Order Number 9315509

An analysis of the market for futures commission merchant services

Torz, Richard J., Ph.D.

City University of New York, 1993

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

A

AN ANALYSIS OF THE MARKET FOR
FUTURES COMMISSION MERCHANT SERVICES

by

RICHARD J. TORZ

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1993

This manuscript has been read and accepted for the Graduate Faculty in Economics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

January 26, 1993
Date

Ronald W. Anderson
Chair of Examining Committee

January 26, 1993
Date

Michael Grossman
Executive Officer

Prof. Ronald Anderson

Prof. Michael Grossman

Prof. Salih Neftci

Supervisory Committee

The City University of New York

Abstract

AN ANALYSIS OF THE MARKET FOR
FUTURES COMMISSION MERCHANT SERVICES

by

Richard J. Torz

Adviser: Professor Ronald W. Anderson

Futures commission merchants (FCMs) are integral members of the futures industry in that they typically act as agents for customers in futures markets through the provision of brokerage services. As compensation for this activity, FCMs charge competitively-determined commissions per round turn per contract to their clients. Hence, their primary function is to behave as brokers for outside futures traders.

Sometimes, FCMs engage in proprietary trading; in other words, they act as principals and trade for their own accounts. In this instance, FCMs act as dealers and attempt to earn income from profitable speculative trading. This practice is often referred to as dual trading.

However, the major dealers in futures markets are not FCMs but rather floor traders, or market-makers. They tend to trade by attempting to turn over their open positions as quickly as possible, usually within a few minutes, and hopefully profit from the successful anticipation of futures price movements. Hence, they are often referred to as scalpers and provide both liquidity and immediacy in futures

trading while earning income by trading the bid-ask spread in futures markets.

This study is an attempt to provide a framework for a beginning analysis on the microstructure of the market for FCM services. In particular, it examines questions dealing with the determination of commissions charged by FCMs in futures trading, factors which may signal the potential existence of a trade-off between commissions and bid-ask spreads in futures markets, and the effects of FCM behavior on liquidity and the costs of transacting in futures trading. A simple model of transactions costs in futures markets is developed which attempts to both theoretically and empirically analyze all of the above issues while taking into account the effects of demand shifts, risk differentials, and margins. Several hypotheses are postulated with regards to these issues. The statistical results derived from the estimation of the model developed generally tend to support these hypotheses.

Acknowledgements

A study such as this is truly the result of collaborative effort. Hence, there are many debts of gratitude which I owe and wish to acknowledge. I would, in the first instance, like to thank my dissertation committee (Prof. Ronald Anderson, Prof. Michael Grossman, and Prof. Salih Neftci) for all their help, advice, and support. Without them, this project would never have even gotten off the ground, let alone been completed. I would also like to thank the many colleagues which took the time to give me whatever aid and encouragement they could. Their input is most appreciated. Further, I would like to express appreciation to the respective staffs of both The Social Science Lab at Queens College and The Computer Center at The CUNY Graduate School and University Center for all of their advisory, research, and training support. They were all quite instrumental in enabling me to not only conduct my empirical research and analysis, but also to learn several important computer skills and techniques which will be important tools for use in my future research endeavors. Finally, I would like to thank, most of all, my parents: my father Florian, who passed away several years ago, and my mother Halyna. They had the most to do with helping me to complete this study: they never allowed me to lose faith in myself and always made sure I persevered, regardless of the circumstances.

Table of Contents

List of Tables

List of Diagrams

CHAPTER 1

FUTURES COMMISSION MERCHANTS

Currently, there is much time and effort being devoted to the analysis of futures markets and futures trading in the United States. In particular, recent research has been undertaken which combines elements of both microeconomic theory and finance theory to study issues dealing with the structure of, as well as conduct and performance in, futures markets. This area of research may aptly be termed "the industrial organization of futures markets", and seeks to develop answers to questions such as the following:

(a) Are futures markets truly competitive, as has often been assumed or asserted in prior research on futures trading? If so, what factors contribute to the existence and maintenance of competition? If not, how and why is market (or monopoly) power exhibited?

(b) What are the relationships among the various futures industry members? In particular, do there exist any potential conflicts of interest which could arise? If yes, what forms do they take and what mechanisms can be used to alleviate them?

(c) What is the exact structure and organization of futures exchanges? How do these exchanges operate?

Futures trading entails the buying and selling of financial assets known as _futures contracts_. These are standardized contracts for deffered delivery (i.e. for delivery at some particular time in the future) of physical goods, financial instruments, or cash. Futures contracts for physical goods are usually referred to as _commodities futures contracts_, while futures contracts for financial instruments are known as _financial futures contracts_. While there are no explicit futures contracts for cash, _index futures contracts_ (in other words, futures contracts written on certain economic and financial indexes) generally require cash settlement when they mature.

The prices of futures contracts are determined within centralized, bilateral auction markets. Contract performance is guaranteed by these markets, since they are traded on designated exchanges according to particular rules of trading conduct set up by the exchanges themselves. Further, there exist certain futures regulatory authorities and organizations which both regulate and monitor futures trading in the United States.

Contracts are currently being traded in food products (oil seeds, grains, livestock, poultry, foodstuffs); wood; precious metals (gold, silver, silver coins, platinum, palladium, copper); fiber (cotton); petroleum products (oil, gasoline, propane); and financial assets (certain foreign currencies, interest-bearing securities, and indexes). Table 1 below lists the various futures exchanges currently in existence in the United States, along with the general categories of futures contracts in which each of them presently trade.

TABLE 1: U.S. FUTURES EXCHANGES AND CONTRACTS

Chicago Board of Trade
Grains, oilseeds, metals, financial assets

Chicago Mercantile Exchange
Livestock, meat, wood, financial assets

Chicago Rice and Cotton Exchange
Food, fiber

Coffee, Sugar, and Cocoa Exchange (New York)
Food, fiber, financial assets

Commodity Exchange, Inc. (New York)
Metals, financial assets

New York Futures Exchange
Financial assets

New York Mercantile Exchange
Metals, petroleum products, food, fiber

New York Cotton Exchange
Food, fiber, financial assets

Kansas City Board of Trade
Grains, financial assets

MidAmerica Commodity Exchange
Grains, oilseeds, livestock, meat, metals, financial assets

Minneapolis Grain Exchange
Grains

Philadelphia Board of Trade
Financial assets

The performance of futures contracts is guaranteed by the existence of clearing associations which service the different futures exchanges. Some clearing associations are actual members of the particular futures exchanges which they service; others, on the other hand, are not. All clearing associations play an important intermediary role in futures trading in that they each literally become parties to each and every trade: they become the long to every short and the short to every long. That is, they become the buyer to every seller and the seller to every buyer. Such an arrangement removes the necessity for any one trader to be concerned about the commitment and financial integrity of any other trader. This is so because, since all futures trades must eventually be cleared through a clearing association, any trader could either make/accept physical delivery of the good on which a particular futures contract is written (or arrange for a cash settlement in the case of index futures contracts) when a given futures contract matures or simply make an offsetting trade. In such a trade, any trader who is long/short a particular futures contract would go short/long in an identical futures contract.

Because clearing associations become parties to all futures trades, and because of the standardization of futures contracts, traders need not deal with one another a second time if they wish to offset their initial trading positions. In this sense, it can be said that the existence of both clearing associations and standardized contracts increases the liquidity (i.e. the ability to trade frequently) and decreases the transactions costs (or the total costs associated with buying and selling in markets) of futures trading. More will be said later on both liquidity and transactions costs.

Integral members of the futures industry are <u>futures commission merchants</u> (FCMs). These are individuals or institutions who usually act as <u>agents</u> for customers in futures trading.[1] They generally receive and process customer trade orders, usually forwarding all trade instructions to traders known as <u>floor brokers</u> who carry out these trades "in the pit", or on the trading floor, of the futures exchange, and subsequently clear them through the clearing association. Furthermore, FCMs closely monitor customer accounts and generate account statements for their customers, as well as for certain futures regulatory institutions. Hence, they are involved in several back-office (i.e. off-exchange) functions as well as being involved in specific exchange functions.

Some FCMs are <u>clearing members</u>; in other words, they are members of the clearing associations affiliated with the given futures exchanges on which they trade. These FCMs are directly supervised by these clearing associations with respect to maintaining solvency and financial integrity. Others are <u>nonclearing</u> FCMs and, as a consequence, are not directly supervised by clearing associations. However, all trades made

---

[1] Agents are individuals authorized by other persons called <u>principals</u> to act on their behalf in transactions involving a third party. A common example of such a relationship is the one between an investor (the principal) and a broker (the agent) who makes financial transactions for the investor.

by a nonclearing FCM must both be registered with and eventually settled through a clearing FCM; hence, there does appear to exist at least the potential for indirect supervision of nonclearing FCMs. Further, nonclearing (as well as clearing) FCMs are subject to regulation from at least two other sources: the Commodity Futures Trading Commission (CFTC) and the National Futures Association (NFA).

The CFTC was created by the passage of the Commodity Futures Trading Act in 1974 and is the principal regulatory agency for the futures industry. As mandated by the 1974 Act, the CFTC must be formally reviewed every four years in order to be reauthorized by Congress. It is responsible for licensing futures exchanges and futures contracts; the approval of all contract terms, conditions,and modifications; ensuring that all futures exchanges make price information publically available; establishing requirements for the reporting of trade positions; the enforcement of disciplinary actions against futures industry members found guilty of trading abuses;addressing complaints on the part of futures trading customers against anyone authorized or licensed to offer future trading services; and general market surveillance of the futures industry. The NFA, on the other hand, is an industry self-regulatory agency which was created and chartered by Congress in 1982. Since its establishment, it has taken over many of the functions which were previously fulfilled by the CFTC, such as regulatory compliance, rule development, testing, mandatory registration of certain futures industry members (such as FCMs), arbitration of futures trading disputes, and education with respect to the futures industry. The CFTC has jurisdiction over all FCMs, whether clearing members or not, and the NFA is explicitly responsible for the regulation of all FCMs.[2]

FCMs necessarily charge competitively-determined commissions for their services. In general, there are two reasons why one can argue that this is so. For one thing, customers in futures trading usually have the option of choosing from potentially many FCMs for a given trade. Further, a given trade may be processed by a potentially large number of floor brokers. It should be emphasized that some floor brokers conduct trades for only a particular FCM, while others (nicknamed "independent order fillers") conduct trades for more than one FCM. In other words, some floor brokers need not be contracturally obligated to trade for only one FCM.

An interesting aspect of FCMs is that many of them also maintain <u>proprietary accounts</u>, that is, trade for their own accounts as opposed to trading for customers. In this situation, such FCMs sometimes act as <u>dealers</u> (i.e. principals rather than agents) in futures trading. These FCMs are generally known as <u>dual traders</u>. They carry customer accounts and also trade, or permit their employees (such as floor

[2] It should be pointed out that FCMs are also supervised by the futures exchanges themselves with regards to trading conduct.

brokers) to trade in accounts in which they have a proprietary interest.

When trading for their own accounts, FCMs tend to behave as <u>speculators</u> in that they are attempting to profit through the successful anticipation of price movements.[3] Therefore, FCMs in actuality have two potential sources of income which they could earn from futures trading: commissions charged to customers and profits earned from trading their own accounts.

It should be noted that FCMs are not the only futures market participants that act as dealers. Another group of futures traders that also engage in dealer-type activity are <u>scalpers</u>. These are traders who trade for their own accounts (i.e. make proprietary trades) exclusively. However, they attempt to turn over their trade positions as quickly as possible; often, they tend to hold a trade position on average for only a few minutes. Thus, they also act as speculators in the sense that they attempt to avoid unfavorable price movements by rapid turn over of their trade positions. As a consequence of this, scalpers provide a necessary service to other futures traders: <u>immediacy</u>, or the ability to enter the futures market and complete a given trade relatively quickly. Hence, they provide <u>liquidity</u> in futures markets and are often known as <u>market-makers</u> since they ensure that a given futures

---

[3] It should be noted that, when making proprietary trades, FCMs could also behave as <u>hedgers</u>; in other words, they may hedge as opposed to speculate in futures. More will be said on hedging later.

contract will always "have a market" for other traders. Scalpers, or market-makers, tend to earn income primarily from trading what is commonly called the <u>bid-ask spread</u>. This is defined as the difference between the <u>ask</u> (or selling) <u>price</u> and the <u>bid</u> (or buying) <u>price</u> of an asset.[4]

Given the above, it seems rather odd that the market for FCM services has been virtually ignored in futures market research. Studies on the futures industry have always either assumed (in an explicit or implicit sense) that this market was competitive or simply not dealt with its market microstructure at all. Hence, several relevant issues have not been examined or even recognized. For example, how FCMs actually affect both the liquidity and transactions costs of futures trading appears to be a fundamentally important question to address. A rigorous analysis of this topic would entail exploring the viability of competition in the market for FCM services, the potential for the existence of <u>principal/agent problems</u> (in other words, conflicts of interest between FCMs and their customers) and how such potential problems could be dealt with in an efficient manner, and whether or not this market should be regulated more strictly and vigorously than it already is.

Still another important question which merits considerable

---

[4] Other dealer-type traders are <u>day traders</u> and <u>position traders</u>. The former hold trade positions for one trading day, while the latter hold trade positions for more than one trading day.

attention is how FCMs would react to the introduction of new trading technologies, such as <u>electronic trading</u> (i.e. trading via the use of computers as opposed to the current method, known as the <u>free crowd</u>, or <u>open outcry</u>, system of trading used in bilateral auction markets), in the futures industry. For years in the U.S., there has been widespread resistence among FCMs, as well as other futures industry members, to innovations such as computerized trading and expanded trading hours (in other words, allowing trading to occur during certain times when U.S. futures exchanges are officially closed). Given the recent federal investigations of current futures trading practices and policies in both Chicago and New York, it appears as though this issue has taken on new significance and, as a consequence, deserves careful analysis.

This study will focus on the market for FCM services. In particular, it will analyze the following issues:

(1) How are futures trading commissions actually determined?

(2) Does there exist any relationship between the commissions charged by FCMs and bid-ask spreads in futures trading?

(3) What effects do FCMs have on both the liquidity in futures trading and transactions costs of

futures trading?

Such a study would entail developing a model of transactions costs with regards to FCM activity, as well as empirical analyses of the determination of both commissions and bid-ask spreads in futures markets. Since the concept of transactions costs in futures trading is (relatively speaking) little understood, a model such as the one mentioned above could be used to formally examine the determination of these costs in futures markets. Hence, issues such as the need for more vigorous regulation of futures trading practices, the costs and benefits of dual trading, and innovations in futures trading could be more fully and rigorously explored.

It should by now be clear that a proper examination and treatment of the above issues, as well as assessment of their importance in both futures trading and research, is needed. However, before beginning a serious study of these topics one must be familiar with the relevant literature which will serve as both the backround and foundation for subsequent analysis. Such a literature review will be the focus of the next chapter.

CHAPTER 2

THE LITERATURE ON FCMs

This chapter will attempt to review the available and relevant literature on the market for FCM services. This literature review will revolve around the following themes:

(1) FCMs and competition
(2) FCMs and principal/agent relationships
(3) FCMs and regulation
(4) FCMs, liquidity, and transactions costs
(5) FCMs and new trading technologies

It should be noted that themes (1)-(3) and (5) actually evolve from theme (4) in that the issue of how FCMs ultimately affect both liquidity and transactions costs involves a discussion of the other issues listed above.

FCMs and Competition

The issue of whether the market for FCM services is truly competitive has hardly been analyzed at all. Perhaps a major reason for this is that a vast majority of economic and financial studies of futures trading either explicitly or implicitly treat it as efficient in the sense that agents in futures markets do not possess market power and entry is free. These assumptions generally imply that there exists perfect competition in futures trading.

The apparent ignorance of any analysis on the questions of both the existence and degree of competition among FCMs could be challenged on two grounds, at least. First, Anderson (1986a) says that, since traders must purchase seats on futures exchanges in order to engage in active trading of futures contracts on those exchanges, entry by potential FCMs is actually not free but could (at least potentially) be limited by the ability of exchanges to control membership size.[4] Second, recent research by people such as Newberry[5], Anderson and Sundaresan[6], and Kyle[7] demonstrate that under different contexts it is possible for some of the participants in futures markets to possess and exhibit monopoly power. Hence, it appears as though there exists at least the potential for some FCMs to exercise a certain amount of market power. Given this, the question remains how such market power would be manifested by FCMs. One possibility is if FCMs are able to increase profits earned from agent activity in futures trading (i.e. from trading for customers) by raising

---

[4] It should be pointed out, though, that entry may be possible by potential exchanges offering futures contracts which are close substitutes for certain existing ones. For more on this, see Silber (1981).

[5] David Newberry, "The Manipulation of Futures Markets by a Dominant Producer", in Anderson (1984).

[6] Ronald Anderson and Mahadevan Sundaresan, "Futures Markets and Monopoly", in Anderson (1984).

[7] Albert Kyle, "A Theory of Futures Market Manipulations", in Anderson (1984).

the commissions that they charge to their customers. Edwards (1984) implies that the ability of clearing FCMs to engage in this will depend on the state of competition in the market for the services of FCMs. Based upon this implication, it seems reasonable to assume the following:

1. If the level of competition is low, clearing FCMs might be able to reap excessive benefits at the expense of their customers since higher commissions represent higher costs of trading to these customers.

2. If the level of competition is high, clearing FCMs may be able to achieve only modest gains at best.

Another issue is what incentives nonclearing FCMs would have to exhibit similar behavior, that is, charge higher commissions. One possible reason could be that such a practice may be done as compensation for having higher margins imposed on them by FCMs who are clearing members.

Margin represents the amount of money or collateral held on deposit by a broker for a customer, by a broker for a clearing member, or by a clearing house for a clearing member, for the purpose of insuring either the broker or clearing house against potential loss on open futures contracts. Margin can always be posted in cash, but at times can also be posted in U.S. Treasury bills, other acceptable (to the futures exchange) securities, or bank letters of credit. The margin deposit is not partial payment on a purchase, but rather a performance bond. Its value is usually set either by the exchange or the clearing association. It is generally equal to around 5 - 10 percent of the value of a particular contract; however, the amount could vary due to elements such as trade position size and the aim of the trade position (i.e. whether the trade was a speculation or a hedge, which is a position taken in the futures market opposite to a position held in the cash market in an attempt to minimize the risk of financial loss from an adverse price movement). For a more detailed discussion on the role of margins in futures trading, see Telser (1981).

There are several different types of margins used. Original (or initial) margin is the total amount of margin per contract required by a broker when a futures position is opened. Another type is maintenance margin, which is a sum that must be kept on deposit at all times for any trade positions held. In the event that a customer's margin falls to or below the maintenance level as the result of adverse price movements (which leads to a transfer of funds between the margin accounts of traders with long and short positons), then the customer's broker must issue a margin call; in other words, the broker requests the customer to bring the margin deposit back up to its original or initial level. The payment made by the customer to the broker in order to return the customer's margin back to the required level is known in futures trading as <u>variation margin</u>.

Margin must be posted at each link in the chain of command in futures trading, starting from the clearing association on down. Thus, clearing FCMs pay margin to the clearing associations of the futures exchanges where they trade while nonclearing FCMs pay margin to the clearing FCMs with which they deal. Hence, it seems at least plausible that nonclearing FCMs might seek compensation for having higher margin requirements imposed on them by clearing FCMs by attempting to raise their commissions. Again, how successful they will be in such an endeavor would depend (at least to some degree) on the extent of competition in the market for FCM services.

It should be noted that, in a somewhat broader context, there do exist models which may serve as starting points toward an eventual model of FCM behavior. For instance, Stoll (1978a,b) and Ho and Stoll (1980, 1981) have developed theoretical and empirical models of dealer behavior in the U.S. stock market. Also, Epps (1976) has developed and empirically analyzed a model on the demand for brokerage services in this same market. Further, in a recent study, Jordan and Morgan (1990) derived basic, general demand functions for and supply functions of FCM services under the assumption that the FCM's primary concern is the provision of brokerage services. Since FCMs (as dual traders) may potentially engage in both broker and dealer activities, these models (among others) could serve as building blocks for a formal analysis of FCM behavior.

FCMs and Principle/Agent Relationships

As was pointed out earlier, FCMs act as agents in futures market transactions, buying and selling contracts for customers. Technically, FCMs do not possess title to their customers' property (i.e. their customers' futures contracts) and are subject to the control of their customers. However, the latter point implies that customers in futures trading are able to effectively monitor the actions of FCMs. Unfortunately, therein may lie a potential problem.

It is quite possible that a situation of moral hazzard may exist in the relationship between FCMs and their customers. This is due to the fact that it may not be possible for investors in futures markets to effectively monitor the actions of FCMs. This could occur if there exist either asymmetries in information (i.e. FCMs possess or know certain information about trading in futures contracts which their customers do not) or high costs in monitoring FCMs. Under circumstances such as these, FCMs may have an incentive to not act in the best interests of their customers. Such a situation is an example of what is often referred to as a principle/agent problem.

Studies on moral hazard and principal/agent problems have been done by economists such as Ross (1973), Garbade and

Silber (1982), and Grossman and Hart (1983). Most of these studies analyzed moral hazard from the viewpoint of the creation of contracts and compensation plans which would insure that agents act in the best interests of principals. Unfortunately, such research has (for the most part) not been done for futures trading. Hence, at this stage all that can be done is a brief survey of the basic principal/agent problems which could potentially exist (and apparently do) in futures markets.

In general, there are two basic ways that FCMs could act in situations which would not be in the best interests of their customers. They could willingly commit fraud or engage in the practice known as dual trading.

Fraud occurs when FCMs attempt to derive benefits (such as, for example, higher incomes) from their customers through decep-tive practices. Hence, fraud involves FCMs trying to better themselves at their customers' expense.[8] A supposedly common example of fraudulent behavior is the technique known as account churning. In this situation, an FCM convinces an investor to engage in frequent trading in order to generate commissions. While it is possible that this practice may not work in an FCM's favor if the customer deals directly with the FCM (since the customer would probably be better able to recognize situations where he or she was being encouraged to

[8] It should be noted that fraud in futures trading generally does not entail exploiting the market as a whole.

trade more frequently than was in his or her best interest), if an investor takes part in a commodity pool (a situation where an FCM interacts with either a commodity pool operator or a commodity trading advisor) then the detection of fraud becomes more difficult for the customer. In a situation such as this, an FCM may be able to benefit from such activity.

Still another example of fraud in futures trading is when FCMs take part in fictitious trading. This involves FCMs using certain schemes which give the appearance of trading, when in actuality no bona fide, competitive trade has occured. Examples of such activity are bucketing (which will be discussed later); cross trading, which involves making an offsetting or noncompetitive match of a sell order for one customer against the buy order for another and is in actuality permissible only when executed as required by specific rules and regulations mandated by the CFTC; and wash trading, where FCMs or floor brokers enter into (or purport to enter into) transactions to give the appearance that purchases and sales have been made but no actual change results in the trader's market position.

Dual trading deals with FCMs who trade for customers and also maintain proprietary accounts.[9] One problem which could arise from this is a potential conflict of interest. At

[9] Technically speaking, dual traders are also classified by the CFTC as floor brokers who execute customer orders and, on the same day, also trade for either their own accounts or accounts in which they have an interest.

times, certain brokers on the trading floor of a futures exchange must choose between processing and executing a customer's trade order at the same time as they wish to trade for proprietary accounts. The CFTC has mandated that customer trades be given priority over proprietary trades, but this rule has been (and continues to be) extremely difficult to enforce.

Still another abuse which could potentially arise from dual trading is that an FCM may have an incentive to use knowledge that is related to a particular customer's trade order to establish open positions so as to obtain profits at the detriment of the customer. An obvious example of this would be if an FCM takes the opposite position to a customer's trade order before entering the market, a practice commonly known as bucketing. A less obvious case is if an FCM takes a position in the market immediately after receiving but before executing a customer's trade order.

To my knowledge, there has so far been practically nothing of a rigorous nature written on fraud in futures trading (although, with respect to regulation of futures trading, the subject has been briefly touched upon; see the discussion below) and hardly any type of analysis done on dual trading in futures markets. The first economic treatment of dual trading in futures markets of which I know is a study performed by Stanley (1981). He defines a dual trader as a floor trader who acts as either a speculator or a floor broker.[10] He analyzes the costs and benefits of dual trading in terms of its effects on the prices to execute brokered orders, the internal costs of efficient execution of trade orders, and the number of brokers required to effectively trade a particular contract. He then conducts a simulation of hypothetical data to examine operational costs both with and without dual trading. His results show that under certain conditions dual trading may be relatively more efficient. Unfortunately, his paper does not contain a true welfare analysis and hence it is difficult to determine whether or not dual trading would result in a welfare improvement under his conditions. Further, there now exist more sophisticated data tapes on futures trading (manufactured by the Chicago Board of Trade) which should allow for a more exact analysis of dual trading.

Recently, Grossman (1989) has done a study on dual trading. He explicitly defines a dual trader as an entity which sometimes acts as an agent in trading and other times acts as a principal in trading. Unfortunately, he does not really do a rigorous analysis of this important topic. Rather, he focuses primarily on the public policy issues

---

[10] Stanley makes a slight error here. A floor trader (or "local"), as defined by the CFTC, is actually a speculator and hence always trades for his own account. A floor broker (or "order filler"), on the other hand, always executes orders for customers. Hence, a dual trader is more correctly defined as a trader on the exchange floor who sometimes acts as a floor broker and other times acts as a floor trader.

associated with dual trading, giving his own opinions (which are not supported by any theoretical analysis) on what the likely effects of either banning or curbing dual trading in the U.S. would be. Essentially, his main conclusion is that it is more efficient to have a system of dual trading in all U.S. financial markets as opposed to not having such a system.

FCMs and Regulation

Given the potential existence of both a lack of competition and principal/agent problems in the market for FCM services, one is naturally led to address the following question: should this market be regulated more rigorously than it already is? This actually involves analyzing two other questions. First, are futures exchanges themselves able to efficiently oversee FCM activity? If not, then would it be more efficient for the government to play a role (either in lieu of or complementary to the exchanges) with regards to jurisdiction over FCMs?

On the first issue, it should be pointed out that there has been a considerable amount written on regulation of futures trading. Most of this literature, however, focuses primarily on the subject of regulation of futures trading practices. However, some attention is also given to the pros and cons of government regulation of futures trading vis a vis self-regulation, and guidelines which attempt to resolve existing conflicts between them. Unfortunately, there has really not been much attention given to the regulation of FCM activity itself beyond noting what current rules and regulations FCMs must operate under.

Anderson (1984a, 1986b) analyzes, in two survey articles, some regulations on FCM practices, as well as some possible ramifications of imposing rules and regulations on certain other aspects of futures trading. Many of these regulations have since been modified, but some have been maintained. In particular, all futures trades are required by law to be executed in the pit of the futures exchange (with the only significant exception to this being exchanges of cash positions for futures positions). Also, with respect to dual trading, FCMs are required to process (and floor brokers are required to execute) customer trades before any proprietary trades.[11] Further, fraudulent trading practices are strictly forbidden by both CFTC and NFA regulations. However, it seems as though regulation of fraud would only be successful for cases where fraud was detectable at relatively low cost. Under these conditions, penalties could be assessed against guilty FCMs and floor brokers. Unfortunately, for the cases where fraud is either too difficult or costly to detect, regulation

[11] However, this rule has been extremely difficult to enforce.

may not be an effective method of dealing with this problem.[12] In fact, recent federal investigations into futures trading practices at the Chicago Board of Trade and the Chicago Mercantile Exchange seem to indicate that FCMs themselves are also subject to abuses on the part of the very floor brokers who execute trade orders for them. Thus, it seems as though futures trading customers are not the only ones who might benefit from more stringent regulatory policy with regards to the use of futures markets.

FCMs, Liquidity, and Transactions Costs

The most interesting (and, it turns out, important) question regarding FCMs and futures trading is the following: How does FCM activity affect the levels of transactions costs and liquidity in futures markets? This, unfortunately, is not an easy question to answer.

With regards to transactions costs, it appears as though FCM activity may potentially have two different effects. On the one hand, one could argue that since FCMs charge commissions for their services which are competitively determined then transactions costs in futures trading should be relatively low. On the other hand, the commissions which futures trading customers explicitly pay for the provision of

[12] It should be pointed out, though, that relatively recent studies seem to demonstrate that restructuring the basic principal/agent relationship in futures trading may be an effective device in handling fraud. An example of this is given in Townsend (1984).

brokerage services are in fact only part of the total transactions costs. There are also certain fees and taxes which they are held accountable for. Finally, and many times most importantly, included also is a price concession to market-makers as they provide immediacy in futures trading. This component of transactions cost is represented by the bid-ask spread. Since this effectively represents the profits made from market-making, if some FCMs compete with market-makers at a given period of time for a given level of profit in futures trading, this could potentially lead to higher transactions costs for futures trading customers for reasons which will be explained below.

With respect to liquidity, several issues need to be considered. Market-makers (or dealers, in general) are usually thought to provide liquidity in securities markets trading because, since they trade for their own accounts, they typically create and encourage the existence of markets for certain securities. Further, dealers usually are thought to face two distinct groups of traders: <u>liquidity traders</u> who trade simply in response to personal preferences and <u>information traders</u> who trade based upon superior information, that is, on information which they possess but which the dealer or market-maker does not. Also, dealers tend to bear certain costs for providing liquidity services (or immediacy). Stoll (1978a,b,1989) decomposes the costs to dealers of ensuring the feasability of traders making immediate purchases and sales into three categories: order costs (the costs of arranging, recording, and clearing trades); holding costs (the price risk and opportunity cost of holding securities); and information costs (the costs of trading with informed traders). Since dealers typically do not know who the information traders actually are,[13] and since dealers lose on average to these traders, they try to profit at the expense of the liquidity traders by widening the bid-ask spread whenever they believe that information trading is either occuring or most likely to occur. This, in turn, could potentially cause transactions costs in futures trading to be relatively high at times.

It should be noted that, as Grossman (1989) points out, dealers in futures markets behave somewhat differently than dealers in other types of securities trading (say, for example, stock trading). Futures dealers typically do not make proprietary trades from an inventory of securities (futures contracts) which they hold and maintain as dealers in other securities markets tend to do.[14] A major reason for this is that futures trading must take place only on the floor of the futures exchange. Hence, futures trading cannot occur off the exchange floor. The implication of this is that futures

---

[13] In fact, dealers usually do not even know for certain that there are information traders in the market until after the fact.

[14] The only possible exception to this might be if the futures dealer behaved as a position trader or day trader. This, however, has not really been analyzed.

dealers probably must depend on their trading skills to a greater extent than other types of dealers do, since they cannot simply trade from an inventory of securities as other dealers typically can. Further, even though FCMs may at times act as dealers, they typically do not behave as market-makers in the sense that they do not set bid-ask spreads but rather tend to conduct their proprietary trades at the existing bid-ask spread.

It should by now be clear how important it is to measure both liquidity and transactions costs in futures trading. Unfortunately, in order to accomplish this, one needs to obtain an estimate of the bid-ask spread in futures markets. Therein lies a severe problem. Estimating bid-ask spreads has been, and continues to be, a rather difficult task for several reasons. For one thing, it is not all that clear what primarily determines the spread. The early literature on this topic, such as Demsetz (1968) and Tinic (1972), emphasize that the spread should primarily cover order costs. Later on, articles by Stoll (1978a,b) and Amihud and Mendelson (1980) emphasize the role of holding costs in determining the spread. Recently, studies by Copeland and Galai (1983), Glosten and Milgram (1985), Glosten (1987), and Glosten and Harris (1988) emphasize that the bid-ask spread may be primarily determined by information costs. All of these studies deal with the measurement and theory of bid-ask spreads in stock markets. Which of these is the primary determinant of spreads in futures markets is still an open issue.

The above becomes even more of a bitter pill to swallow when one realizes, as Stoll (1989) points out, that there are actually two types of bid-ask spreads. The quoted spread represents the difference between the quoted ask and bid prices at a given point in time. The realized spread (also called the effective spread by Roll (1984)) represents the average difference between the price at which a dealer sells at one point in time and the price at which a dealer buys at an earlier point in time. Theories of the bid-ask spread actually refer to the quoted spread, while empirical estimates of the bid-ask spread actually are estimates of the realized or effective spread.

Further, estimating the spread for futures trading turns out to be more difficult than for stock trading. This is because, as Ma, Peterson, and Sears (1989) indicate, unlike the organized stock market, bid-ask quotes are not always recorded in futures markets. All that is usually recorded are changes in transactions prices, or ticks. Since futures contracts trade at a rapid pace on the trading floor, any bid or ask prices which are actually recorded are typically done so independently from the recording of tick-by-tick data and are very rarely even observed for heavily-traded futures contracts. In addition, it is likely that not all bid or ask prices which are recorded are quoted or recorded at the same time. Thus, spreads which are calculated from such quoted bid and ask prices are frequently biased.

A final complication is that the empirical literature on bid-ask spreads in futures markets is rather sparce. However, two important studies deserve mention. Thompson and Waller (1988) identify several factors which influence spreads in futures trading (trading volume, the proportion of trading activity attributable to scalping behavior, contract price, contract price volatility, and market order size) and estimate the bid-ask spread as the average of the absolute price changes from tick to tick over a specified time interval. Ma, Peterson, and Sears (1989) compare several different measures of the bid-ask spread: Roll's (1984) measure, which takes twice the square root of the negative of the covariance of successive price changes[15]; a measure developed by Choi, Salandro, and Shastri (1988), which modifies Roll's measure by taking into account the probability that one price change will be followed by another of the same sign[16]; Bhattacharya's (1983) measure, which only examines reversing price movements and obtains estimates of spreads by tabulating the mean value for all such price changes of equal magnitude; the measure developed by Thompson and Waller (1988); and their own

[15] In a non-trending (i.e. informationally efficient) market, the covariance of successive price changes should have a negative value.

[16] This is done to deal with a potential bias in Roll's measure due to the occurence of trending market prices which generate a positive covariance term. The value of their probability measure is obtained by using maximum likelihood techniques.

measure, which is similar to the one developed by Choi et al but which uses a probability measure that is apparently simpler to calculate. They estimate bid-ask spreads for futures prices using tick data for four different futures contracts for a given trading period using their own, as well as the Bhattacharya and Thompson-Waller, measure. A comparison of their spread estimates show little differences among the various measures. They then go on to investigate the effects of trading noise and information trading on bid-ask spreads during the trading day.

Obviously, what is needed is more research on bid-ask spreads in futures markets. This would entail not only analyzing how they can be measured, but also how futures trading activity would affect them. On the one hand, one could argue that since dealers in general provide liquidity this should result in reduced spreads. On the other hand, however, since market-makers tend to profit from successfully trading the spread and for other reasons mentioned earlier, FCMs who are dual traders may, by competing with them, actually widen spreads at times. Which of these two effects will tend to dominate and under what conditions still remains an open question.

FCMs and New Trading Technologies

A final issue to consider is how FCMs would react to the introduction of new trading technologies in the futures industry. Since an innovation in futures trading can be thought of as an investment, this question is equivalent to analyzing how much risk FCMs are prepared to accept in the market for their services. Hence, one would need to analyze how risk-averse FCMs are. This is not a trivial consideration since FCMs have a significant influence on exchange affairs and decision-making.[17]

A related issue is whether or not it is in the best interests of FCMs (as well as other futures trading participants) to allow or facilitate the introduction of new trading technologies. This would obviously depend on whether the new innovation would be viewed as either a substitute for or complement to the trading services already provided. For example, electronic, or computerized, trading has historically been opposed by FCMs, floor brokers, and floor traders. One reason for this is the widespread concern that such a trading system will eventually replace the need for the brokerage and dealer services provided by all these groups of futures market participants. This might be the case if electronic trading were conducted during regular trading hours. However, a new computerized trading system which would operate only during certain hours when futures exchanges were closed to floor trading would probably encounter less

[17] It should be noted, though, that it is usually informally believed that floor traders tend to exert the most influence on exchange policy. This, however, has not been studied rigorously.

resistance from these groups of traders.[18]

Burns (1982) analyzes the benefits of electronic trading during regular exchange hours. He argues that electronic trading would reduce transactions costs in futures trading, improve both the quality and dissemination of information (which, in turn, would foster market liquidity), and mitigate actual and potential trading abuses of brokers and dealers. He goes on to explain that, despite these advantages, it is not very likely that electronic trading during times when exchanges are open to floor trading will be viable (due to the interests of independent floor brokers and floor traders in the status quo and the absence of effective competition to existing futures contracts which removes the incentive for exchanges to reduce market users' transactions costs) unless dramatic changes occur in the futures industry, such as the removal of artificial impediments to the introduction of electronic trading (e.g. dual trading).

It is hoped that this literature review will serve to highlight some of the main issues which need to be addressed when researching the market for FCM services. However, any analysis of this topic requires the development and examination of a model of FCM behavior, particularly with regards to the effects on liquidity and transactions costs in

---

[18] Such a system is scheduled to be put into operation at the Chicago Mercantile Exchange sometime this year. Also, the Chicago Board of Trade is considering the adoption of a similar computerized trading system.

futures trading. Such a model would, it seems, shed considerable light on the nature of transactions costs in futures markets and should provide at least a starting point for an empirical investigation into dual trading.

The primary focus of this study is to derive and analyze a model of FCM behavior, with specific applications to how liquidity and transactions costs in futures markets would be affected by FCM activity. In essence, the study will proceed as follows. First, in Chapter 3 we will theoretically examine the relationship between total transactions costs, commissions, and bid-ask spreads in futures markets under several different market assumptions. Included will be an analysis of what happens when there exists a system of negotiated commissions (which is what presently occurs in futures trading in the U.S.). Next, Chapter 4 will present an empirical analysis of our model. This will involve examining whether or not there exists any relationship between commissions charged for certain futures contracts by FCM's and the market values of these contracts, obtaining Roll-type estimates of bid-ask spreads for these contracts, and using these estimates (along with other variables) to perform cross-sectional analyses on these contracts. Finally, Chapter 5 will present a summary and some final conclusions.

CHAPTER 3

A MODEL OF TRANSACTIONS COSTS IN FUTURES TRADING

In this chapter we theoretically explore transactions costs in futures markets. In particular, a model is developed which analyzes how commissions and bid-ask spreads are related within the context of total transactions costs and shows that there tends to exist a trade-off between them. In other words, futures customers, in seeking lower transactions costs through lower commissions, actually end up "paying" higher bid-ask spreads.

We begin by assuming two distinct groups of traders in futures markets: brokers and dealers. Brokers trade futures for futures customers; these customers contract with the brokers to transact in (i.e. buy and/or sell) futures contracts for them in return for commissions which are charged per round turn per contract. Futures commission merchants (FCMs) fall into this category.

Dealers, on the other hand, trade futures for their own accounts; hence, they engage in proprietary trading.[19] We further assume that dealers in futures trading exclusively act as scalpers and, as a consequence, earn income by trading the bid-ask spread for a particular futures contract. Thus,

---

[19] Note that this distinction does allow for the existence of dual traders, since at any given point in time a trader in the pit can only execute a given trade either for a customer account or for a proprietary account.

futures dealers act as market-makers and provide liquidity in futures markets. Floor traders (or "locals" as they are commonly called) fall into this category.

We next assume that total transactions costs in futures trading per round turn per contract consist of the total commission charged per transaction per contract plus the bid-ask spread for that contract. We choose to ignore taxes and exchange fees in our analysis for simplification. If desired, these could be included within the context of the model being developed here. However, it is expected that their inclusion would not significantly alter either the results or conclusions of this analysis.

We assume that there exists a net demand function for transactions services in futures markets. This net demand function can be expressed as follows:

$$T = T(Q); \; dT/dQ = T' < 0 \qquad \{1\}$$

In the above formulation, T is total transactions expenditures per round turn for a given futures contract and Q is the total number of contracts traded per time period. The net demand function gives the maximum total transactions costs that futures customers are willing to pay in order to engage in trading a particular futures contract. The negative first derivative implies that marginal transactions costs tend to fall as Q rises. This reflects the fact that as transactions costs are lower more traders will be encouraged to use futures. In other words, futures trading customers seek a list of reservation prices in futures markets.

In futures trading there are two general types of trading services offered by FCMs: brokerage, or customer trading, services and dealer, or proprietary trading, services. Dealer services are "offered" in the sense that when floor traders engage in trading activity they stand ready to make a market in a particular futures contract, thus providing liquidity which might not possibly exist otherwise. Hence, we assume that the total supply of transactions services for a particular futures contract consists of the supply of brokerage services and the supply of dealer services for that contract. In this context, the functions representing these can be expressed as follows:

$$C = C(Q);\ dC/dQ = C' > 0 \qquad \{2\}$$

$$S = S(Q);\ dS/dQ = S' > 0 \qquad \{3\}$$

Equation {2} represents the supply function for brokerage services, while Equation {3} represents the supply function for dealer services. In these functions, C is the total commission charged per round turn for a given futures contract and S is the bid-ask spread for that contract. These functions essentially give the minimum commissions and bid-ask spreads that FCMs and market-makers are willing to accept in order to trade in a given futures contract. The positive first derivatives for both functions imply that marginal brokerage costs (or commissions) and marginal bid-ask spreads tend to rise as Q rises; in other words, FCMs and market-makers seek higher commissions and higher bid-ask spreads, respectively, for relatively larger trade sizes.[20]

Assuming that FCMs seek to maximize expected profit per contract traded, equilibrium in this model is attained when net demand for total transactions services coincides with supply for total transactions services at a given level of Q. Mathematically, this condition is satisfied by combining Equation {1} with Equation {2} and {3} as follows:

$$T(Q) = C(Q) + S(Q) \qquad \{4\}$$

Note that Equation {4} implies that, for a particular futures contract, in equilibrium total transactions costs per round turn equals total commission charged per round turn plus the bid-ask spread. Basically, this equation could be used to first determine the equilibrium value of Q and then use this to determine the equilibrium values of T, C, and S.

The situation described above and implied by Equation {1} through Equation {4} is illustrated in Appendix 3.1 for the special case of <u>linear</u> net demand and total supply functions. In the graph, Q* represents the equilibrium volume of trading in a given futures contract per time period, T* represents the equilibrium level of transactions costs for trading volume Q*, S* represents the bid-ask spread earned by market-makers at this equilibrium, and C* (which is merely T* minus S*)

---

[20] Hence, in contrast to futures trading customers, FCMs and floor traders seek quantity, or volume, <u>premiums</u> as Q rises.

represents the equilibrium commission level charged by FCMs for customer trades made at Q*. One should note that the function S(Q) is needed so as to obtain graphically the level of commissions assessed by FCMs upon futures trading customers in equilibrium for a given contract.

It is useful at this point to discuss the implications of this rather simple model. First, it shows that both commissions and the bid-ask spread are determined endogenously. In other words, FCMs and floor traders use information with regards to trading volume Q in order to set the sizes of C and S in the market, respectively. Second, the model demonstrates that both trading groups are necessary with regards to the determination of total transactions costs in futures markets. This turns out to be the case despite the fact that FCMs and floor traders are two distinct groups of futures traders performing two distinct functions in futures markets. Thus, according to our model it is actually the interaction of brokerage and dealer services which determines the levels of commissions charged and bid-ask spreads set in futures trading.

An interesting (and, it will turn out, important) issue to consider is the following: Given the fact that there currently exists in the U.S. a system of negotiated commissions in futures trading, whereby FCMs and their customers engage in a bargaining process which results in reductions in the commissions being assessed for customer trades, how does this affect the results of the model? In other words, what effects would such a commission system in futures markets have on the values of Q, T, S, and C <u>in equilibrium</u>? Such a question requires the use of comparative statics analysis.

To analyze the above issue, we assume the existence of the following supply function for brokerage services in futures trading:

$$Cn = Cn(Q); \; dCn/dQ = Cn' > 0 \qquad \{5\}$$

Equation {5} simply states that <u>negotiated</u> commissions (Cn) for a particular futures contract are a positive function of the number of trades made in that contract. To account for the fact that such commissions are lower than the ones previously expressed in Equation {2}, it must be the case that $Cn(Q) < C(Q)$ for all acceptable values of Q (i.e. for all $Q > 0$). This situation is portrayed graphically in Appendix 3.2. Note that now the equilibrium condition is given by the following:

$$T(Q) = Cn(Q) + S(Q) \qquad \{6\}$$

The graph in Appendix 3.2 compares the two equilibriums given by Equation {4} and Equation {6}. The equilibrium values of Q, T, S, and Cn according to Equation {6} are, respectively, Q**, T**, S**, and Cn**. A comparison of the two equilibriums reveals a rather startling result. While, as expected, $Q^{**} > Q^{*}$, $T^{**} < T^{*}$, and $Cn^{**} < C^{*}$, our model also shows that $S^{**} > S^{*}$! Hence, we obtain the surprising conclusion that while negotiated commissions for a particular futures contract increase trading volume and reduce total transactions costs for that contract, they also increase the bid-ask spread for the contract. Thus, our model predicts that negotiated commissions should, ceteris paribus, <u>widen</u> the bid-ask spread for a given futures contract.

The question this raises is why such a result should occur. A plausible explanation is that, holding other factors constant, the bid-ask spread tends to be determined by the degree of competition between FCMs and floor traders. If one assumes that at any given time there exists a given amount of profit which can be earned on a given trade (the idea of a so-called "fixed pie"), then it becomes clear that on a given trade FCMs and floor traders face competition for this "fixed pie". Hence, a system of negotiated commissions as currently exists in U.S. futures trading actually provides "locals" with the opportunity to profit at the expense of FCMs and their customers by widening bid-ask spreads in futures markets.

Three more comparative static exercises will serve to illustrate other aspects of our model. In the first case, assume that the net demand function for transaction services <u>shifts</u>. This would indicate a change in the willingness on the part of potential traders to utilize futures markets. In particular, assume that net demand <u>increases</u>. This is illustrated in Appendix 3.3 as a <u>rightward</u> shift in the function T(Q) from T0(Q) to T1(Q). A comparison of the two equilibriums shows Q1 > Q0, T1 > T0, S1 > S0, and C1 > C0. Thus, our model predicts that, ceteris paribus, an increase in net demand for transactions services should increase trading volume, transactions costs, bid-ask spreads, and commissions charged for a given futures contract. In fact, Appendix 3.4 illustrates that this result should hold even with the existence of negotiated commissions!

In the second comparative statics case, assume that there exist risk differentials in futures dealer services. In other words, let us assume that floor traders, in providing liquidity services to all futures traders, generally engage in two different categories of market-making activity: those that entail the floor traders taking on considerable risk (high-risk dealer services) and those that entail them taking on relatively low amounts of risk (low-risk dealer services). An example of a high-risk dealer service is engaging in proprietary trading during periods of sluggish or "thin" trading; during these periods, the potential profit per trade available to floor traders is greatly reduced due to increased waiting times for information arrival and trade execution. Similarly, an example of a low-risk dealer service is engaging in proprietary trading during periods of vigorous or "heavy" trading; during these periods, potential profitability for floor traders increases due to reduced waiting times for information arrival and trade execution.

It seems reasonable to argue that floor traders will set relatively large bid-ask spreads when they provide high-risk dealer services and relatively smaller bid-ask spreads when they provide low-risk dealer services. This situation is illustrated in Appendix 3.5, where Slr(Q) represents the supply function for low-risk dealer services and Shr(Q) represents the supply function for high-risk dealer services. Note that Shr(Q) > Slr(Q) for all Q > 0. This graphically indicates that, for a given futures contract and for a given amount of contracts traded, the bid-ask spread will always be larger when high-risk dealer services are provided as opposed to low-risk dealer services. The rationale for this is that when floor traders are engaging in high-risk trading activity they will require a larger potential profit to compensate them for the added risk which they must bear. Hence, the difference between Shr(Q) and Slr(Q) at a particular value of Q represents a <u>risk premium</u> which floor traders impose upon other futures traders when undertaking relatively risky dealer activity. Careful inspection of the graph in Appendix 3.5 shows that the existence of risk differentials in futures dealer services should, ceteris paribus, lead to a situation of higher bid-ask spreads and <u>lower</u> commissions charged for a given futures contract.

The third comparative statics exercise analyzes the effects of <u>margins</u> on our model. As was previously discussed, margins represent a cost to futures trading customers. In the context of the theoretical model developed here, margins are actually an <u>additional</u> cost assessed against people who contract with FCMs to transact for them in futures markets.

When brokerage customers' margin accounts fall below the maintenance margin level, their brokers place margin calls to the customers to bring the margin levels back up to the requisite amounts. However, this scenario implies an increase in margins in the market. This situation is depicted in Appendix 3.6, assuming for simplicity a fixed level of margin in the market for a given contract. On the diagram, M0 and M1 represent margin levels added to the total commission charged per round turn C(Q) and the bid-ask spread S(Q) in the market for a particular futures contract, with M1 > M0. The implication of the diagram in Appendix 3.6 is clear: an increase in margins for a given futures contract should, ceteris paribus, lower the bid-ask spread for that contract.

These three comparative statics exercises demonstrate that there exist certain parameters in our net demand and total supply functions which must be controlled for in our analysis. Failure to do so may result in anomolous results which would contradict the central hypothesis that we wish to examine, namely the existence of trade-offs between commissions charged by FCMs to their trading customers and bid-ask spreads set by floor traders. Thus, in formulating the empirical form of our model it is important that we both include other variables which may also potentially affect bid-ask spreads in futures markets and to structure the model in such a way so as to attempt to effectively control for demand shifts and risk differences. The empirical analysis of the model is the subject of the next chapter.

CHAPTER 4

DATA ANALYSIS AND METHODOLOGY

In order to empirically examine the question of whether or not there does exist a trade-off between commissions charged by FCMs and bid-ask spreads in futures market trading, it is necessary to do the following: (1) obtain both commission and transactions price data for various futures contracts for a specific time period; (2) estimate bid-ask spreads for these contracts; (3) analyze the relationship between the estimated bid-ask spreads and the commissions charged for these same futures contracts over the specific time period. However, one must be sure to take into account other factors which could also potentially affect bid-ask spreads in futures markets.

Obtaining transactions price data is a relatively straightforward procedure. The study used the Time and Sales Data Base of the Chicago Board of Trade futures exchange (hereafter denoted CBOT). This data base contains transactions price data, both for purchases and sales of a single type of contract as well as for spreads (i.e. the purchase of one maturity and the sale of a different maturity for a given contract).[21]

[21] One problem with this data base is that the transactions prices are recorded on a tick basis. That is, a price observation is recorded only when a trade occurs at a price which is different from the last recorded price. Hence, not all transactions prices are

From this data base, we obtained transaction price data for all futures contracts traded on the exchange during the week of December 4, 1989 to December 8, 1989. A period of one trading week was chosen to simplify the data manipulation involved; yet, given this, the data set for our analysis still consisted of a total of 34,557 transaction prices! However, an initial inspection revealed that some of these contracts either were not traded at all on certain days or were not traded all that frequently some of the days. Hence, to maintain at least a fair level of confidence in our estimates of bid-ask spreads, it was to include in the subsequent analysis only those futures contracts which had at least 100 recorded tick prices per day during this trading period. This reduced the number of futures contracts in our analysis which traded each day during the specified trading period on the CBOT to 12. Table 2 below lists the 12 futures contracts which were used; the dates in parentheses correspond to the maturity dates for these contracts:

TABLE 2: FUTURES CONTRACTS USED IN THE STUDY

(1) Maxi Major Market Index (December 1989)

(2) Soybeans (May 1990)

(3) Soybeans (July 1990)

recorded.

(4) Soybean Meal (January 1990)

(5) Soybean Meal (March 1990)

(6) Maxi Major Market Index (January 1990)

(7) Soybean Oil (January 1990)

(8) Soybean Oil (March 1990)

(9) Corn (March 1990)

(10) 100 Troy Ounce Gold (February, 1990)

(11) Soybeans (January 1990)

(12) Soybeans (March 1990)

For each of the above futures contracts, an estimate of the daily bid-ask spread was calculated utilizing the method developed by Thompson and Waller (1988). This technique calculates the bid-ask spread (BAS) for any futures contract as the average absolute difference in successive transactions prices for that contract. This relationship is expressed in Equation {7} below:

$$BAS = [\sum |Pt-(Pt-1)|]/n \qquad \{7\}$$

In the above equation, Pt is the current transactions price, Pt-1 is the previous successive transactions price, and n is the total number of successive transactions price differences. We chose to use this method rather than the one formulated by Roll (1984) which estimates the bid-ask spread for any security as twice the positive square root of the negative of the covariance between successive transactions price changes for that security.[22] The reason for this choice on our part was that Roll's technique can only be applied if the security trades in a non-trending market; in other words, a necessary condition to use the Roll method for estimating bid-ask spreads is the existence of a negative covariance between successive transactions price changes. To examine whether or not this condition was satisfied on a daily basis for each of our 12 futures contracts, correlation coefficients between successive transactions price changes per contract per day were calculated. These turned out to be positive most of the time. Since the sign of the correlation coefficient between two variables is the same as the sign of the covariance between the same two variables, it was concluded that the necessary condition to utilize Roll's technique was not fulfilled and so the Thompson-Waller method was used instead. Hence, Equation {7} was used to calculate a total of 60 bid-ask spreads. In other words, we calculated a bid-ask spread for each one of the 12 futures contracts in our study for each day in our trading period.

Since in the United States futures commissions are

---

[22] An inflation factor of 2 is needed because Roll assumes that transactions prices are recorded such that unchanged as well as different transactions prices are included. In an informationally efficient market, half the transactions prices will be unchanged. Hence, an inflation factor of 2 is necessary to compensate for this. However, it should be noted that, since tick data only deals with price changes, an inflation factor is not necessary in that case.

negotiable, obtaining commission data is not straightforward. Futures commission merchants (FCMs) do not routinely report or publicize the commission rates they charge their customers. Hence, to obtain commission data we systematically contacted the FCMs listed in the FCM directory of the National Futures Association. In this way, we finally obtained a sample of roughly 20 commissions charged for each one of the 12 futures contracts in our study.

Inspection of the commission data obtained revealed a surprising pattern of both non-differentiation and differentiation of commissions charged by FCMs. In other words, it was observed that while some FCMs simply charged the same commission for all futures contracts in which they traded, other FCMs actually charged different commissions for different contracts.[23] This raises the possibility that our commission schedule may tend to exhibit somewhat less variation than one might expect. None the less, the range for the entire commission schedule which was obtained was still between $12 and $92 per round turn per contract.

In order to take into account other factors which could potentially affect the bid-ask spread for each of the futures contracts in this study, it was necessary to obtain further

[23] Of course, one must remember that, in futures trading, there exist volume discounts; thus, these are actually initial commissions charged. As a futures customer trades more in a given contract, the commission charged will tend to be negotiated downward.

market-related data on a per contract basis. Unfortunately, not all of the data needed or desired was available on our tape from the CBOT Time and Sales Data Base. Hence, other data sources were perused in order to collect the required information. Most of the added data was quite easily obtained directly from The Wall Street Journal.

From the CBOT Time and Sales Data Base data tape, we were able to calculate the number of recorded transactions on a daily basis for both an individual contract and all contracts traded on the exchange. For a given contract on a given day, the ratio of the former to the latter represents a measure of relative market share; in other words, we calculated total transactions in that contract for that day relative to total transactions in all contracts traded for that same day. Given the fact that this ratio was determined with transaction price data, one could argue that such a relative market share variable actually measures relative trading volume. Thus, we have a variable that should indicate how trading in a particular contract on the CBOT as compared to other contracts on the exchange affects the bid-ask spread for that contract.[24]

From the Wall Street Journal, daily information per contract was obtained on settlement price, open interest, and

---

[24] It would have been preferable to use actual trading volume data per contract per day, but this is not available from the Time and Sales Data Base.

contract size.[25] Contract size is the standardized number of units of a particular commodity that a single contract represents. The open interest represents the total number of a particular futures contract outstanding for a given trading day. The settlement price represents the market price at which a particular futures contract is valued at the end of a particular trading day.[26] At times, this is simply the last price at which a transaction in that contract took place. However, this assumes that the contract actually traded either at or fairly close to the close of trading for that day. If this is not the case, then this price must be determined by a settlement committee which is organized by the exchange where the contract trades. This is done to insure that the settlement price represents as close as possible the true, fair market price of the contract at the close of trading for

---

[25] The only exception were the two Maxi Major Market Index contracts. Since information on these are generally not reported by the Wall Street Journal (or, for that matter, any of the other readily-available financial publications) unless a pre-determined minimum number of these contracts are traded, such information had to be requested directly from the CBOT.

[26] Two facts should be noted with regards to the settlement price. First, this is the price which is used to "mark to market" in futures trading. Second, this price represents (as do all recorded transactions prices) the price per unit of measurement of the underlying commodity on which a given futures contract is written. The only exceptions to this are financial futures contracts, such as the Maxi Major Market Index contract, whose prices are expressed on a per contract basis.

that particular trading day.

For a particular contract, the contract size multiplied by the daily settlement price yields a measure of the daily market value for that contract in terms of the underlying commodity upon which the contract is written. It is expected that this, as well as the daily open interest, will have an effect on the bid-ask spread for the contract.

Finally, the standard deviation of the transactions prices per contract per day was also calculated from the CBOT Time and Sales data tape. Given the fact that our estimates of bid-ask spreads were calculated using these transactions prices, it is expected that variability in a contract's transactions prices as measured by their standard deviation will have an effect on the contract's bid-ask spread as well.

To begin our analysis, we wished to examine whether or not there tended to exist any type of a systemmatic relationship between the average commission charged per day for each of our futures contracts and the daily market value for each contract. The logic behind this was that, since the determination of futures commissions has never been previously studied, it was important to attempt to determine if brokerage costs assessed by FCMs and, in turn, paid by futures trading customers were somehow related to a measure of the value of these contracts in the futures market. Hence, a regression plot was done for these two variables based upon the data which was collected; the results of the plot show a direct relationship. The regression equation calculated from this plot, based upon our 60 observations, is the following:

$$\underset{(72.1453)}{AVGCOMM = 36.09502} + \underset{(8.0000)}{0.00016MKTVAL}$$

$$R^2 = 0.48904 \qquad SEE = 2.06793$$

In the above regression equation, AVGCOMM is the average daily commission charged per contract and MKTVAL is the daily market value per contract. The numbers in parentheses below the intercept and slope coefficient represent the corresponding t-values and SEE is the standard error of the regression. What is observed is that the regression relationship explains roughly 49% of the variation in the two variables, and further that MKTVAL turns out to be significant in explaining the average levels of commissions charged for each one of the futures contracts in our study. However, there still remains approximately 51% of the variation in these two variables that is unexplained by the above model. Nonetheless, it appears as though we have identified at least one of the important determinants of futures commissions.

Once the above relationship was analyzed, attention was focused upon the hypothesis that there exists a trade-off between bid-ask spreads and commissions in futures trading. To empirically examine this issue, the following multiple regression model was estimated based upon our data:

$$BAS = B0 + B1(NLSDP) + B2(AVGCOMM) + B3(MKTVAL) + B4(RMS) + B5(OPENINT)$$

In the above model, the variables BAS, AVGCOMM, and MKTVAL are all as previously defined, NLSDP is the natural log of the daily standard deviation of transaction prices per contract, RMS is the daily relative market share per contract, and OPENINT is the daily open interest per contract. For purposes of this study, the most important coefficient is B2, the coefficient of AVGCOMM. If, in fact, there does exist a clear, systemmatic trade-off in futures trading between bid-ask spreads and commissions, then the above model should show that B2 is both negative and significant.

However, as was mentioned previously, it was necessary to control for other factors which may potentially affect bid-ask spreads for our futures contracts. Hence, we had to incorporate the other variables into our model in order to account for this. Assuming significance of the respective coefficients for these other variables, we had the following hypotheses with regards to their signs: B1 > 0, B3 > 0, B4 < 0, and B5 > 0.

We believed B1 should be positive since NLSDP represents variability in transactions prices. Since higher variability in transactions prices implies higher risk being borne by market-makers in their profit-seeking endeavors, the bid-ask spread should be increased to compensate them for taking on this added risk. Further, since the relevant literature often indicated that the log of price variability often provided a better and more significant fit in models of bid-ask spreads, we chose to use the natural log of the standard deviation of tick prices in our model. In fact, Demsetz (1968) explicitly mentions that semi-log regression models of bid-ask spreads generally tend to provide better results on the whole relative to others. We observed this to be true when we attempted to use the standard deviation of tick prices rather than NLSDP in our model.

We believed B3 should be positive for reasons similar to the ones for the assumed positive sign for B1. Higher market value implies that, for a given contract size, there exists a higher settlement price. This, in turn, imposes greater profitability risk upon market-makers. Thus, to compensate for this, there occurs a widening of the bid-ask spread.

We believed B4 should be negative since a higher RMS generally implies the existence of lots of relative trading activity in the market. This, in turn, implies that scalpers have less time to wait for the arrival of information into the market. Thus, there should occur a reduction in the average amount of time needed for trade execution. Since all this implies lower costs to market-makers, the bid-ask spread should be decreased.

We believed B5 should be positive since higher open interest in general implies more public interest in a particular contract.[27] As such, one can view this as an increase in demand for the contract on the part of all futures

---

[27] In a sense, open interest is akin to the number of shares of stock issued by a corporation.

traders in the market. Since higher demand usually entails higher costs to both buyers and sellers, it is expected that the bid-ask spread will be increased as a consequence. In this sense, open interest can be viewed as a proxy for elasticity of demand for a given futures contract. As such, the possibility exists that open interest may be useful in analyzing issues such as the degree of imperfect competition in futures trading and the effects of the entry of new futures trading firms into the market.

Our model was estimated using the 60 observations which were obtained for each of the variables in our data set. The empirical results are reported in Table 3 below.

TABLE 3: EMPIRICAL RESULTS OF THE MODEL

VARIABLE	COEFFICIENT	T-VALUE	SIGNIFICANCE
NLSDP	0.281989	3.512	0.0009
AVGCOMM	-1.301575	-27.654	0.0000
MKTVAL	4.38759E-05	6.969	0.0000
RMS	-13.611077	-10.244	0.0000
OPENINT	5.08493E-06	2.518	0.0148

$R^2 = 0.99106$ $\bar{R}^2 = 0.99022$ $F = 1175.17461$

D-W = 1.25935 Degrees of Freedom = (5, 54)

As can be observed from Table 3, all the independent variables in the model are significant at the 5% level[28] and possess the hypothesized signs on their coefficients. The analysis of variance statistics for the model indicate that it fits our data extremely well and explains approximately 99% of the variation among the variables. The relatively low Durbin-Watson statistic is not too surprising, given that the model was estimated from a panel data set; in other words, we utilized a combination of cross-sectional and time-series data since we have daily market information on 12 different futures contracts over a 5-day trading period. However, it should be noted that this rather low value for D-W could be a signal that there exsits some misspecification bias or error in the model. This will be dealt with later on.

Since the coefficient of primary concern for this study is B2, it is important to analyze this further. The numerical estimate of B2 indicates that, holding all other factors constant, the change in BAS will be approximately -1.30 times the change in AVGCOMM. In practical terms, this implies that a given reduction in average commissions charged by FCMs for trading a particular futures contract will yield a given increase in the bid-ask spread for that contract which will be

[28] In fact, with the exception of OPENINT, they are significant at the 1% level as well.

roughly 1.3 times greater. Hence, it does appear as though the bid-ask spread tends to react to the degree of competition between FCMs and floor traders. In addition, examination of the sizes of the t-values for all the independent variables seems to imply that bid-ask spreads may be the most sensitive to this factor, relative to other factors which could potentially affect them.

In spite of the apparent success of our model, several questions remain with regards to its validity. For one thing, the model does not truly contain a variable which actually represents trading volume. In particular, it would be interesting to analyze how trading volume <u>per transaction price</u> would affect the bid-ask spread for a given contract. To obtain such a variable, we contacted the CBOT and requested daily volume data for each of the futures contracts in our study. Once this additional data was obtained, we created a proxy for average daily volume per transaction price per contract by dividing the total daily volume figure by the number of daily recorded transactions prices for each contract. This new variable, denoted AVDLYVOL, was subsequently added to the model.

Before re-estimating our model, several other modifications were made. We included dummy variables which represented different types of futures contracts in our study. The dummy variables were denoted as follows: (1) D1 for the 100 troy ounce February 1990 Gold contract; (2) D2 for <u>each</u> of the soybean-type contracts; (3) D3 for the March 1990 Corn contract. Within this framework, the December 1989 and January 1990 Maxi Major Market Index contracts were chosen as the "base commodity". This specification was included to examine the significance of contract type on bid-ask spreads and, further, to attempt to control for the demand and risk differences discussed previously in Chapter 3. Also, to better reflect the concept that the bid-ask spread should be evaluated on a per contract basis, each of our estimated bid-ask spreads for each of our contracts was multiplied by that contract's size. This was done so that our estimated bid-ask spreads would themselves be on a per contract basis rather than on a per unit of commodity measurement basis. This new bid-ask spread measure was denoted NEWBAS.

Hence, our model was re-estimated in the following form:

$$\begin{aligned} \text{NEWBAS} = {} & \text{B0} + \text{B1(NLSDP)} + \text{B2(AVGCOMM)} + \text{B3(MKTVAL)} \\ & + \text{B4(AVDLYVOL)} + \text{B5(OPENINT)} + \text{B6(D1)} \\ & + \text{B7(D2)} + \text{B8(D3)} \end{aligned}$$

Under the hypothesis that both demand and risk differences are important in affecting bid-ask spreads, we believed that the regression coefficients B6, B7, and B8 should all be positive and significant. This reflects the idea that both higher demand for and higher levels of risk (as bourne by floor traders) on given futures contracts should widen the bid-ask spreads for those contracts. Further, we believe that B4 should be negative as higher trading volume should reduce the bid-ask spread. The empirical results for this specification of the model are reported in Table 4 below.

TABLE 4: EMPIRICAL RESULTS OF THE MODIFIED MODEL

VARIABLE	COEFFICIENT	T-VALUE	SIGNIFICANCE
NLSDP	1227.585	2.534	0.0144
AVGCOMM	-193200.217	-38.486	0.0000
MKTVAL	-9.766	-54.605	0.0000
AVDLYVOL	-128.128	-2.683	0.0098
OPENINT	-0.500	-9.057	0.0000
D1	2035291.395	41.461	0.0000
D2	1689207.483	41.560	0.0000
D3	1463509.206	40.245	0.0000

$R^2 = 0.99324$ $\bar{R}^2 = 0.99218$ $F = 937.06302$

D-W = 1.74802 Degrees of Freedom = (8, 51)

Several observations become apparent upon examination of Table 4. First, all variables are significant at the 5% level of significance.[29] Thus, they all turn out to be relevant in

[29] In fact, the change in model specification has made all variables significant at the 1% level except for NLSDP and, marginally, AVDLYVOL.

explaining and determining bid-ask spreads for the futures contracts in our study. Second, the "fit" of the model actually improves under the new specification. This indicates that the new version appears to be better in explaining variation in the variables than the previous version. Third, the Durbin-Watson statistic improves greatly under the new specification. Hence, it seems as though the previous version of our model did, in fact, contain some misspecification bias or error which apparently was corrected to some extent in the new version.

Unfortunately, the empirical results of the new version of the model also reveal a surprising result: the signs on the coefficients of MKTVAL and OPENINT are the opposite of what they were hypothesized to be and what they turned out to be in the previous version. As a consequence, we have the rather disturbing situation that the new model is statistically an improvement over our original specification but contradicts some of our previous hypotheses and conclusions. This naturally gives rise to the question of what is the cause or reason for this paradox.

One plausible explanation for the negative sign on the coefficient of OPENINT is that this variable may be a proxy for the <u>total frequency of trading</u> in a given contract. It seems logical to argue that as the <u>total</u> frequency of trading for a particular futures contract increases (as it typically does the closer the time period to the contract's maturity date), the lower the bid-ask spread for that contract should become. This reflects the fact that higher trade frequency generally results in lower costs to scalpers in that they are better able to turn over their trade positions relatively quickly with a lower probability of suffering a loss. Thus, if this is the case, then it is quite concievable that the estimated value for B5 would have a negative sign.

What is more puzzling is the negative value of the estimate of B3, the coefficient of MKTVAL. It is not so obvious why, with our change in model specification, we should obtain the result that, holding other factors in our model constant, higher market value for a given futures contract should reduce the bid-ask spread for that contract. A possible rationale for this result is that some factor <u>not</u> in our model is playing a role in causing this. Specifically, what the model may be picking up is the effects of changes in <u>margins</u> on bid-ask spreads.

As was explained previously, margins represent a cost to <u>outside</u> futures traders (such as customers of FCMs). Given the way we have defined the market value of a futures contract, an increase in market value could only occur through an increase in the daily settlement price. Given the fact that the daily settlement price is used to "mark to market" each trading day and that this involves a margin call being made to some futures trading customers, higher market value leads to an increase in margins paid. However, since margins are not required from floor traders (since they are essentially _inside_ traders), they are not a part of their costs. Hence, higher margins reflect _relatively lower dealer costs_. Thus, under these conditions, one should observe that higher market value for a given futures contract will tend to lower the bid-ask spread for that contract.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Futures commission merchants (FCMs) are integral members of the futures industry. They typically act as agents for futures trading customers by providing brokerage services. As compensation, they charge competively-determined commissions to their clients.

At times, FCMs may engage in proprietary trading; in other words, they trade for their own accounts. When engaging in this type of activity, they have a second potential source of income: profits earned from successful speculative trading. In this sense, they act as dealers (i.e. principals) in futures trading. Such FCMs are often known as dual traders.

However, provision of dealer services is not the primary function of FCMs; their main role is the provision of brokerage services to futures customers. The major providers of dealer services are floor traders, or market-makers. Since they tend to trade by attempting to turn over their positions as quickly as possible (and hence act as scalpers), they provide liquidity and immediacy in futures markets and earn income primarily by trading the bid-ask spread.

This study attempts to provide a beginning analysis on the market for FCM services. Specifically, it examines the following issues: (1) the determination of futures trading commissions; (2) the potential existence of a relationship between commissions charged by FCMs and bid-ask spreads set by floor traders; and (3) the effects of FCM behavior on liquidity and transactions costs in futures trading. A model is developed which attempts to both theoretically and empirically analyze all of the above questions. The statistical results of the model generally tend to support all hypotheses postulated in this study.

In particular, the following conlusions can be made with regards to the empirical results obtained in this study:

(1) The variable MKTVAL appears to be quite important in determining the level of commissions charged by FCMs to their futures customers. However, it seems as though their exist other factors which also are involved in this process.

(2) There does seem to be a definite, significant relationship between the commissions set by FCMs and the bid-ask spreads set by floor traders. The empirical results generally show the existence of a negative trade-off between these two variables for a given level of transactions cost, with the degree of this trade-off apparently depending upon the extent of competition between these two groups of futures traders.

(3) It appears as though FCMs do, in fact, reduce the level

of transactions costs in futures trading. However, it also seems to be the case that they increase the price concession that futures trading customers pay to market-makers.

(4) Both demand and risk differences appear to be important, not only with regards to determining commissions and bid-ask spreads but also in terms of significantly affecting the apparent inverse relationship between them.

(5) Margins in futures trading also seem to be important factors in affecting the above-mentioned relationship.

(6) This study is important in that it provides a vehicle for analyzing the trading conduct of both FCMs and floor traders.

Yet, despite the above conclusions this study is not a definitive examination and analysis of the market for FCM services by any stretch of the imagination! There still exists the scope for further research into this area. More work is needed on the question of commission-determination by FCMs in futures trading. This would entail not only identifying other variables which are important with respect to this issue, but also attempting to assimilate better commission data.

Another avenue of future research into this area is analysis of alternative methods of incorporating demand differences, risk differences, and margin requirements within the context of the negative relationship between commissions charged by FCMs and bid-ask spreads set by floor traders. This study admittedly gives only a brief treatment of these very important issues. What is needed is a more robust examination of how changes in net demand for transactions services, the existence of risk differentials in the provision of dealer (or, more appropriately, market-maker) services, and the imposition of (as well as changes in) margins affect not only the trade-off between commissions and bid-ask spreads in futures markets but their levels as well.

Further, more research is necessary into the questions of how great is the extent of competition between FCMs and floor traders and how competition between these two groups of futures traders affects other aspects of futures trading. Included in this would, naturally it seems, be an analysis of dual trading and its effects on all the issues already mentioned. Such work could provide information on the optimal supplies of both brokerage and dealer services to futures markets, the net demands for these services, and the welfare implications of dual trading.

Finally, there exists a need to develop more formal and appropriate measures of bid-ask spreads for futures market analysis. It is still not clear exactly what the important determinants of these spreads actually are. Also, the question of how to handle information trading within this context remains open.

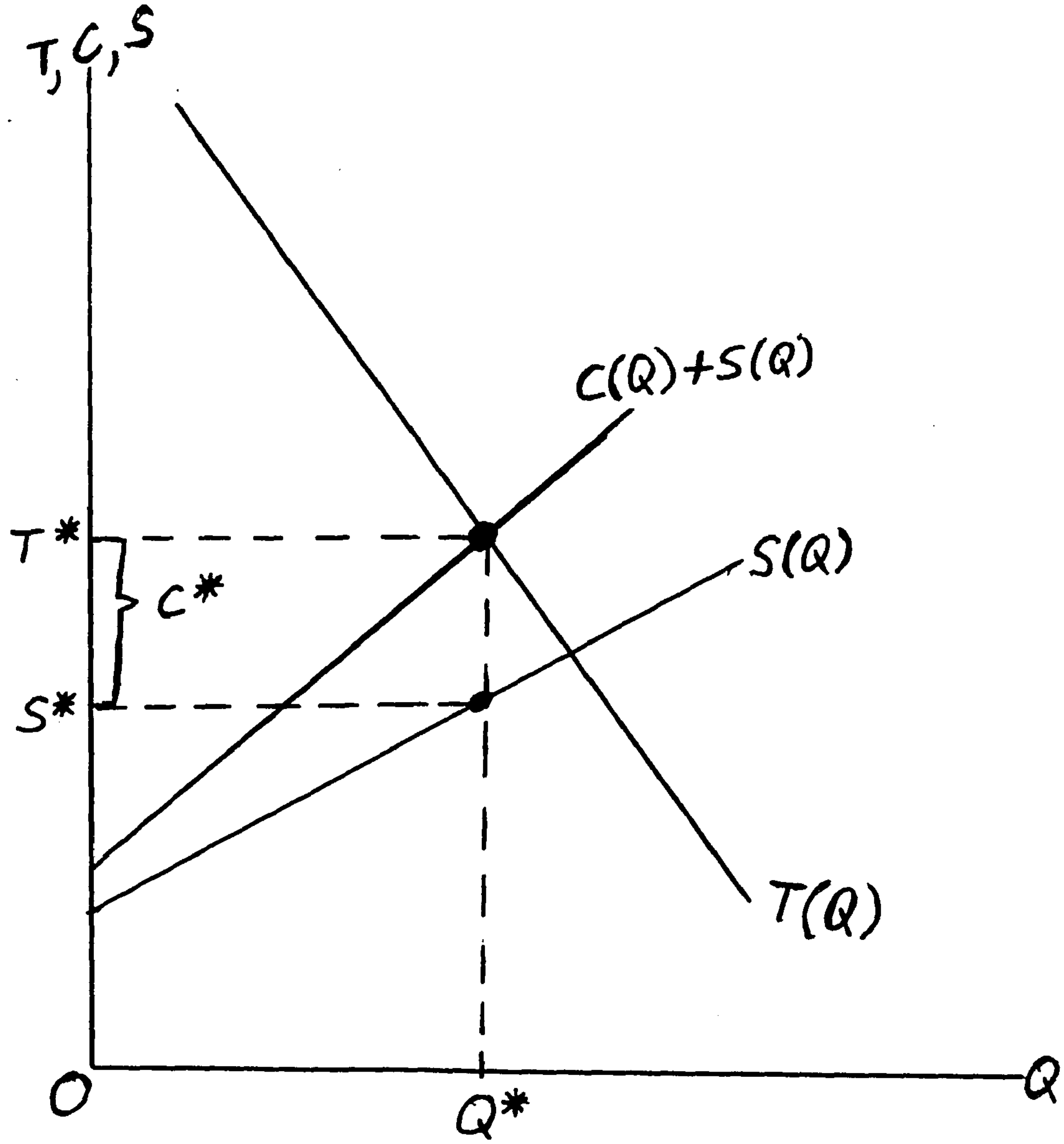
It is hoped that this study has shed some light on the market for FCM services. However, as was discussed above, there still exist issues and questions which require further research, analysis, and examination. Until these concepts are adequately dealt with, this market will continue to remain a rather curious mystery in the field of financial economics.

APPENDIX

DIAGRAMS FOR CHAPTER 3

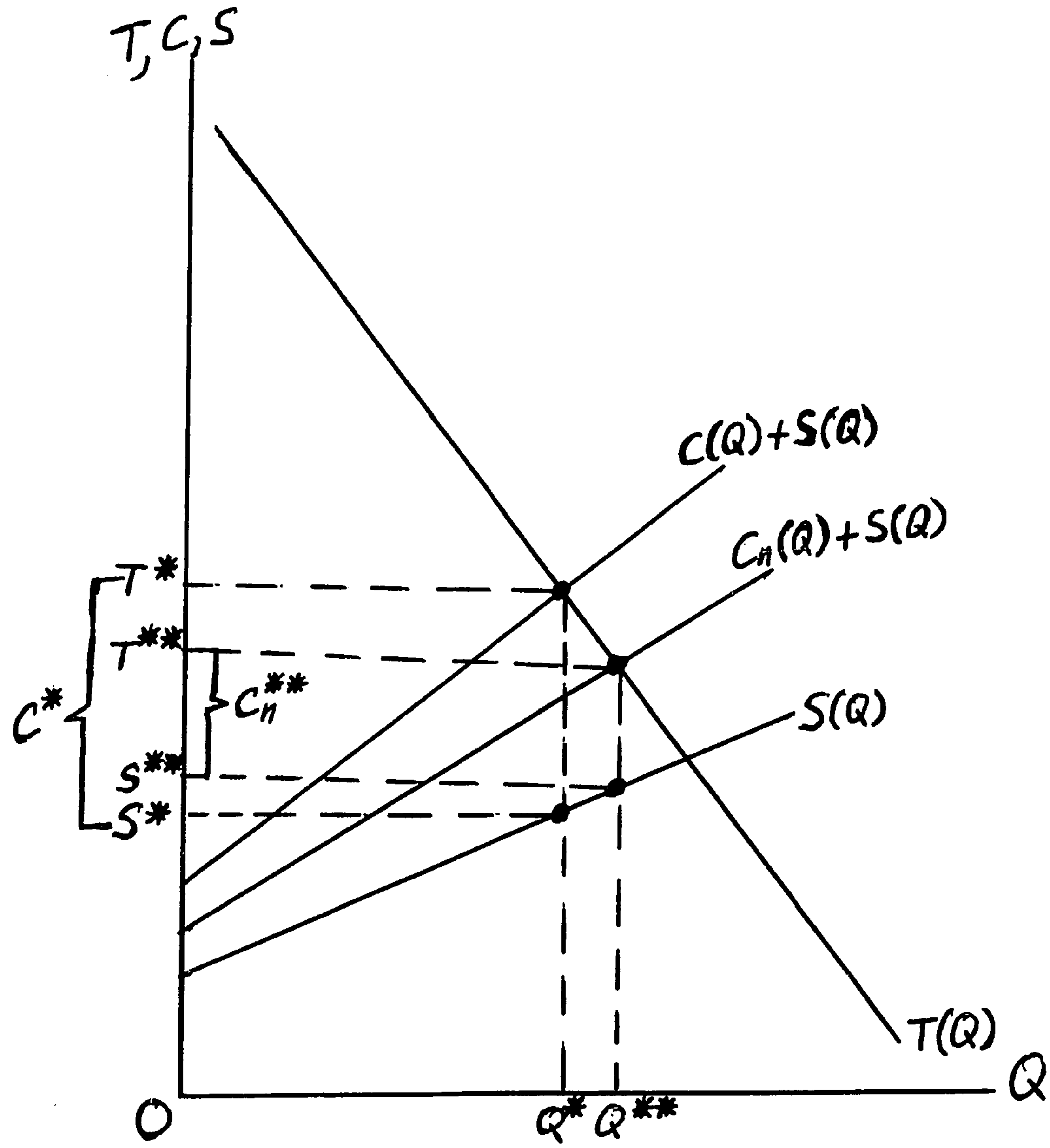
APPENDIX 3.1

EQUILIBRIUM IN THE SIMPLE MODEL



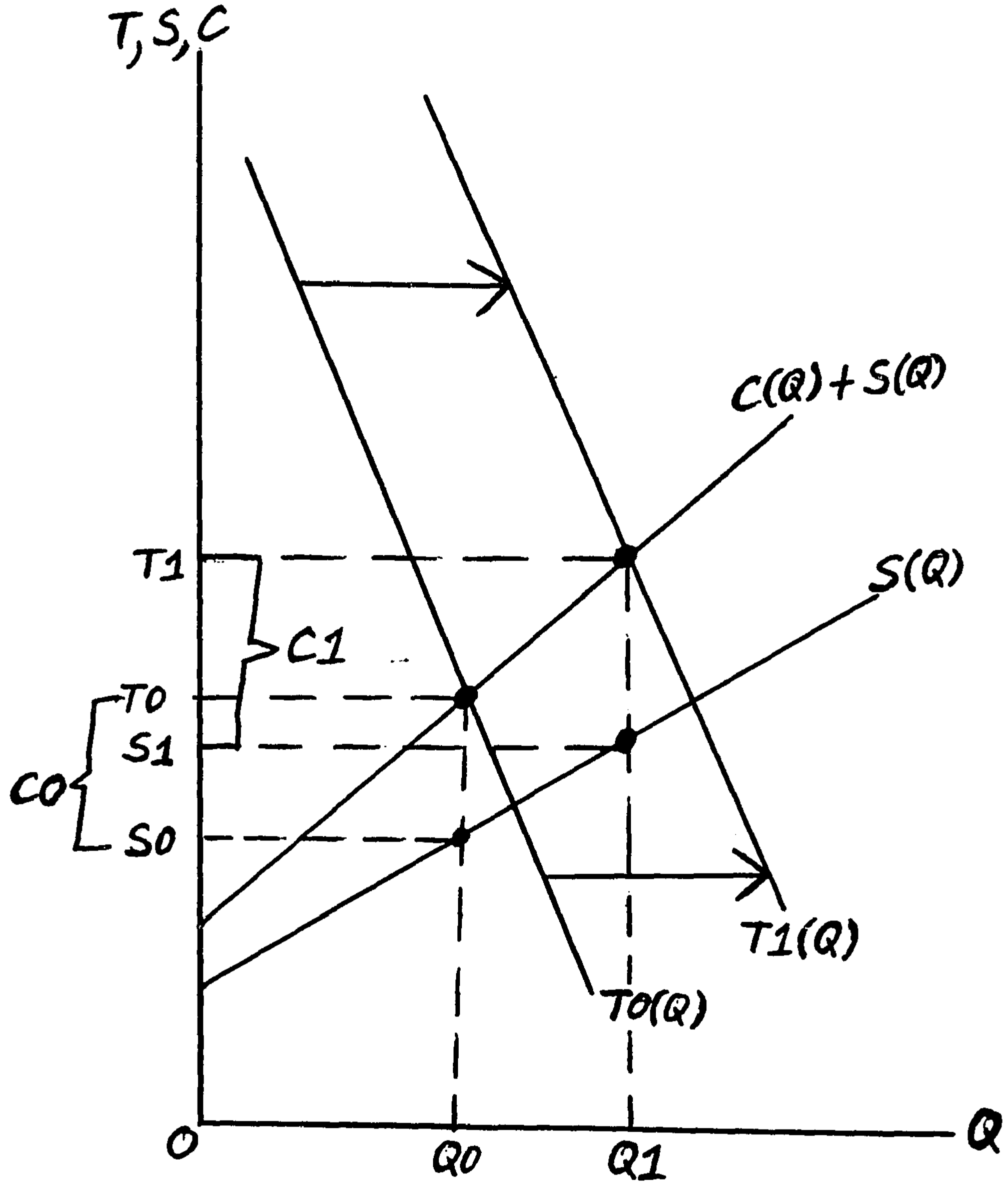
APPENDIX 3.2

NEGOTIATED COMMISSIONS AND EQUILIBRIUM



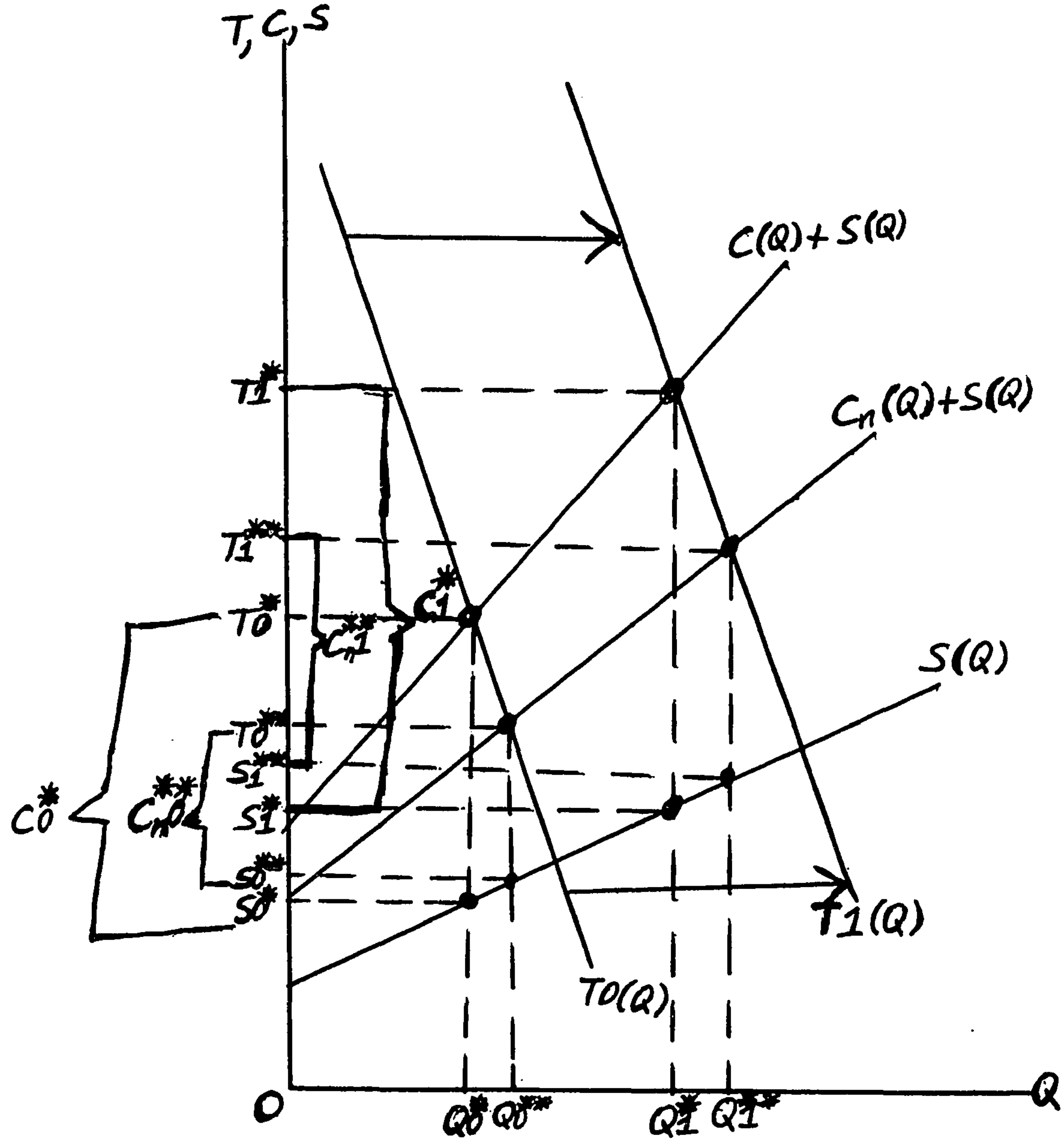
APPENDIX 3.3

DEMAND INCREASE AND EQUILIBRIUM



APPENDIX 3.4

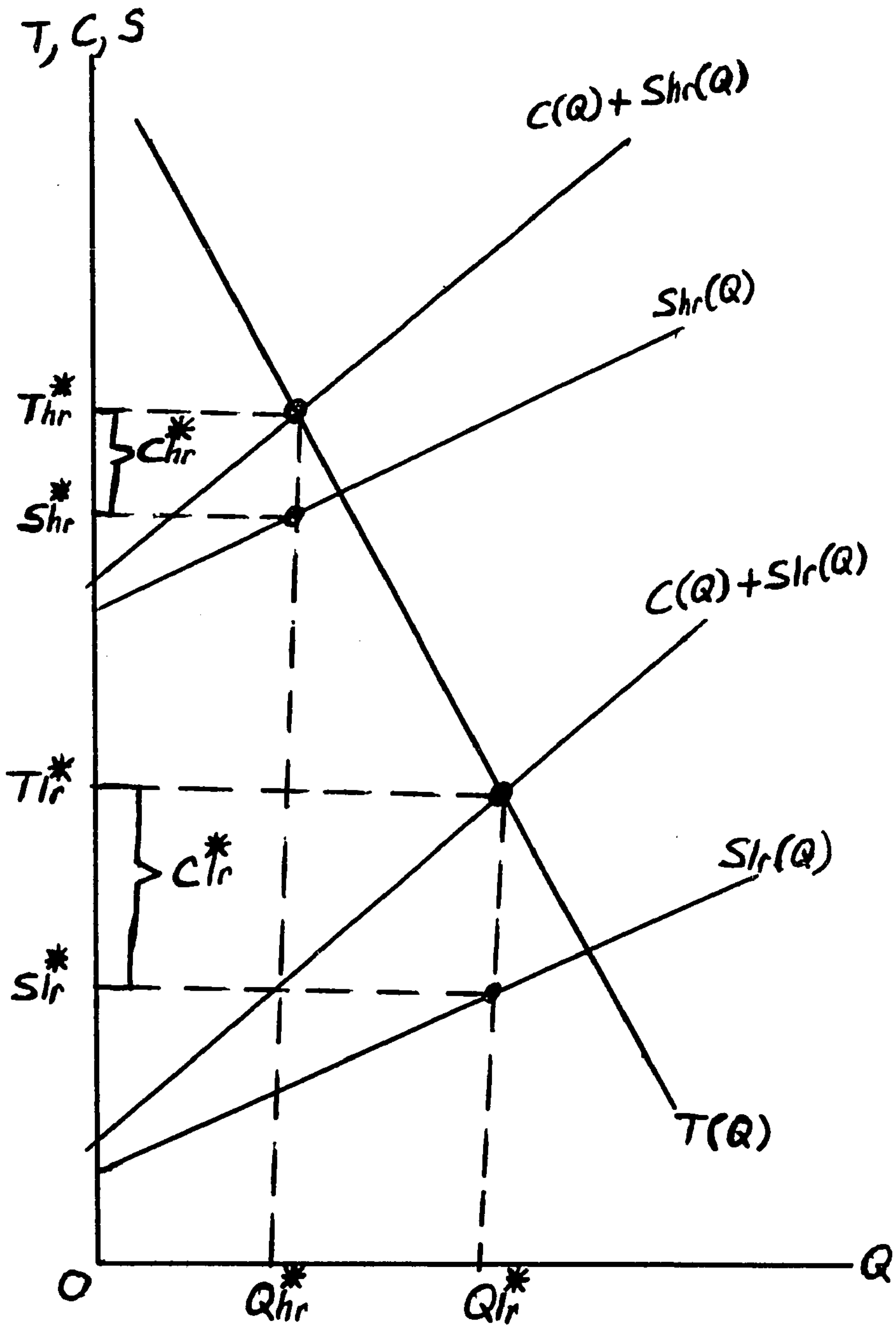
DEMAND INCREASE, NEGOTIATED COMMISSIONS, AND EQUILIBRIUM



$$C0^{*} = T0^{*} - S0^{*}$$
$$C_{n}0^{**} = T0^{**} - S0^{**}$$
$$C1^{*} = T1^{*} - S1^{*}$$
$$C_{n}1^{**} = T1^{**} - S1^{**}$$

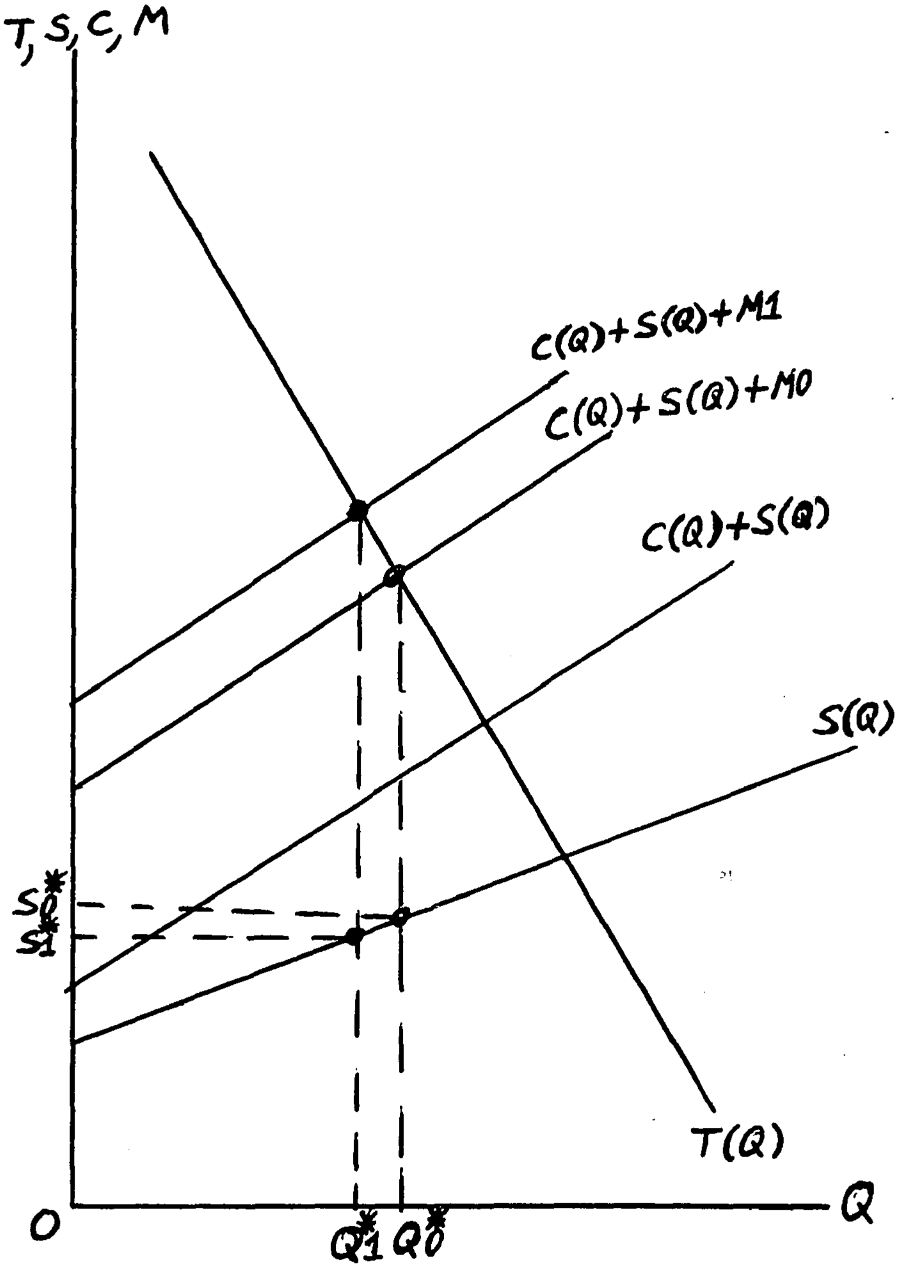
APPENDIX 3.5

RISK DIFFERENTIALS AND EQUILIBRIUM



APPENDIX 3.6

MARGINS AND EQUILIBRIUM



REFERENCES

[1] Amihud, Yakov and Mendelson, Haim (1980). "Dealership Market: Market-Making With Inventory", Journal of Financial Economics, vol. 8, 31-53

[2] Anderson, Ronald W. (1984a). "The Industrial Organization of Futures Markets: A Survey" in Ronald W. Anderson (editor), The Industrial Organization of Futures Markets (1984), Lexington Books, 1-33

[3] Anderson, Ronald W. (1986a). "Exchange Competition in the Futures Industry", manuscript

[4] Anderson, Ronald W. (1986b). "Regulation of Futures Trading in the United States and the United Kingdom", Oxford Review of Economic Policy, vol. 2, no. 4, 41-57

[5] Bhattacharya, M. (1983). "Transaction Data Tests of Efficiency of the Chicago Board Options Exchange", Journal of Financial Economics, vol. 12, 161-185

[6] Burns, Joseph M. (1982). "Electronic Trading in Futures Markets", Financial Analysts Journal, Jan.-Feb., 33-41

[7] Commodity Futures Trading Commission, Glossary of Trading Terms, March (1988)

[8] Choi, J.; Salandro, D.; and Shastri, K. (1988). "On The Estimation of Bid-Ask Spreads: Theory and Evidence", Journal of Financial and Quantitative Analysis, vol. 23, 219-230

[9] Copeland, Thomas E. and Galai, Dan (1983). "Information Effects on the Bid-Ask Spread", Journal of Finance, vol.XXXVIII, no. 5, 1457-1469

[10] Demsetz, Harold (1968). "The Cost of Transacting", Quarterly Journal of Economics, February, 33-53

[11] Epps, Thomas W. (1976). "The Demand for Brokers' Services: The Relation Between Security Trading Volume and Transactions Cost", Bell Journal of Economics, vol. 7, no. 1, 163-194

[12] National Futures Association, FCM Firm Directory

[13] Edwards, Franklin R. (1984). "The Clearing Association in Futures Markets: Guarantor and Regulator" in Anderson (1984), 225-254

[14] Garbade, Kenneth D. and Silber, William L. (1982). "Best

Execution in Securities Markets: An Application of Signaling and Agency Theory", Journal of Finance, vol. XXXVII, no. 2, 493-504

[15] Garman, Mark B. (1976). "Market Microstructure", Journal of Financial Economics, vol. 3, 257-275

[16] Glosten, Lawrence R. (1987). "Components of the Bid-Ask Spread and the Statistical Properties of Transaction Prices", Journal of Finance, vol. XLII, no. 5, 1293-1307

[17] Glosten, Lawrence R. and Harris, Lawrence E. (1988). "Estimating the Components of the Bid-Ask Spread", Journal of Financial Economics, vol. 21, 123-142

[18] Glosten, Lawrence R. and Milgrom, Paul R. (1985). "Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders", Journal of Financial Economics, vol.14, 71-100

[19] Grossman, Sanford J. (1989). "An Economic Analysis of Dual Trading", manuscript

[20] Grossman, Sanford J. and Hart, Oliver D. (1983). "An Analysis of the Principal-Agent Problem", Econometrica, vol. 51, no. 1, 7-45

[21] Ho, Thomas and Stoll, Hans R. (1980). "On Dealer Markets Under Competition", Journal of Finance, vol. XXXV, no. 2, 259-268

[22] Ho, Thomas and Stoll, Hans R. (1981). "Optimal Dealer Pricing Under Transactions and Return Uncertainty", Journal of Financial Economics, vol. 9, 47-73

[23] Ho, Thomas and Stoll, Hans R. (1983). "The Dynamics of Dealer Markets Under Competition", Journal of Finance, vol. XXXVIII, no. 4, 1053-1074

[24] Jensen, Michael C. and Meckling, William H. (1976). "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", Journal of Financial Economics, vol. 3, 305-360

[25] Jordan, James V. and Morgan, George E. (1990). "Default Risk in Futures Markets: The Customer-Broker Relationship", Journal of Finance, forthcoming

[26] Logue, Dennis E. (1975). "Market-Making and the Assessment of Market Efficiency", Journal of Finance, vol. XXX, no. 1, 115-123

[27] National Futures Association, A Compliance Guide: Futures Commission Merchants and Introducing Brokers

[28] Ma, Christopher K.; Peterson, Richard L.; and Sears, Stephen R. (1989). "Trading Noise, Adverse Selection, and the Intraday Bid-Ask Spreads in Futures Markets", manuscript

[29] Marshall, John F. (1989). Futures and Options Contracting: Theory and Practice, South-Western Publishing Company

[30] Roll, Richard (1984). "A Simple Implicit Measure of the Effective Bid-Ask Spread in an Efficient Market", Journal of Finance, vol. XXXIX, no. 4, 1127-1139

[31] Ross, Stephen A. (1973). "The Economic Theory of Agency: The Principal's Problem", American Economic Review, vol. 63, no. 2, 134-139

[32] Silber, William L. (1981). "Innovation, Competition, and New Contract Design in Futures Markets", Journal of Futures Markets, vol. 1, no. 2, 123-155

[33] Silber, William L. (1984). "Market-Making Behavior in an Auction Market: An Analysis of Scalpers in Futures Markets", Journal of Finance, vol. XXXIX, no. 4, 937-953

[34] Stanley, Kenneth L. (1981). "Measuring the Operational Costs of Dual Trading: An Analytical Framework", Journal of Futures Markets, vol. 1, no. 3, 329-336

[35] Stoll, Hans R. (1978a). "The Supply of Dealer Services in Securities Markets", Journal of Finance, vol. XXXIII, no. 4, 1133-1151

[36] Stoll, Hans R. (1978b). "The Pricing of Security Dealer Services: An Empirical Study of NASDAQ Stocks", Journal of Finance, vol. XXXIII, no. 4, 1153-1172

[37] Stoll, Hans R. (1989). "Infering the Components of the Bid-Ask Spread: Theory and Empirical Tests", Journal of Finance, vol. XXXIV, no. 1, 115-134

[38] Telser, Lester G. (1981). "Margins and Futures Contracts", Journal of Futures Markets, vol. 1, no. 2, 225-253

[39] Thompson, Sarahelen R. and Waller, Mark L. (1988). "Determinants of Liquidity Costs in Commodity Futures Markets", manuscript

[40] Tinic, Seha M. (1972). "The Economics of Liquidity Services", Quarterly Journal of Economics, vol. 86, 79-93

[41] Townsend, Robert M. (1984). "Theories of Contract Design and Market Organization: Conceptual Bases for Understanding Futures Markets", in Anderson (1984), 275-306

[42] The Wall Street Journal (1989), various issues