of a contract could result in loss of a membership

³⁶ Quoted from Andreas (1894), Volume III, p. 351. The following communication illustrates a typical settlement between counterparties. "We beg to advise you that a private settlement has been arranged on the Sept. Barley on which we yesterday reported default. This settlement is satisfactory to all parties concerned; consequently we ask that our request for the appointment of a Committee to determine a settlement price be withdrawn." BOD meeting 10-7-1919.

in the association, the value of this membership stemming from the right to trade contracts "on 'Change." The relevance of this rule was illustrated a year later during a debate over initiation fees: "The amount of initiation fee is not one of the questions taken into account when a man is proposed for membership. The character and standing of the applicant is the only matter for consideration."³⁷

In 1873, the CBOT extended its efforts by making nonperformance of any contract, on or off the exchange, grounds for requiring a demonstration of financial ability.

The rule stated:

Any member of this Association who fails to comply with and meet any business obligation or contract, may, on complaint of any member of this Association, be required to make an exhibit of his financial condition on oath to the Directory of this Board, which shall be open to any aggrieved member; and should such member, failing as aforesaid, refuse to make such statement, he shall be expelled from the Association.³⁸

This measure amplified rules protecting members from nonperformance losses. The usefulness of earlier measures depended on the ability to anticipate counterparty failures. This dependence weakened their effectiveness. In particular, failure of a counterparty could result from failure on a contract made by that counterparty with yet another member. Like dominoes, contract failures could cause a string of seemingly unrelated counterparties to fail. Ringing, because it left risk assessments to individual members who lacked the ability to detect the exposures of their counterparties, was susceptible to these systemic failures. The 1902 bankruptcy of George Phillips illus-

³⁷ FTC II, p. 72.

³⁸ Quoted from Andreas (1894), Volume III, p. 299.

trates this problem. Losses from the Phillips bankruptcy reached the accounts of 748 members, more than 42% of the CBOT membership.

Arrangements for payments from counterparties ranged from banking arrangements to handle payments to adoption of a clearinghouse within the association. The CBOT developed a clearinghouse for handling difference payments in 1883. Describing the forthcoming clearinghouse the *CBOT Annual Report* said it "meets a want which has long been felt by the trade." A contemporary described its operations saying "It takes no cognizance of the transactions on the board, but simply plays the part of a common fund, to which each member pays the excess of his daily debit over his daily credits, or receives the excess in case the later aggregate be greater than the former."³⁹ This clearinghouse began operating on September 24, 1883. Summarizing its operations during its first fourteen weeks, Chicago's *Tribune* reported that 26,986 checks had been processed. That newspaper reported that under the previous system 260,000 checks would have been required.⁴⁰ Contract registration initially occurred only at contract settlement. Introduction of contract registration in 1884 extended clearing operations beyond handling of difference payments and beyond those performed by bank clearinghouses. After this date, traders intending to settle through the clearinghouse were required to turn in Check Slips at the inception of these contracts. The registration requirement recorded contractual obligations.

³⁹ *Chicago Tribune*, 1-1-1884, p. 9.

⁴⁰ A newspaper report of check clearing by the Chicago Clearing Association indicates that growth in check clearings had declined. This was explained as due to the operations of the clearing house. *Chicago Tribune*, December 3, 1883, p. 6.

The extent of clearing operations in the years before BOTCC cannot be directly ascertained. The importance of the CBOT clearinghouse does come through in various communications. A 1906 letter describes the consequences to a member on being denied access to the clearinghouse: "It started a run on my firm. Those who had credits with us wanted their money at once, while those who owed us refused to pay, waiting, as some of them said, till they could settle for 10%."⁴¹ Other evidence confirms an increasing role for the CBOT clearinghouse. A 1903 change to the rules required that loss or damages from defaulted contracts be paid through the clearinghouse. While this left determination of these amounts to the affected parties, their processing through the clearinghouse gave the exchange a record of member performance. In 1917 the exchange began requiring members to notify the clearinghouse when calling for margin. Members making their deposits were required to notify the clearinghouse of their compliance. On failure to make the required margin deposit, the calling party had the right to offset the contract on the exchange floor. The defaulted contract then became "due and shall be payable through the Clearing House,...., the same as though the said contract had fully matured."

Ringling, generally with a facilitating clearinghouse or bank, was the predominate method of clearing at the US exchanges. Emery (1896, p. 66) quotes from a copy of the clearing sheet used at the New York Produce Exchange: The clearing bank is intended "to facilitate the payment of differences on the deliveries, direct settlements and

⁴¹ BOD 10-17-1906.

rings of the previous day."⁴² Rules for Lard and Provisions contracts traded at the New York Produce Exchange stipulated that on agreement to form a ring, the parties were compelled "to settle their differences on said contract with each other, on the basis of the settlement price." This rule bound exchange members to the settlements reached by the ring. The New York Cotton Exchange, established on April 8, 1871, used direct and ringing settlements with no clearinghouse until 1896.⁴³ Boyle (1931) describes clearing at the New Orleans Cotton Exchange. The exchange organized on September 19, 1871 allowed contracts to "be settled through the Clearing House of the Cotton Exchange, or by offset between members, or by ringing out and paying only the balance due."

C. Settlement with Complete Clearing

Complete clearing interposes the clearinghouse as counterparty to each side of exchange-traded contracts. Contracts agreed to on the floor of the exchange and accepted for clearing require the clearinghouse to take the buy side of every contract to sell and the sell side of every contract to buy. This role substitutes the credit risk of the clearinghouse for the credit risk of individual counterparties. Thus, contracts exchanged in a complete clearing system are completely fungible: grade standards imply that commodities underlying contracts are the same and complete clearing implies that all contracts have equivalent credit risks.

⁴² It is not clear when the New York Produce Exchange adopted a clearing bank. Trading at that exchange began in 1877. A Chicago *Tribune* article summarizing business developments in 1883 reported that the New York exchange formed an in-house clearinghouse on October 29, 1883 on a three-week trial basis. The operation halted after the trial period.

⁴³ Emery (1896), p. 68

The following table adds the clearinghouse as counterparty to the contracts used to illustrate the ringing system.

Table 3 Illustration of Complete Clearing								
Trading partners					Clearinghouse			
Counterparty	Buy Price	Sell Price	Profit (Loss)	Net Profit	Buy Price	Sell Price	Profit (Loss)	Net Profit
A	0.93	1.00	0.07		1.00	0.93	(0.07)	
	0.95	0.93	(0.02)	0.05	0.93	0.95	0.02	(0.05)
B	1.00	0.93	(0.07)		0.93	1.00	0.07	
	0.93	0.95	0.02		0.95	0.93	(0.02)	
	0.97	0.93	(.04)	(0.09)	0.93	0.97	0.04	0.09
C	0.93	0.97	0.04		0.97	0.93	(0.04)	
	0.93	0.93	0.00	0.04	0.93	0.93	0.00	(0.04)
D	0.93	0.93	0.00		0.93	0.93	0.00	

As before shaded cells are the settlement prices obtained from D's trade. The first five columns repeat Table 2. The four columns on the right side give the clearinghouse position in each of these contracts. The clearinghouse can be seen to have the opposite side of each contract. Naturally, these contracts offset one another in performance states. Thus, in states of the world where nonperformance options expire unexercised, the final outcome from a complete clearing system is identical to that of a ringing system. The routes taken by payments do differ in a complete clearing system. In complete clearing, the cash payment made by A goes to the clearinghouse. The clearinghouse, in turn, makes a cash payment to B. However, since the cash flows of

counterparties A and B remain unchanged, A and B are indifferent between a ringing settlement and complete clearing. Thus, from the perspective of A and B, the complete clearing system operates like a ringing system augmented by a clearinghouse to facilitate payments between counterparties.

Contrasting this offset with that made through the ringing settlement, B's original and substituted counterparty is the clearinghouse. Recall that B's minimum condition for entering a ring settlement was a reduction in counterparty loss exposure. Provided a choice between ringing settlements and settlements through a complete clearing house, B again requires lower loss exposures as the minimum condition for accepting complete clearing. With complete clearing, B is assured of no contract dependencies. A result that, in itself, frequently can reduce loss exposure. Given B's participation in a ringing settlement, counterparty C's ability to offset the contract with B is unchanged by the adoption of complete clearing. C prefers complete clearing when it reduces dependence on B's decision to participate. Otherwise, C is indifferent between ringing and complete clearing. Finally, like B, D's preferences are determined after comparing the loss exposures obtained from each settlement arrangement.

Treating the adoption of a clearing system as a permanent choice, B prefers a complete clearing system if loss exposure from the clearinghouse is expected to be less than that typically obtained from ringing arrangements. While some counterparties may pose less exposure than the clearinghouse, the avoidance of contract dependencies obtained by complete clearing implies lower loss exposures than those realized from ringing arrangements. Electing to not adopt a complete clearing system implies

that B regards the proposed complete clearinghouse as a greater risk than a typical counterparty.

C's consideration of these alternative clearing systems focuses on cost concerns. C can anticipate the increased costs incurred each time that B elects to not participate in ringing settlements. C is indifferent between clearing arrangements provided B's participation is assured. Complete clearing makes C's offset automatic rather than at B's option, thus C's vote is entirely based on higher expected costs under a ringing system.

As all traders can expect to find themselves on occasion in B or C shoes, ballots for the adoption of complete clearing express a consensus of the members' assessments of the net values of these future loss exposures and cost savings. Traders favoring adoption of complete clearing will be those who can either expect substantial savings on their margin deposits or generally less counterparty loss exposure. Traders having modest required margin deposits will expect little savings from adoption of complete clearing. If these traders can also sufficiently manage their counterparty loss exposures through a ringing system, they will lack incentives to vote for adoption of a complete clearinghouse. Once adopted, complete clearing shifts the realization of nonperformance losses to the clearinghouse. The loss-sharing arrangements made between members of the clearinghouse serve to allocate any losses among these members. Their need to control loss exposures from nonperformance motivates the clearinghouse to adopt measures which reduce its exposure to nonperformance risk.

The adoption of rules by the clearinghouse is constrained in two ways. First, the

additional cost of adhering to clearinghouse rules cannot exceed the value added by adopting complete clearing. Thus, members exert an external influence on clearinghouse decisions. Second, clearinghouse loss-sharing arrangements imply loss exposures from all open contracts. Members will avoid any loss-sharing arrangement that inadequately compensates for this risk. As lack of participation in the loss-sharing arrangement implies the clearinghouse is nonviable, this results in internal pressures on clearinghouse decisions.

The internal pressure motivates pricing of clearing services to compensate participants in the loss-sharing arrangement for their exposure to losses from contract non-performance. However, compensatory payments reduce the value of benefits obtained from complete clearing creating external pressure to limit rates of compensation. The compensation rate for the complete clearinghouse is its contract-clearing charge per unit of loss exposure. Pricing its services at a level which just satisfies its external pressures, its rate of compensation can be controlled by adopting trading rules which limit loss exposures. However, as trading rules impose explicit and implicit costs, these costs when added to the clearing fees would invoke external pressure against the clearinghouse. Hence, adoption of contract rules requires clearing fees at or below the indifference point of a majority of members. The clearinghouse satisfying this externally imposed boundary price will find its marginal condition is met when reducing clearing fee revenues just equals the incremental cost stemming from a rule change.⁴⁴ Parties

⁴⁴ This marginal condition presumes that most members are indifferent to an addition or loss in the number of members. If additional members are valued, the sum of clearing fees and the cost of rules may need further reduction to offset the value lost when members dissatisfied with the cost structure leave the exchange.

to the clearinghouse arrangement will be those members who find this rate of compensation adequate for the level of exposure which results. Risk neutral clearinghouse members will demand compensation just equal to expected losses.

The analysis here suggests that adoption of complete clearing systems would stem from needs to reduce counterparty exposure and to lower the cost of maintaining open positions. The following comment provides direct evidence of the importance attached to reductions in margin costs. After the Kansas City exchange adopted complete clearing an observer contrasted its complete clearing with its former arrangements, stating:

Under the system the tying up of large sums of money in margins, in event that a long or short on the other end refuses to 'ring out,' is avoided. Thus, an evil which tends to concentrate future trading into the hands of the stronger firms is eliminated.⁴⁵

At times, exchange members avoided the cost of carrying these balances by simply not conforming to rules requiring quick responses to calls for margin. The following 1920 complaint from the Rogers Grain Co. to the Board of Directors of the CBOT illustrates:

This rule has practically become a dead letter with many. Very few members put up margins until after the close even though they are called at Nine O'clock in the morning, while the rules provide that margins shall be put up and evidence is submitted of same within one hour,...⁴⁶

This response reduced the cost of carrying margin balances, but increased nonperformance risk and, notably, further elevated margin requirements to safeguard against this risk.

⁴⁵ "The Exchanges of Minneapolis, Duluth, Kansas City, Mo., Omaha, Buffalo, Philadelphia, Milwaukee and Toledo," *Annals of the American Academy of Social Science*, 1911, p. 227-252.

⁴⁶ BOD 10-26-1920.

Complete clearing systems originated in Europe. Emery (1896, p. 71-72) indicates that European coffee exchanges featured complete systems. In France, a complete clearinghouse was referred to as a *Caisse de Liquidation* and in Germany as a *Liquidationskasse*. Hirschstein (1931, p. 213) indicates that after 1924, the produce exchanges of Germany adopted complete clearing systems modeling them on a system used for many years by a futures exchange operating in Hamburg. De Lavergne's (1931, p. 218) description of French clearing is consistent with the system described by Emery in the late 19th century:

To replace the collateral security which might theoretically be required, but in fact is not, there has been set up at some of the exchanges a bureau of settlement (*Caisse de Liquidation*) in the form of an independent corporation. Such bureaus are attached to the exchanges at Havre, Lille, and Roubaix, as well as the sugar exchange at Paris.

When a contract is entered into, the function of the bureau of settlement is to substitute for the original contract between buyer and seller, two new and distinct contracts--one between the bureau as buyer and the original seller, and the other between the buyer and the bureau as seller. As a result of this operation, the individual buyers and sellers have no direct relations with one another, but each has a contract with the bureau.

In the United States, officials of the New York Coffee exchange proposed to copy the clearing system used in the European coffee exchanges. That proposal was rejected--apparently more than once.⁴⁷ Complete clearing was first adopted in the United States by the Minneapolis Chamber of Commerce in 1891.⁴⁸ That exchange, later renamed the Minneapolis Grain Exchange, was first organized in October 1881.

⁴⁷ Emery (1896), p.72.

⁴⁸ See FTC II, p. 17. I am indebted to Lester Telser who provided this reference.

The adoption of Rule VI in 1891 implemented its complete clearinghouse:

Section 1. All transactions made in grain during the day shall be cleared through the clearing association, unless otherwise agreed upon by the parties to the transaction. Upon acceptance by the manager of such transactions, the clearing association assumes the position of buyer to the seller and seller to the buyer in respect to such transactions and the last settling price shall be considered as the contract price.⁴⁹

The operation of the Association's clearinghouse is described as follows:

Most of the larger firms own memberships in it and it has been found to be almost a vital necessity to the trade. Certainly it insures less friction than the old way of trading and also facilitates business generally. When the trades are checked at the close of the session the member gives a check to the clearing house for margins or in case the market has fluctuated in favor of their customers they receive a check. It does away with a great deal of trouble. To settle with the clearing house at a certain time every day is a far different matter than calling each other for margins.⁵⁰

Rule VII provided the Chamber of Commerce with the right to control its exposure to nonperformance risk by requiring margins. The rule states:

Section 1. The manager of this Association may call from purchasers below the market and from sellers above the market such reasonable margins as in his judgement may be necessary for the protection of the association. Such margins to be placed to the credit of the party paying the same and to be retained by the manager, in whole or in part, as he may deem necessary until the trades for which such margins have been paid have been settled.⁵¹

The Board of Trade of Kansas City (Missouri) was organized in 1869, but by the mid-1890s was regarded as unsuccessful. In March 1899, the Kansas City exchange organized a Board of Trade Clearing Company modeled after the clearing corporation of the Minneapolis Chamber of Commerce. Referring to control over its exposure to

⁴⁹ FTC II, p. 146.

⁵⁰ Annals (1911), p. 232.

⁵¹ FTC II, p. 146.

nonperformance risk, George G. Lee, clearinghouse manager said: "As the clearinghouse is responsible for all trades put through it, close tab must be kept on the position of each member." The clearing manager of the Kansas City exchange had wide latitude in setting margin requirements.⁵² The Duluth Board of Trade, first organized in 1881, incorporated its clearing association in 1909 with rules patterned after those adopted by the Minneapolis Association.⁵³

The complete clearing systems established in the United States prior to 1925 all followed the Minneapolis loss-sharing model. Each was incorporated with share purchases limited to exchange members. Shares entitled members to clear the trades of the exchange and to charge for this service. No other members were permitted to clear trades. Incorporation limited the loss to the owners of the clearinghouse to the value of their shares and the sum of their deposits held by the clearinghouse.

D. Evolution of clearing systems

This section summarizes the three methods of clearing. Markets employing these methods have certain commonalities. Each market sought to increase the ability of members to obtain contract offset. This ability increased the benefits that could be derived from transacting in benchmark commodities rather than making similar but more costly transactions in the actual commodities.

Participants in direct settlement markets were able to offset contracts provided they could be assured of counterparty performance. The rules developed by markets

⁵² Annals (1911), p. 227.

⁵³ FTC II, p. 158.

relying on direct settlement systems were responses to the problem of contract nonperformance. The intent was to lessen the frequency and extent of nonperformance problems. Successfully avoiding these problems moved the members of these exchanges closer to obtaining full contract offset. The two most common rules adopted were exchange arbitration of disputes and the right to collect margin deposits. Arbitration of disputes through the exchange avoided the slower and more costly resolutions available in civil courts. Provision of member rights to collect margin moved this source of protection from a right under common law where adequate time had to be allowed for the posting of the required margin. Making the right to require margin a right of membership, enabled quicker access to this protection as well as establishing margin nonperformance as a contract default. This later feature enabled members to protect themselves against further build up of nonperformance exposure.

Ringing systems took advantage of the increased contract fungibility obtained from uniform grade standards. When the nominal terms of all contracts entering the ring were identical, offsets could be obtained by ring participants. These participants must accept an externally imposed settlement price and must be willing to accept the loss exposures implied by substituted counterparties. The benefits obtained from ringing were the reduction in contract dependencies and lower costs for maintaining open positions. This later reduction coming principally through lower margining requirements as contracts were offset. These features enabled more cost efficient controls over nonperformance risks. Exchange rules adapted by binding the participants to every ringing settlement to the agreements made by the ring.

Complete clearing established contracts as completely fungible. As every contract accepted by the clearinghouse involved the clearinghouse as a counterparty, the credit risk of every contract was identical. Exchanges created clearinghouses as synthetic members of the exchange. Members of the clearinghouse became participants in a loss-sharing arrangement. Faced with nonperformance risk, clearinghouses adopted rules to limit their exposures to nonperformance losses and sought compensation for exposures remaining.

Thus, clearing evolved from arrangements negotiated between individuals to rules imposed by the exchanges. Flexibility lost during the course of this evolution resulted in lower risks of contract nonperformance and lower costs of maintaining open positions. The memberships of these acted in a manner consistent with Smith and Warner (1979); that is, by binding themselves to externally determined rules they achieved lower rates of contract default and lower costs of operation.

V. Summary

Futures contracts are defined as substitutes for associated cash transactions. This definition enables a discussion of the evolution of controls over nonperformance risk. Three clearing methods are discussed: direct, ringing and complete. The incidence and operation of each is described. Direct clearing systems feature bilateral contracts with terms specified by the counterparties to the contract. Exchanges relying on direct clearing systems serve chiefly as mediators in trade disputes. Ringing is shown to facilitate contract offset by increasing the number of potential counterparties. Increased ability to obtain contract offset is valuable because counterparties can

reduce the number of dependencies of their outstanding contracts and can reduce the costs incurred by maintaining open positions. Entry into a ring settlement was voluntary; but on joining the ring, exchange rules bound the participants of the ring to its settlements. Exchanges which cleared through ringing methods generally adopted a clearinghouse to handle payments.

Complete clearing interposes the clearinghouse as counterparty to every contract. This measure ensures that contracts are fungible with respect to both the underlying commodity and counterparty risk. Exchange members benefit from complete clearing because contract offset is automatic rather than dependent on counterparty interest in offset. The loss-sharing arrangements of the complete clearinghouse produces exposure to loss from every open contract. Members of the clearing house respond by requiring compensation for this risk. As the amount of this compensation reduces the value of complete clearing, the amount of this compensation is bounded. Participants of the loss-sharing arrangement will substitute rules for pricing up to the point where the marginal value of risk reduction obtained from rules equals the marginal benefit from compensation.

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