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Default Risk in Futures Markets: The Customer-Broker Relationship

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ABSTRACT

The traditional view of the futures clearinghouse as an insurer that eliminates the need for customers to evaluate default risk is inaccurate. A clearinghouse member default in 1985 confirms that the clearinghouse only guarantees payment from member to member, not from customer to customer or member to customer. Thus, non-defaulting customers are subject to losses as a result of the action of individuals with whom thay have no contractual obligations. This study models the behavior of customers choosing a futures commission merchant (FCM) given the current legal position of the clearinghouse. In a single-period model with symmetric information, customers can eliminate their exposure to defaults of other customers or of their FCM only by choosing to trade through "boutique" (undiversified) FCMs. In practice, monitoring and rebalancing costs may impede the attainment of zero default risk. However, FCM diversification remains an important factor in customer choice of an FCM. When setting capital requirements, clearinghouses and government regulators need to consider the implications of diversification for both customer and market protection.

FUTURES MARKETS PROVIDE A well-recognized service to the economy by allowing for broader access to the means for reducing risk. Futures markets are distinguished from forward markets largely by the role played by the clearinghouse and its members. The clearinghouse has been viewed by Telser and Higinbotham (1977), Black (1976), Edwards (1983), and others as providing an important "insurance" function. Each trader need not worry about the risk of default by the other side of the contract because the clearinghouse presumably plays the short for every long and long for every short. Traders need only be concerned about the ability of the clearinghouse to live up to the terms on the futures contract.

One feature believed to enhance confidence in the clearinghouse is the requirement that margin be posted at the clearinghouse by each side of the contract (see Telser (1981), Garbade and Silber (1983), and Brennan (1986)). Given daily resettlement on futures contracts, if one side of the contract defaults, the clearinghouse can close the position and use the margin to satisfy the other side of the contract. In practice, the clearinghouse requires only that the broker, or futures commission merchant (FCM), post the margin and, within some constraints, leaves the FCM to set requirements with its own customers.

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The traditional insurance view of the role of the clearinghouse and margin requirements is a simplified model of the contractual relationships between the clearinghouse, FCMs, and customers. The 1985 failure of Volume Investors, an FCM and clearing member of the Commodities Exchange, Inc. (COMEX), illuminates the actual relationships. Some customers of Volume defaulted on a margin call, causing Volume to default on the clearinghouse's margin call that exceeded the firm's assets. The clearinghouse seized all of the accumulated margin previously posted by the FCM on behalf of its customers in order to pay the other member FCMs. This left the non-defaulting customers of Volume with no margin at the clearinghouse and no timely means of obtaining margin and payment on any gains from the failed FCM.[1] Thus, customers whose only connection with the individuals who defaulted was the use of a common FCM found that they had substantial sums at risk in a gamble that they could not hedge. The clearinghouse guarantee did not extend to those customers. In the clearinghouse's view (supported by the Commodity Futures Trading Commission (CFTC) (July 1985c)), the non-defaulting customers' exposure was the FCM's problem. This significant event stimulated a heightened awareness of the legal position of the clearinghouse and the concomitant default risk faced by customers.[2] Thus, the behavior of FCMs, the approach that investors should take, and the regulation of FCM capital must be re-examined in light of this event that reveals characteristics of futures trading that are inconsistent with the traditional view of the insurance role of futures markets.

Even in the period prior to the Volume failure, the dearth of literature on the behavior and regulation of FCMs is surprising. (The article by Edwards (1983) is an important exception that discusses some of the issues before Volume's failure revived interest in the issues.) Although issues such as the capital inadequacy of FCMs are generating a great deal of discussion between exchanges, FCMs, and regulators particularly in the wake of events in financial markets in the fall of 1987 (see CFTC (1988)), regulators and investors have had to rely on a literature that presents heuristic and sometimes inconsistent arguments for various hedging, investing, and regulatory policies. This paper will contribute to the literature by presenting the first rigorous economic model of the intricate interaction between FCMs and their customers that incorporates the actual legal and practical standing of the clearinghouse relative to FCMs and their customers.

The organization of the paper is as follows. First, we describe some details of the institutional framework in which clearinghouses and clearing member FCMs operate. Next, we describe the perspective of an individual customer of the FCM

[1] The Volume default occurred March 20, 1985 as a result of an unusually large increase in the price of gold during March 18 and 19. Following liquidation of the positions of Volume and its customers on COMEX, approximately $18 million was owed to non-defaulting customers. A receiver arranged a partial payment of approximately $7 million in October 1985 and a final payment in February 1986. See Corcoran and Ervin (1987). For press accounts of the incident, see Kerwin (1985), Maidenberg (1985), O'Dea (1985), and Szala (1985).

[2] It can be argued that the Volume failure should have provided no new information about the contractual relationships since the clearinghouses had always made their legal position clear (Rutz (1989b)). Nevertheless, there are numerous indications that the event conveyed some new information, including press accounts, the increased use of third party custody of margin, and the issuance of a legal opinion by the CFTC Office of the General Counsel.

considering that only FCMs can fail, not the clearinghouse. The customer is considered to be concerned about the level of commissions and the risk of dealing with one FCM versus another. To emphasize the insights related to the non-traditional view of the clearinghouse, we adopt a single-period, costless information model and focus on the role of default risk in futures trading holding other aspects of FCMs constant—for example, the capital position and the involvement in non-futures business. The futures positions of the FCM and its other customers are shown to be one of the many features important to the customer in deciding whether to "hire" the FCM. Thus, we derive a demand function for the FCM's services—an expression relating the size of customers' futures positions with the FCM and characteristics of the FCM's business, other features held constant. Next, we describe the FCM's decision problem regarding how much commission to charge and regarding the composition of its trading in futures on its own account. We model the FCM's desires as expected utility maximization of its profits. The FCM's optimal decision must consider that its actions will affect the demand for its services by customers. The effect of a capital requirement relative to the unconstrained optimum is also examined.

Next we address the effect of monitoring and rebalancing costs on the feasibility of attaining the default risk-free objective. Those costs must be weighed against the level of default risk carried by a customer using a more diversified FCM. If the costs are sufficiently high, diversified FCMs may be preferred; however, specialized FCMs, particularly those offering trading advice in a limited number of contracts, may in fact offer low default risk to their principal clientele.

Finally, we examine the role of private and government regulators in constraining the activities of FCMs. Capital standards, for example, may incorporate the effect of diversification in consideration of customer and market protection, especially in a world of information and rebalancing costs. The concerns of regulators reflected in capital constraints may, nonetheless, be inconsistent with some customers' interests.

I. The FCM in the Clearinghouse Framework

A. The FCM Balance Sheet

Although many FCMs are diversified businesses involved in a wide variety of broker-dealer activities, spot and forward market transactions, foreign exchange, etc., we focus only on the interaction of customers and firms through the futures markets. Even in the absence of risks originating from other businesses that could cause an FCM to fail, our point is that customers should be aware of default risk in futures transactions. Consequently, the FCM modeled here is a "pure futures" firm. This reduces the complexity of the model and keeps it focused on futures markets and futures market regulation. This type of model could, we believe, be extended to the more typical firm dealing in many markets, but this is a topic for future research.

Futures commission merchants are financial intermediaries in the sense that they act as agents in futures markets for their customers. The FCM places orders to buy or sell futures contracts either through its employees on the trading floor

or through some other member firm and earns a commission for performing this service. The clearinghouses of the exchanges stand between member FCMs and as such require that each member FCM post margin at the clearinghouse to facilitate the daily resettlement process. Member FCMs, in turn, require margin from customers (including non-member FCMs). By exchange rule, an FCM must collect margin of at least L_c from all its customers. In practice, FCMs typically require more than the exchange minimum for all but the most creditworthy customers, so we assume that aL_c, $a \geq 1$, is collected.[3] The amount of customer margin that the FCM must post at the clearinghouse, M_c, is then determined according to either a "gross" or a "net" system as adopted by each clearinghouse.[4] Under gross margining, $M_c = L_c$. Under net margining, the FCM nets the short and long positions on each contract and then posts at the clearinghouse only the minimum margin requirement on the net position, so $M_c \leq L_c$. For both systems, we assume that the FCM earns interest on all customer margin at the riskless rate r whether held by the clearinghouse or by the FCM.[5]

FCMs also trade futures on their own account and must post margin, M_m, at the clearinghouse for those trades, and we assume that the interest rate r is earned on these funds as well as on any unmargined government securities, G. In order to finance these assets, the FCM employs equity capital, K_0, and borrows from the bank or from the bond market in the amount B at a rate y. Funds $aL_c - M_c$ are "segregated" from the FCM's own account funds M_m, and thus $M_m + G = K_0 + B$.

Thus, the FCM's balance sheet at the start of the period would be as shown in Figure 1.[6]

The model developed here simplifies the problem by viewing the FCM in a one-period context. At the end of the period, the customers have gained or lost on their positions, as has the FCM. The customers' gain or loss, Δ_c, is recognized not only in a change in the margin account at the clearinghouse designated for the FCM but also in the liability which the FCM has to its customers. For

[3] We assume that aL_c is deposited in cash although, in practice, a portion of aL_c is deposited as government securities, letters of credit, and even third party custody arrangements. The assumption of all cash margin highlights the nature of default risk. We ignore other details of the margin system that would add complexity without changing the essential features of the model. These details include: 1) margins on hedge and spread positions are usually lower than margins on "speculative" positions; 2) non-member FCMs must post the gross margin of their customers with the FCM through which they trade; 3) maintenance margin, or the required margin one period after the initial margin is posted, is generally less than original margin; 4) purchasers of futures options must pay the full purchase price, which is then used as part of the required initial margin for sellers of futures options; 5) floor traders, exchange members who trade for their own accounts through member FCMs, need not post initial margin at some exchanges.

[4] Currently, only two futures exchanges, the Chicago Mercantile Exchange and the New York Mercantile Exchange, require gross margin from FCMs. See Rutz (1989a) for this and other current information on futures and securities exchange procedures.

[5] In support of this assumption, at the Chicago Board of Trade's clearinghouse, 80% of the margin at the clearinghouse is held in U.S. government securities in the name of the FCM, and most of the remainder is in the form of standby letters of credit. Cash in the clearinghouse account, on which the clearinghouse earns interest, is well less than 1% of the total margin (Rutz (1989b)).

[6] Note that this balance sheet could be further simplified by canceling the two M_c terms. However, in the default analysis it is important to keep funds at the clearinghouse distinct from the funds at the FCM.

(Cust. Margin @ CH)	M_c	aL_c	(Due to Customers)
(FCM Margin @ CH)	M_m	B	(Bank Borrowing)
(Cust. Margin @ FCM)	$aL_c - M_c$	K_0	(Beginning Capital)
(Unmargined Securities)	G		

Figure 1. FCM's balance sheet at start of the period.

example, if customers have a net gain on their futures account, then the magnitude of the "cash" at the clearinghouse associated with customers' positions is increased, as is the amount that the FCM owes its customers. The gain or loss on the futures position in its own account, Δ_m, has a direct effect only in the FCM's separate account at the clearinghouse. Commonly, Δ_c and Δ_m are called variation margin. In addition, we assume that the FCM will owe $B(1 + y)$. The FCM will have earned, at the end of the period, round trip commission fees less variable operating expenses and less fixed costs of operation, which we will call net operating income and denote by X. The FCM's balance sheet at the end of the period is displayed in Figure 2.

The additional variable on the balance sheet at the end of the period is D, the volume of defaults by customers that the FCM experiences. In determining the net amount that the FCM owes its customers, components of Δ_c would be negative for customers owing the FCM, and liabilities would be less by those amounts. Customer defaults represent funds due from customers (not a liability in itself) that are not received and so are added back to liabilities.[7] Because the FCM must still meet the margin call from the clearinghouse, i.e., if $\Delta_c < 0$ then the clearinghouse reduces the reserves it owes the FCM, there is no offset to the asset side of the FCM's balance sheet, and therefore defaults must reduce capital at the end of the period, K_1. Capital at the end (before dividends are paid) and at the beginning of the period are thus related by

$$K_1 = K_0 + r(M_m + aL_c + G) + \Delta_m - yB - D + X, \tag{1}$$

or

$$K_1 = K_0(1 + r) + (r - y)B + raL_c + \Delta_m - D + X. \tag{1a}$$

The FCM will be unable to fulfill its obligations when $K_1 < 0$.

The FCM is influenced by customers' decisions only through two variables: defaults and net operating income. Net operating income contains three components: commission fee revenue and the variable and fixed costs of serving customers' demand for execution, research, and advice services. We will assume that, for the services provided on a given set of contracts, the larger the number

[7] For example, consider an FCM with two customers. The first customer has a gain of \$10, or $\Delta_{c1} = 10$. The second customer has a loss of \$5, or $\Delta_{c2} = -5$. Total variation margin and defaults are $\Delta_c + D = 10 - 5 + 0 = 5$, so the FCM has L_c + \$5 due to customers. However, if the second customer creates a default loss of \$5, $\Delta_c + D = 10 - 5 + 5 = 10$, so the FCM has a greater net liability, L_c + \$10, because it will not receive the \$5 due from defaulting customers.

(new CH liability to Cust.)	$M_c + \Delta_c$	$aL_c + \Delta_c + D$	(Due to Customers)
(new CH liability to FCM)	$M_m + \Delta_m$	$B(1+y)$	(Due to Bank)
(Cust. Margin @ FCM)	$aL_c - M_c$	K_1	(Capital)
(Unmargined Securities)	G		
(interest earnings)	$r(M_c + M_m + aL_c - M_c + G)$		
(net operating income)	X		

Figure 2. FCM's balance sheet at end of the period.

of contracts traded by customers, the larger the net operating income. However, the fixed cost component increases as the firm offers those services in different contracts. Thus, the degree of specialization by the FCM affects the net operating income function.

The framework must be disaggregated to the individual customer level. Let Δ be a $z \times 1$ vector of the price changes on z futures contracts with variance-covariance matrix given by V, and let N be an $n \times z$ matrix where each row is a vector of a customer's position in each contract. A positive entry in the N matrix signifies a long position. Let M_Δ be the $z \times 1$ vector of exchange required margin on each contract. An m subscript on N, M, and Δ will continue to denote the values for the FCM's own account. Therefore, $L_c = 1' \mid N \mid M_\Delta$, $\Delta_c = 1'N\Delta$, $M_m = \mid N_m \mid M_\Delta$, and $\Delta_m = N_m\Delta$, where $1'$ is a $1 \times n$ vector of ones and $\mid N \mid$ denotes a matrix of the absolute values. The total resettlement flow (variation margin) is $1'N\Delta + N_m\Delta$.

The aggregate default, D, is the sum of all defaults experienced by the FCM over the period, or $D = \Sigma D_i$, where D_i is the default by the ith customer. Of course, if the FCM owes the ith customer, $N_i\Delta > 0$, then the customer does not default. The default by a customer is a complex decision, but here the analysis is simplified by assuming that the customer would only default if the losses resulted in insolvency, i.e., if the futures loss exceeded the customer's (currently uncertain) net worth at the end of the period, w_i.[8] Of course, if the loss does not exceed initial margin, then the FCM will experience no loss even of the customer defaults on variation margin. Thus, default occurs only if the loss exceeds the greater of initial margin and end-of-period net worth. We make two other simplifying assumptions: 1) the FCM is the only creditor of the customer, and 2) the judicial system would award the FCM all the remaining net worth up to the future loss. Thus, the magnitude of the default loss for the FCM is the amount by which the customer's futures loss exceeds the greater of initial margin and end-of-period net worth. Relaxation of these assumptions would entail detailed analysis of customer balance sheets and bankruptcy law, which are not important for our

[8] See Brennan (1986) for a two-period model of the customer's default decision, incorporating price limits and margin effects.

present purpose. Therefore, the variable D_i is

$$D_i = \begin{cases} -N_i\Delta - \max\{|N_i|M_\Delta, w_i\} & \text{if } N_i\Delta < -\max\{|N_i|M_\Delta, w_i\}, \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

The value of D_i can also be written

$$D_i = -\{N_i\Delta + \max\{|N_i|M_\Delta, w_i\} - |N_i\Delta + \max\{|N_i|M_\Delta, w_i\}|\}/2 \quad (3)$$

and is not a function of Δ over some values of Δ or is a decreasing (increasing) function of Δ for a positive (negative) position at a given w_i.

B. The Margin System and Segregation

In the Volume Investors case, three customers defaulted on losses that exceeded the resources of the firm, and the FCM, in turn, defaulted on the margin call of the clearinghouse. The clearinghouse suspended the FCM from further trading and used the margin at the clearinghouse (M_c) and other clearinghouse funds to pay other FCMs with net gains. Non-defaulting customers, some with gains on positions, no longer had margin at the clearinghouse and, instead, had claims against a failed FCM.

The Volume case points up some important characteristics of the system for segregating customer funds at both the FCM and clearinghouse levels. At the FCM level, segregation means that funds belonging to one customer cannot be used to satisfy the obligations of another customer to the FCM or of the FCM's own account. At the clearinghouse level, segregation means that customer funds may not be used to satisfy FCM obligations on its own account (Δ_m). However, as the Volume incident clarified, the aggregate customer account of the clearinghouse can be used to satisfy customer obligations to the other side of the market (Δ_c) when the FCM defaults.[9] If Volume had properly maintained segregation of customer funds, the default would have had less serious consequences for non-defaulting customers. That is, Volume could have declared default upon initial recognition of an inability to pay customer variation margin to the clearinghouse and left all non-defaulting customer funds retained by Volume intact. In liquidation, non-defaulting customer funds at Volume, $aL_c - M_c$, would have been readily accessible. However, non-defaulting customer gains and margin at the clearinghouse would still be owed to these customers by a failed FCM. The Volume case illustrates that segregation cannot be relied upon to completely protect customers in default situations. When the FCM fails to pay customer variation margin, Δ_c, to the clearinghouse, even if segregation is maintained, only customer funds at the FCM ($aL_c - M_c$) are protected, not customer funds at the clearinghouse (M_c plus gains). If segregation is breached at the FCM level, all customer funds including $aL_c - M_c$ are at risk.

Customer funds are somewhat less at risk if the default is due to the FCM's own account trading and FCM variation margin, Δ_m, because even at the

[9] Corcoran and Ervin (1987) present an extensive review of the legal issues involved. Essentially, the CFTC Office of the General Counsel has issued an opinion to the effect that the use of the comingled margin account to satisfy the obligations of an FCM without regard to the identity of individual customer funds is not inconsistent with the Commodity Exchange Act.

clearinghouse there is segregation of customer funds from the FCM's own account. In the event of an FCM default on Δ_m, the clearinghouse cannot use $M_c + \Delta_c$ to satisfy the FCM's obligations, but, if the FCM defaults on Δ_c, the clearinghouses can use $M_m + \Delta_m$ to make up the deficiency.

Under these segregation rules, the choice of a margining procedure has an effect on the priority and access of the clearinghouse and non-defaulting customers to margin funds in the event of an FCM default.[10] For price changes no greater than the initial margin requirement, a net margin amount at the clearinghouse is sufficient to cover the customer variation margin payment due from the FCM. To see this, consider the worst case, where every element of $N\Delta$ is less than zero (every customer of the FCM has trading losses). Then $\Delta_c = 1'N\Delta < 0$, and the clearinghouse is owed $|1'N\Delta|$. Under net margining, margin at the clearinghouse is $M_c = |1'N|M_\Delta$. Since every element of M_Δ is positive, $|1'N\Delta|$ is less than or equal to $|1'N|M_\Delta$ when price changes do not exceed margin. Since margins are set according to a near-worst-case scenario (typically, margin is based on approximately three standard deviations of historical futures price changes), a net margining system assures the clearinghouse of priority and immediate access to funds sufficient to cover the FCM's obligation in the vast majority of cases. A gross margining system extends clearinghouse protection to some instances of price changes greater than margin. The potential shortfall to the clearinghouse under each system is $\Delta_c - M_c$, or

$$\begin{aligned} \text{Gross:} \quad & |1'N\Delta| - 1'|N|M_\Delta, \\ \text{Net:} \quad & |1'N\Delta| - |1'N|M_\Delta. \end{aligned} \tag{4}$$

The obverse of clearinghouse priority and access is that customers lose priority and access to M_c in the event of FCM default on Δ_c. Therefore, any system which reduces M_c, such as the net margining system, can enhance customer protection due to the priority and access effect, an improvement in customer welfare conditional on a default.

This potential enhancement of customer welfare is, however, a function of the source of the FCM default and the maintenance of the segregation system. If the default were due not to the inability of the FCM to pay Δ_c, but rather to the FCM's default on its own liability to the clearinghouse, Δ_m, the clearinghouse would not be entitled to seize customer funds, $M_c + \Delta_c$, because customer funds are segregated from FCM funds at the clearinghouse. Thus, the clearinghouse would gain no priority over customers, and the customers would be indifferent to the use of gross or net margining. Furthermore, customers would prefer gross margining in all instances if the risk of FCM malfeasance were considered significant. For example, if an FCM improperly used the margin funds of one customer to make up variation margin deficiencies for other customers or

[10] In addition to the "priority and access effect," there could be an "earnings effect." Under the situation where the FCM would not earn interest on customers' margin at the clearinghouse or where the securities deposited by customers as margin were not acceptable as margin at the clearinghouse, net margining could provide more interest earnings to the FCM than gross margining does. In practice, this earnings effect appears to be small enough to be ignored for our purposes. See footnote 5 above. The National Futures Association (1986, pp. 74–76) cites two surveys that show interest earnings on customer margin to be a significant portion of FCM earnings.

for the FCM's account, then the customer funds remaining at the FCM for recovery in the event of bankruptcy would be diminished under a net system.

It will be in FCMs' interests to provide assurances (e.g., regarding internal controls) to customers that segregation will be maintained, particularly when net margining is used. Even so, the monitoring of FCMs for maintenance of segregation (and other safeguards of customer funds) is likely to be an important function of regulation (by both clearinghouses and government). Thus, customer preference for one margining system over another depends on the customer's perception of the reliability of FCM assurances and the efficiency of monitoring of FCMs by regulators. The less effective these assurances and monitoring, the more customers would prefer gross margin.

Although Edwards (1983) pointed out that a clearinghouse stands between members, not between individual customers, and this fact should have been recognized in legal and institutional circles prior to the Volume case,[11] the view that futures market customers are subject, indirectly, to the defaults of other market participants and are not "insured" by the clearinghouse against defaults has received little attention in the economics and regulatory literature. In this study, the default risk heavily influences the strategy of traders and regulators, as shown in the next two sections.

C. *The Framework in Terms of Underlying Factors*

Before proceeding with the analyses of demand and supply, we take one additional step to simplify the presentation. This will ease interpretation of future results and provide a more attractive environment for empirical testing in future research. A property of positive definite matrices, such as a variance-covariance matrix of full rank, is that the matrix can be decomposed into an orthogonal matrix times a diagonal matrix times the transpose of the orthogonal matrix. This is essentially a property of "principal components." Let $V = P'\Sigma P$, where $P'P = I$ and Σ is diagonal. The matrix P contains the eigenvectors of V. Then the problem addressed here can be stated in a transformed state. For example, the variance of the ith individual's portfolio of contracts is $N_i V N_i' = N_i P' \Sigma P N_i' = T_i \Sigma T_i'$, and we may consider the vectors T_i just as well as the N_i, except that the T_i are equivalent customer positions in the independent underlying factors, F, with $E[FF'] = \Sigma$. This characterization does not require any of the assumptions of the "Arbitrary Pricing Theory."

Therefore, we may focus on variation margin $\Delta_c = TF$ with initial margin $L_c = 1' \mid TP \mid P' M_F$ for customers and on $\Delta_m = T_m F$ with $M_m = \mid T_m P \mid P' M_F$ for the FCM's own account, where $M_F = PM_\Delta$ is the vector of initial margins. If all the elements of T_m are long positions, then the margin can be written more simply as $T_m M_F$, and similarly for T. The advantage of independent factors is that investing in each factor can be considered separately from other factors in a portfolio context. The implication for traded contracts which are linear combinations of underlying factors can be found by undoing the transformation. In

[11] The increased use of third party custody of margin since the Volume failure suggests, however, that the event did reveal some new information even to some institutional traders who consider the risk now sufficient to warrant such actions to try to avoid losses.

practice it is also likely that the number of material underlying factors is substantially smaller than the number of contracts (different delivery dates count as different contracts). Ehrhardt, Jordan, and Walkling (1987) have provided evidence supporting this viewpoint.

The expression for end-of-period capital in this framework is then restated as

$$K_1 = K_0(1 + r) + (r - y)B + ra1' \mid TP \mid P'M_F + T_mF - D + X. \quad (5)$$

Defaults are given by ΣD_i, where

$$D_i = \begin{cases} -T_iF - \max\{T_iP \mid P'M_F, w_i\} & \text{if } T_iF < -\max\{\mid T_iP \mid P'M_F, w_i\}, \\ 0 & \text{otherwise} \end{cases} \quad (6)$$

II. Customer Demand for Broker Services

A customer intends to transact in the futures market but must employ an FCM to effect the transaction. The customer may choose an FCM for a variety of reasons, including research, execution, trading costs, and default risks. Under costless information, however, research by the FCM is superfluous. A role for research will be discussed when the costless information assumption is relaxed in Section IV. We will presume that the cost of trading with an FCM is an accurate proxy for the execution benefits offered by an FCM, so we will focus attention on default risk and the tradeoff with transaction costs. If the commissions charged by FCMs are the same, then the customer can choose based on the riskiness of dealing with the FCM. Alternatively, the customer would be willing to pay a somewhat higher commission to an FCM with lower risk.[12] We assume that the value of a does not vary across FCMs. The ith customer chooses the FCM that provides the highest utility, $V_i(c, R)$, as a function of the cost of transacting and the risk inherent in transacting with the FCM, where R is the relevant risk measure. We assume that R is costlessly observable to customers. Notice that the utility is not a function of the returns on the customer's futures position because the customer has already decided on the desired futures position prior to locating an FCM.[13] We assume that $dV/dc < 0$ and $dV/dR < 0$ and therefore indifference curves in the cost-risk space are downward sloping. We also presume that, for the same increment in risk, the customer will require greater compensation in the form of a reduction in commissions as the level of risk gets higher. At some reservation level of risk, R_i^*, the ith customer will prefer to avoid trading through the FCM, and thus $V_i(c, R) = 0$ for all c when $R \geq R_i^*$.

Customers are viewed as a heterogeneous group with differing willingness to trade off transaction costs and risk. In addition, they have different reservation values, R_i^*, that terminate trading. The higher R is, the fewer customers trade in

[12] It is interesting that Szala (1985) quotes a clearing firm official's comment that Volume's nondefaulting customers were not "innocent victims" in that they received the benefit of "cheap commissions" available at Volume by electing that firm over larger, better-capitalized firms.

[13] If the customer could also choose among competing futures exchanges that traded the same or similar contracts, then the default risk of the entire clearinghouse would be an additional component of R. We assume here that the clearinghouse has a negligible probability of failure.

the futures market. Thus, a utility function can also represent the market size, and the relationship between $V(c, R)$ and c for a given R can be considered the market demand schedule for FCM services. The value of $V(c, R)$, without the i subscript, indicates whether the "representative" customer will trade and also indicates the number of customers whose critical level of risk is not exceeded.

The risk faced by the customer is that the FCM's capital will drop below zero and the customer will not be able to get back the funds in the margin account.[14] Thus, the measure of risk can be expressed as

$$P[K_1 < 0 \text{ given } T_iF + |T_iP|P'M_F > 0], \tag{7}$$

that is, the conditional probability that the FCM will be bankrupt when the customer still has funds in the margin account. This probability does not consider the case where the customer has lost all the funds in the margin account because in that case the customer owes the FCM, and the customer does not own a liability of the FCM.[15] Equation (7) incorporates a wide variety of important features reflected in (5), (6), and (3). For the moment, we will concentrate on the FCM's portfolio decision for a given level of capital, K_0.

The customer may use (7) to choose from a spectrum of FCMs—from well-diversified to undiversified. In this paper, a "boutique" FCM is an extreme case of an undiversified FCM and provides an interesting contrast with diversified FCMs. A "boutique FCM" takes positions on its own account identical (up to a scale factor) to the positions taken by its customers who all take the same position. A boutique FCM is the minimum risk FCM for another customer with the identical intended futures position. In fact, the boutique has no risk for this customer; i.e., $R = 0$. Whenever the customer has margin left in the account—for example, the customer has a gain on the futures position—all other customers also have margin remaining, as does the FCM's own account. Thus, there is no

[14] Choice of FCM is not the only way a customer can mitigate this risk. For example, third-party custody of margin and letters of credit in lieu of cash or securities margin reduce the assets under the control of the FCM. However, the extent of protection provided by such arrangements in the event of default has not been tested in the courts. See Corcoran (1986).

[15] We ignore the risk of funds of both gaining and losing customers being tied up while accounts are frozen and the risk to both types of customers of involuntary liquidation of accounts. Corcoran and Ervin (1987) discuss this risk extensively and suggest that it can be mitigated by prearranged procedures for transferring accounts from failed FCMs to healthy FCMs, using initial margin provided by the clearinghouse guarantee fund, by an insurance program, and in some cases by the affected customers. Volume Investors first defaulted on a clearinghouse margin call on March 20, 1985 and subsequently was suspended from further trading. Initial attempts by the clearinghouse to transfer accounts to healthy firms were unsuccessful due to a lack of initial margin funds, so the clearinghouse authorized involuntary liquidations of all Volume accounts. This was not completed until March 27. See CFTC (July 1985c).

As noted above, the segregation of customers' and FCM funds creates a formal difference between FCM default due to FCM trading and FCM default due to customer trading. In the former case, if segregation has been properly maintained up to the time of default, customer margin and gains will still be intact at both the FCM and the clearinghouse, and the customer has first priority to all funds. Only if segregation has been breached by the FCM are customer funds at risk in this instance, and only customer funds at the FCM, $L_c - M_c$, are at risk. We do not consider this separately, however, because we assume that customers cannot predict when segregation might be violated; hence, customers consider either type of default as potentially equally injurious.

possibility of default losses, and the customer's funds are safe. If the customer experiences a loss large enough to wipe out the margin account, there is a strong possibility of default losses at the FCM, but, because the FCM does not owe the customer any money, the default losses are irrelevant. Therefore, everything else equal, a customer will always prefer dealing with a boutique, and the customer's indifference curves in the c, R space intersect the cost axis at a commission level that makes the customer indifferent to an FCM with a positive risk but lower commission. Under the costless information assumption, customers know the signs (long or short) of the futures positions of the FCM and its customers in the aggregate.

To analyze the customer's indifference curves for the less extreme cases of non-boutique FCMs and determine whether a similar conclusion applies even to them, we assume that the relevant risk measure, the probability given in (7), can be adequately characterized by the mean and variance of FCM capital conditional on the customer having funds remaining in the margin account. For a given level of commissions charged, the customer then chooses an FCM to maximize

$$E^{+}[K_1] - \alpha \operatorname{var}^{+}[K_1], \tag{8}$$

where α is a parameter, $I = T_i F + \mid T_i P \mid P' M_F$ is the index position for customer i (we have suppressed the i subscript on I), $E^{+}[K_1] = E[K_1 \mid I > 0]$ is $\int_0^\infty E[K_1 \mid I = x]\, dG(x)$, and

$$\operatorname{var}^{+}(K_1) = \operatorname{var}\{K_1 \mid I > 0\} = \int_0^\infty E\{[K_1 - E(K_1 \mid I = x)]^2 \mid I = x\}\, dG(x), \tag{9}$$

with $G(x)$ being the distribution of the index position. The relevant measure of risk to the customer is the variability of capital conditional on the customer's index being positive. Therefore, the customer must take the expected value of the squares of the deviations of K_1, given $I > 0$, from the conditional mean of K_1. (Edwards and Neftci (1988) consider margin setting in a similar context of truncated risk measures.)

Result 1: At a given commission fee, customers prefer FCMs to switch out of futures positions that differ from the customers' and into futures positions that mimic the customers' position.

Justification: A shift of a given amount of margin into the factor that the customer is trading will not change the total variance of the FCM's profits. However, the conditional variance (9) evaluated by the customer will decrease because now, for a given value of $I > 0$, the FCM's profits are more predictable. In addition, the $E\pi$ conditional on $I > 0$ also increases because the FCM will have larger gains when the customer has gains. Because the mean increases and variance decreases, the probability of default losses incurred by the customer declines, and thus increased mimicking of the customer's position is preferred by the customer.

Thus, the customer will prefer that the FCM mimic the customer's transactions, or, put another way, customers will choose to trade through FCMs whose

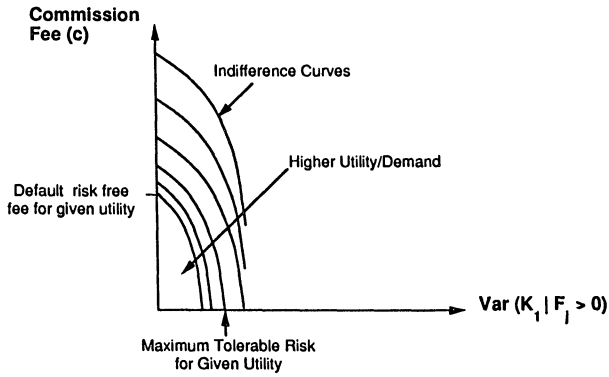

Figure 3. Customer indifference curves: commissions versus risk.

own portfolio contains a component that is consistent with the customer's. As discussed above, such FCMs are more likely to have funds to meet their liabilities when customers have margin left in their accounts, and, when the customer has no margin remaining (large losses on their positions), the FCM is also likely to experience losses but the customer is unconcerned because the FCM does not owe the customer anything. Customers will be willing to pay higher commissions to an FCM whose positions mimic its customer's positions because that FCM would provide a lower risk means of taking a futures position.

The above analysis characterizes the customers' indifference curves between cost and risk of using an FCM. The curves are concave, intersect the cost axis at the level of fees for a riskless FCM, and intersect the risk axis at some maximum risk level for a zero cost. The utility level increases as one moves to the left or toward the origin. If the customer's position is loaded on one factor, then Figure 3 illustrates these features of the indifference curves. In turn, the indifference curves imply a demand curve faced by the FCM that is downward sloping in T for a given c.

Recall that, under the traditional viewpoint of futures trading, none of the above considerations would be relevant, and customers would not need to be concerned about the riskiness of their FCM. In that view, FCMs are merely couriers and bearers of good or bad news regarding the outcome of the order they were requested to fill. The clearinghouse is then partly obligated to the customer for any remaining margin. The implication is that the financial health of both the other party to the trade and the participating FCMs is irrelevant, and, regardless of which FCM is used, the risk is the same. Under the viewpoint discussed here, however, the default experience and the futures position of the FCM's own account are relevant to a customer who may be subject to losses when the FCM owes money to the customer.[16]

[16] Customers of stockbrokers would also need to be concerned about such risks if they keep securities in broker custody (see DeCicco (1990)). However, the existence of SIPC guarantees to customers and additional insurance often provided by brokers reduces the need for customers to take actions that are appropriate for futures customers, and such guarantees may therefore promote diversified stockbrokers.

III. FCM Supply of Services

An FCM must decide the volume and types of customers it desires to service. Given the costs of servicing customers and the risks associated with defaults by customers, the FCM will choose the optimal size of the firm. As described in the previous section, customers are sensitive to the risks and the costs of futures trading through an FCM. Thus, the FCM can control the volume of its business by influencing the magnitude of default risk and the amount it explicitly charges customers for its services.[17] In this costless information model, the tools that the FCM can use are its commission fee and the character of its own account trading.[18] As in the previous section, the variable of interest is the transformed position so that the underlying factors, F, play the fundamental role.

We will assume that net operating income is an increasing function of commissions and marginal revenue is declining. The effect of commissions on defaults is also assumed negative. Higher commissions drive away both short and long customers, thereby reducing expected defaults. Commissions can be viewed as controlling the overall size of the FCM's business. On the other hand, the own account trading influences the composition of the FCM's business. As the FCM's trading moves away from a diversified position and toward one contract, customers in other contracts will become alarmed and desert the FCM for other FCMs that are less risky in the conditional probability sense discussed in the previous section. A more concentrated FCM portfolio will attract like-minded customers, and ultimately operating income will be an increasing function of the house position. Similarly, a rise in the concentration of the FCM's own account may decrease the expected levels of defaults if the number of customers falls, but ultimately expected defaults rise as more like-minded customers are attracted. In the extreme, further increases in own account positions will not attract any more customers, and so the default function flattens. We will assume that the necessary second-order conditions for a maximum are satisfied by the net operating income and default functions.

We assume that the FCM wishes to maximize the expected utility of profits with constant absolute risk aversion, A. The first-order conditions are subject to the segregation and budget constraint on the amount of the margin used for the FCM's own account trading plus its unmargined securities, G:

$$| T_m P | P' M_F + G = K_0 + B. \tag{10}$$

Therefore, the first-order condition can be written:

$$EU'(\pi)\left(\frac{\partial X}{\partial c} - \frac{\partial D}{\partial c}\right) = 0,$$

$$EU'(\pi)\left(F + \frac{\partial X}{\partial T_m} - \frac{\partial D}{\partial T_m}\right) \mp \lambda M = 0, \tag{11}$$

[17] The formation of a clearinghouse association is itself an effort directed toward reducing the default risk borne by FCM customers. The associaton does not eliminate risk but does substantially diminish it relative to a market without an association.

[18] When we relax the costless information assumption, own account trading can represent a variety of variables, such as advertising, research, and advice, that can influence customers' choice of FCM.

where λ is the shadow price of the budget constraint and is subtracted from the expression when $T_m^* > 0$ but added when $T_m^* < 0$. Invoking joint normally distributed factors and assuming that the effects of C and T_m on the customer base and the default variable are deterministic, the first-order conditions are

$$\frac{\partial X}{\partial c} = \frac{\partial ED}{\partial c},$$

$$EF + \frac{\partial X}{\partial T_m} - \frac{\partial ED}{\partial T_m} \mp \lambda M/EU'(\pi) = A \operatorname{cov}\{T_m F - D, F\}. \tag{12}$$

The optimal commission fee equates marginal net operating income with the expected marginal default cost, and the optimal own account futures position is where the marginal expected return (both capital gains and additional commission net operating income) less marginal expected default losses plus the shadow price of the budget constraint equals absolute risk aversion times the measure of marginal risk, the covariance of net profits and the futures price movement.

We consider a benchmark situation where the FCM does not incur the cost of defaults (under the traditional view, the clearinghouse owners incur the cost). The optimal futures position would be given by

$$T_m^* = A^{-1}\left(EF + \frac{\partial X}{\partial T_m}\right)\Sigma^{-1} \mp A^{-1}\lambda M\Sigma^{-1}/EU'(\pi), \tag{13}$$

where Σ is the diagonal variance-covariance matrix for the underlying factors, F. Recall that T_m also represents investments in research on factors and execution in certain factors, so that $\partial X/\partial T_m$ may have some non-zero components. If the market were believed to be unbiased, then the FCM's position in each factor would be based on the marginal net operating income (net of operating expenses) and the variability of the factor. If there were no effect of T_m on operating income, X, and futures prices were unbiased, then $T_m^* = 0$ because there is no return to buying or shorting futures. An equally weighted portfolio would result from identical commissions, identical margins, common variances, and identical expectations for price changes.

A number of factors could cause the FCM to deviate from an equally weighted, well-diversified position, such as returns from specialization, the desire to appeal to customers by reducing their risk of loss, and size effects that create discontinuities in the cost function, and the random allocation of customers could also push the FCM away from a well-diversified position. The latter feature has an effect because FCMs do not have identical customer bases: by accident some types of customers will use particular FCMs because of location or other factors. This combined with some of the other features can have a substantial effect on the FCM's choice.

First we introduce the default problem into our benchmark situation and show that this influences the FCM's own account trading. This produces an effect that works counter to most of the other effects but that will not eliminate the relevance of other considerations.[19]

[19] If the FCM is risk neutral, there is no reason to take positions opposite those of customers (i.e., hedge), and the other considerations are all that is relevant. The optimal solution must satisfy $EF + \partial X/\partial T_m = \partial ED/\partial T_m$; i.e., marginal revenue equals marginal cost.

Result 2: In an unbiased futures market, a risk-averse FCM has some incentive to take positions opposite those of their customers if the FCM incurs costs of customer defaults, i.e., the FCM has a component of demand that relates to hedging; however, the customer evaluation of risk and its effect on FCM demand would be expected to dominate the hedging component for FCMs with low risk aversion.

If the optimal futures position for the FCM is long, then the optimal position is

$$T_m^* = A^{-1}\left(\frac{\partial X}{\partial T_m} - \frac{\partial ED}{\partial T_m}\right)\Sigma^{-1} - \lambda M \Sigma^{-1} A^{-1}/EU'(\pi) + \operatorname{cov}(D, F)\Sigma^{-1} \quad (14)$$

or for the jth factor is

$$T_{mj}^* = \left[\left(\frac{\partial X}{\partial T_{mj}} - \frac{\partial ED}{\partial T_{mj}}\right) - \lambda M_j/EU'(\pi)\right]A^{-1}\sigma_j^{-2} + \beta_{D,F_j}, \quad (15)$$

where β_{D,F_j} is the regression coefficient between D and F_j. That term represents the component of the FCM position derived from a hedging demand of the FCM. Because defaults are related to price movements in futures contracts, futures contracts can be used to hedge some of the risk (options on futures could be even better hedging devices). If the FCM's customers happen to be long in factor j, then negative values of F_j could produce default losses and $\operatorname{cov}(D, F_j) < 0$. Therefore, the FCM should make T_{mj} less positive than under the benchmark, or even negative—a position opposite to customers.[20]

Such hedging by the FCM has other effects that must also be considered, in particular the effect on marginal net operating income and marginal default experience shown in parentheses in (15) that will always have the opposite sign of the β term and of the λ term. Taking the opposite position from initial customers will cause the FCM to become less concentrated in a particular type of customer and therefore increase risk for that type of customer (in this example, customers long in factor j). Customers taking positions short in factor j or in other factors will be pleased because they perceive a reduction in risk. (In this arena, opposite repel and similars attract.) If those customers are outnumbered, however, by the initial customers (long in factor j), the change in net operating income may be negative as the initial customers leave or are only willing to use the FCM at a lower level of commission charges. Furthermore, the increased risk to initial customers will drive away more of those customers than short customers who would be attracted. Because defaults occur only in unlikely events but the loss in commission revenue occurs in any event, the operating income term would be expected to dominate. As the FCM moves long positions and attracts more long customers, the β becomes more negative (an increased hedging demand corresponding to the increased number of long customers). Whether the brack-

[20] Notice that the view that FCMs take on customers to hedge their own account trading puts the causation in the wrong direction. When the customer has gains, the FCM does not participate in those gains. If the FCM has gains in its own account, the FCM does not want to incur default losses to reduce its gains.

eted term in (15) dominates depends on the size of the absolute risk aversion coefficient.

The only benefit to trading in futures in the case of unbiased futures prices is the indirect effect on customers. There is no direct return to holding futures, but there is a cost arising from the budget constraint. The only source of return is the relationship between T_m and customers' trading, either as a hedge or, more importantly, as a magnet for customer business.

Other features may have similar effects that offset hedging. Specialization in factor j, say in executing trades, can be taken advantage of given that the FCM already has customers who focus on factor j. The $\partial X/\partial T_{mj}$ may include an economy that the FCM can exploit by concentrating more efforts on factor j. Fixed costs may be incurred in trading in a factor that would produce for small firms a disincentive to broaden the services offered by the FCM. With low levels of risk aversion, the incentive will not need to be very great to induce specialization.

The FCM can evaluate its risk level at the benchmark position (13) and determine the optimal commission schedule to offer. From this point in the commission-risk space, the FCM can consider increasing its risk by taking larger (in absolute value) positions in a particular factor to cater to a particular clientele and determine what level of commissions provides sufficient reward to justify a shift away from the benchmark. Because the FCM utility function exhibits constant absolute risk aversion, the tradeoff function is linear. The FCM would be expected to interact with its customers at the point of intersection between the FCM's choice line and the highest customer indifference curve. Reaching the highest (southwestmost) indifference curve will generate the greatest market demand within that market segment. If the FCM is less risk averse than its customers, then the intersection of the FCM's tradeoff function with customers' indifference curves is likely to occur at the zero risk position for some customers because their concave indifference curves will be everywhere steeper than the FCM's tradeoff function. That is, customers' willingness to pay higher commissions when they perceive that the FCM is riskless provides a potent incentive for FCMs to specialize and deviate from a well-diversified position (if they would not have done so on their own). That is, the term $\partial X/\partial T_m$ would be large and positive at large values of T_m that would satisfy the first-order condition. Given the additional features discussed above, boutique FCMs should flourish, particularly among smaller, less risk-averse FCMs, in a world of costless information.

Two factors prevent the above discussion from applying universally. The measure of risk used by the FCM is the unrestricted variance of profits, but the customer's risk measure is a subset of this total variance:

$$\frac{\partial \operatorname{var}(T_mF - D)}{\partial T_m} = \frac{\partial \operatorname{var}^-(T_mF - D)}{\partial T_m} + \frac{\partial \operatorname{var}^+(T_mF - D)}{\partial T_m}. \tag{16}$$

So, the customer will view the riskiness of the FCM at the margin as much smaller than will the FCM. Therefore, customers will desire for the FCM to enlarge its own account position (see Result 1), but the FCM, perceiving greater risk to such a strategy, may balk even though the FCM is less risk averse. Second,

customers are only concerned about the marginal expected return in the event that $I > 0$, whereas the FCM must consider total marginal expected return. FCMs that perceive that they have an advantage in a particular factor are more likely to become more focused on a particular clientele in the customer market, i.e., more likely to trade the risk for the return.

To this point, the FCM has been considered as operating in a regulation unconstrained environment. If binding capital constraints were imposed by creditors or regulators, the FCM's position would be limited.[21] Typically, capital constraints are of the form $\gamma_1 1' \mid T \mid M_F + \gamma_2 \mid T_m \mid M_F \leq K_0$, with $\gamma_2 > \gamma_1 > 0$. This constraint limits the sum of customer initial margin (i.e., the number and size of customer accounts) and FCM own account initial margin (i.e., the number and size of FCM positions). The capital constraint would introduce another Lagrange multiplier, λ_K, into each of the equations in (12) to produce first-order conditions:

$$\frac{\partial X}{\partial c} = \frac{\partial ED}{\partial c} + \frac{\partial \mid T \mid}{\partial c} \lambda_K M_F \gamma_1, \tag{17}$$

$$EF + \frac{\partial X}{\partial T_m} - \frac{\partial ED}{\partial T_m} - \left(\frac{\partial T}{\partial T_m} M_F \gamma_1 - \gamma_2 M_F\right)\lambda_K = A \operatorname{cov}\{T_m F - D, F\}. \tag{18}$$

Notice from (17) that the λ_K term implies that capital requirements increase the commissions charged at the optimum in order to compensate for the additional shadow price of the customers' accounts. The effect is to limit the FCM's customer base and/or the volume of trading that an FCM does on its own account. To the extent that the constraint is binding, this of course reduces FCM owners' welfare by reducing the flexibility of the FCM to establish the desired combination of customer base, costs, etc., and preventing the FCM from attaining the highest possible customer indifference curve. While a proportional reduction in the size of the FCM's own portfolio can lower the risk of customers in a large, diversified FCM (as one would suspect from equations (1) and (8)), this will not be the case for a near boutique. If a few customers take positions different from the other customers, then the reduction in the FCM's own account will increase the risk of loss to the customers who are "purchasing the boutique service." The FCM will have smaller gains on its own account and be less able to withstand the costs of default losses resulting from "deviant" customers, those who take opposite positions. Of course, reduction of a near-boutique FCM's position reduces default risk for the "deviant" customers. Some of the near boutique's majority customers may be driven away to another FCM (presumably one for whom the capital charges are less constraining), driven out of the market if the risk has risen beyond their reservation risk tolerance given the expected return, or remain but be subject to the higher risk and higher commissions.

[21] Grant (1987) relates the reactions of FCM to recently proposed capital rules. In Section V the rationale for such a constraint is briefly discussed.

IV. Model Extensions: Market Frictions

The model presented in the previous sections was based on assumptions of costless information and a single period. The single-period assumption precludes the consideration of costs associated with changing FCMs, i.e., rebalancing costs. In this section, we describe the effects of relaxing those assumptions on the structure of the demand for FCMs. We start with a multiperiod horizon and then add rebalancing cost and information costs.

In a multiperiod context, i.e., the situation where the customer and the FCM both plan on maintaining their positions beyond a single period, customers will take positions in the current period that may be revised in subsequent periods. The revisions to a customer's and an FCM's position may depend on the time path of futures and spot prices and on other random variables related to business unrelated to futures. Given the analysis in the previous sections, the revisions of other customers' and of the FCM's futures positions will affect the risk of every other customer of the FCM. If a customer does not revise his or her position consistent with the FCM and other customers, then the one customer's risk will change from default risk free to risky. Thus, the customer will likely desire to change FCMs whenever the FCM's character changes. In a multiperiod world, the prospect of switching FCMs must be included in the customer's original decision to employ a particular FCM. However, in a world of costless switching of FCMs, the prospect of changing FCMs every period would not have an effect on the customer's initial choice of FCM. The customer would be able to ascertain the position of the FCM and its customers for the first period and choose a riskless FCM, a boutique. If in a future period the character of the FCM changed, the customer could effortlessly and costlessly change to another FCM that at the time provided default risk-free trading for the customer. Thus, the single-period nature of the analysis presented above is not by itself responsible for conclusions about the role of boutiques, but the assumptions of costless information and rebalancing do have an important joint influence, as discussed next.

If there are costs associated with changing FCMs in a multiperiod context, the demand for boutiques may be substantially reduced. The customer would anticipate incurring the costs of rebalancing his or her position in an effort to locate an FCM that provided a lower risk "trading partner." Recognizing the prospect that costs may be incurred in the future, the customer would be willing to take more default risk in the current period in hopes of avoiding the costs of rebalancing in the future. That may, therefore, mitigate against the use of boutique FCMs for some customers.

If a customer retains some confidence that the character of the FCM is unlikely to change inconsistently with the changes that the customer may desire, the risk reduction offered by the boutique will remain a highly demanded service. For example, customers who consistently held a long spot position and therefore desired to hold a short futures position for hedging would be interested in using an FCM that tailored its services to such short hedgers. The customer would evaluate the likelihood of changes in the FCM's character as very small and thus the likelihood of the customer incurring rebalancing costs as very small. Otherwise, customers would gravitate toward more diversified FCMs whose character

was viewed as unlikely to change because, although customers would change their positions and the FCM would change its position, the net effect would leave the FCM equally well diversified with the same level of default risk over time. The customers would be willing to bear that level of risk in exchange for avoiding the costs of rebalancing. Thus, the larger those costs, the smaller the demand for boutiques.

In the absence of information costs, customers would know the status of the FCM's own account and of other customers' accounts. Furthermore, because everyone would have the same information, expectations about the future direction of prices would be homogeneous. Thus, customers could clearly identify default risk-free FCMs, and there would be no disagreement or prospect of future disagreements on the direction of futures prices. In that context there would be no demand for research and advice from the FCM.

When information is costly there is a rationale for research efforts by FCMs. FCMs may feel that they have some expertise in analyzing particular futures and spot markets. To some extent, then, in a world of costly information there is an added incentive for the FCM to specialize and to become a boutique. Any different expectation on the movement of futures prices will provide this additional motivation to take positions (long or short) in particular futures. If the FCM disseminates its research, then the research can perform a function of informing customers what the FCM thinks is a profitable strategy and thus its own likely trading strategy. Thus, research can be an indicator of the character of the FCM's own account in a world where information about the FCM's own account is costly for customers to obtain. Customers with similar approaches and perspectives on the market will be able to identify FCMs that are like-minded. Those customers obtain a lower level of default risk even if that is only a by-product of their choice of FCM based on research. If the FCM were following its own advice, the research would be a more credible indicator. Similarly, an FCM could advertise a specialized customer base in order to market the associated low default risk. However, monitoring costs could hamper the effectiveness of these indicators. Other features such as size could also be indicators of degree of specialization. Of course, in a world of costly information, such indicators are noisy, but they may provide relatively cheap sources of information and promote the establishment of and demand for specialized FCMs that have the default risk characteristics of near-boutiques. Information costs substantially alter the character of the customer choice problem but may in some cases still leave a role for boutique FCMs though the appeal would be substantially less broad than in the earlier analysis.

The combination of information costs and rebalancing costs can synergistically lower the effective demand for boutiques. If there is uncertainty about the current and future positions of the FCM and there is a cost to locating and then switching to another FCM in the future, the boutique advantage of default risk-free trading must be weighed against the expected cost of switching FCMs in future periods and the risk of inaccurate information. The FCM and its customers could change positions in futures contracts from short to long on a moment's notice.[22] Even if

[22] FCMs that historically have exhibited a single-minded consistency in their view of price movements—for example, well-known "gold bugs" or stock market bears—would attract like-minded futures customers who would be receiving the risk reduction benefits of dealing with a boutique without fears of incurring rebalancing cost in the future.

the customer has reliable information about the changes, if the customer does not also conclude that a position change is warranted, then the customer is left to either switch FCMs incurring a cost or just bear the default risk. A diversified FCM will be preferred to a boutique to the extent that the cost of switching FCMs is high and the risk of inaccurate information about the dynamics of the FCM and its customer base is high.

In summary, costly information and rebalancing costs in a multiperiod perspective jointly impede the use of boutiques to control default risk. While such factors create a bias toward the use of diversified FCMs, they are not sufficient to guarantee a lack of demand for boutiques. Customers must evaluate a tradeoff between the current and expected future costs and the level of default risk. We would expect a low default risk feature to appeal to a market segment that is relatively time stationary in its attitudes toward the use of futures (e.g., short hedgers). On the other hand, aribtrageurs or speculators who can be short one day and long the next depending on relative prices would be expected to prefer dealing through diversified FCMs. Similarly, less well informed customers (i.e., those for whom incremental costs are especially high) would probably prefer to deal through diversified FCMs because the day-to-day changes in the level of default risk would be anticipated to be very small. Thus, they would be willing to bear a higher level of default risk consistently over time in order to have lower expected costs.

V. The Private and Public Regulation of FCM Capital

Higher capital implies a lower probability of FCM failure, and this may seem to be in the interest of customers and the clearinghouse.[23] However, the usefulness of higher capital depends crucially on assumptions about information and rebalancing costs. In addition, the possibility of clearinghouse failure is relevant to optimal capital levels. Higher capital is irrelevant to pure boutiques in frictionless markets if clearinghouse failure is excluded. However, if clearinghouses can fail, the customers of any FCM, even a boutique, have some exposure to defaults of other market participants.[24] The clearinghouse (i.e., the members) would realize that, because safety influences customer demand, more capital would garner benefits for customers and thereby for FCMs. Capital would need to be higher for undiversified FCMs because of the greater probability of a default to the clearinghouse and of losses assessed against other, non-defaulting FCMs and their customers. Of course, the cost of more capital to each FCM and its customers (as discussed at the end of Section III) would also be recognized by customers and by the clearinghouse and would be weighed against the benefit of reduced claims on the clearinghouse. In a perfect information world, there would be an

[23] Price limits have been discussed as a means of "keeping members solvent" (see Edwards (1983) and Brennan (1986)), but this remains a controversial point because when a limit move occurs the FCM may be unable to liquidate customers' positions and therefore the FCM's risk will not be reduced. Brennan (1986) suggests that requiring additional margin when participants do not know the true equilibrium price increases the willingness of customers to provide the margin instead of defaulting.

[24] Kane (1980) examined the effect of imperfect clearinghouse guarantees of performance and default risk on equilibrium futures prices.

optimal level of capital fully reflecting the joint interests of customers and FCMs. In general, the level of FCM capital that satisfies customers, who are creditors of the FCM, would be higher than that chosen by FCM owners, and therefore there would be no need for a clearinghouse or government imposed capital requirement.

Whether the capital level would be greater or less in the case of frictions depends on the effect of the specific frictions on market participants. In some cases, the level of capital that members would adopt will be higher than in the frictionless case. For example, if customers recognize the obstacles to information flow and rebalancing created by frictions, they may be more concerned about safety and so desire more capital than in the frictionless case. With other frictions, it may be necessary for the clearinghouse to impose higher capital requirements because no individual member would use sufficient capital to protect other members. For example, if customers do not recognize the problems posed by frictions, then the level of capital chosen through FCM-customer interaction may be lower than that necessary to protect the interest of all members. The clearinghouse would have an interest in protecting itself and its member firms and so would impose higher capital requirements than would be chosen by an individual member.[25]

Free rider problems affect the decisions of members to form clearing associations and of customers to trade. In a world of costly information, verification of the capital and character of FCMs would be expensive. Because no one individual or FCM may have the incentive to incur the costs of monitoring and each entity wants to "free ride" on the efforts of others to monitor and produce information, the market may collapse because no one produces the information. The clearinghouse thus would have an additional incentive to produce information because it may be a low marginal cost producer and because production of information creates benefits for members by avoiding the free-rider and "market for lemons" problem. To some extent, the expense of such information is higher in part because it may not be in the interest of some FCMs or customers to reveal trading information. However, one advantage that boutiques have, especially in a world of costly information, is that the information needed for discerning a boutique is very small. All one needs to know is whether the aggregate position of the FCM and its customers is highly concentrated on the type of position that the customer wants to take. A pure boutique would have a 100% concentration. Such information would be just as useful, if not more useful, than other risk-reducing devices such as segregation and capital constraints.

The government may consider the regulation of FCMs as appropriate both because clearinghouse policies may not adequately reflect the interests of uninformed customers and because of its additional concern about externalities associated with market failures. Even if each clearinghouse protected customer and member interests in its associated exchanges, the cost incurred at other exchanges or in spot markets in the event of a failure at one exchange would be

[25] Morgan (1984) discusses the role of self-interest in a bank regulator's determination of optimal capital policy. Similar tradeoffs between costs and benefits of constraining capital also occur for regulators of FCMs.

an externality that would only be a consideration of a government regulator. Given free-rider and lemons problems, the clearinghouse and/or the government regulator could serve a useful function either by imposing capital or other regulations or, to the extent that they were viewed as credible, by performing as producers of information or guarantors of the quality of information on characteristics of FCM business. The production of information also could be considered as useful *customer* protection device in lieu of other measures.

A major issue for private and public regulators, therefore, is whether the uninformed customer problem is best solved by capital regulation, information production, or other methods. In particular, regulators have to bear the monitoring costs regardless of how they regulate. Thus, they could choose to inform customers about the degree of diversification of an FCM in lieu of imposing higher capital charges. This method would in fact enhance the ability of customers to choose their own level of default protection by trading through diversified or undiversified firms. Also, boutiques could continue to offer the specialization-based services. Whether the most cost-effective means of protecting minority customers is for the government, to the extent that it is viewed as credible, to play the role of producer of information and guarantor of information quality or to set discriminatory capital or other requirements is an interesting policy issue that is left for future research. An additional issue is whether market protection, accounting for externalities, might only be accomplished through capital regulation or other constraints on FCM operations.

VI. Conclusion

In this paper, a view of futures markets and the role of clearinghouses is presented that accurately captures the default risk borne by customers. The traditional academic viewpoint overstates the safety of trading in futures. Incorporating the more realistic viewpoint leads to a model of customer and FCM interaction that is useful for customers, FCM managers/owners, FCM creditors, and regulators. At a given level of commissions, customers prefer using an FCM that is a boutique, that is, an FCM whose own account and whose customers' portfolios all involve the same positions (up to a scale factor) in the futures market. In this extreme case, default risk can be eliminated. That is a novel observation that has interesting implications.

Regulatory policies such as capital requirements will restrict the size of the FCM—particularly the magnitude of own account trading. The boutique customer will find that his or her risk will be increased. Majority customers in less concentrated FCMs will also experience an increase in risk. Only in the case of relatively well-diversified FCMs—where no one customer constitutes a significant portion of the FCM's business and each customer has returns independent of other customers—will customers experience a decrease in risk when FCM's own account trading is restricted. These effects of capital standards have never been recognized in previous literature.

In a world of costly information and rebalancing costs, the demand for boutiques may be reduced. Although customers may have difficulty identifying

boutiques and difficulty acquiring default risk-free services of FCMs, boutiques may still arise as a means of capitalizing on advantages of specialization and thereby also provide lower default risk for customers.

Private and public regulators in that environment may play the role of "standing in the shoes" of uninformed customers. Private regulators will weigh the costs to members of regulations against the benefits. Government regulators may not account for the costs to members and will include the reduction of costs of externalities among the benefits. However, if inadequate information in the hands of customers is the source of problems with FCM-customer interaction, an alternative for regulators is to increase customer awareness and access to reliable information. Whether that alternative is the most cost-effective regulatory function is a topic for future research. The analysis of the interactions between capital and various other features of trading through FCMs needs to be extended beyond the contribution of this paper, but the model developed here should provide a useful framework for further research on FCM behavior and regulation.

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