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COMMENT

April 6, 1998

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COMMODITY FUTURES TRADING COMMISSION
RECEIVED
FOR PUBLIC RECORD

Ms. Jean A. Webb
Secretary
Commodity Futures Trading Commission
Three Lafayette Centre
1155 21st Street NW
Washington, DC 20581

Dear Ms. Webb:

I understand that you are currently considering a proposal from Cantor Fitzgerald. In light of this fact, I am enclosing a copy of a paper written by Prof. Bruce Weber and me. The paper, "Next Generation Trading in Futures Markets: An Overview of the Cantor Financial Futures Exchange (CFFE)" outlines features of the CFFE and sets forth hypotheses regarding the potential market impact of CFFE. Descriptions of the Cantor Financial Futures Exchange are based upon material supplied by Cantor Fitzgerald. The hypotheses and conclusions were based on these descriptions, together with an independent review of the current academic literature regarding the impact of technology on market structures and performance. We think that the current venture provides some interesting opportunities for on-going research regarding technology and markets.

Sincerely,

Mike Uretsky

Next Generation Trading in Futures Markets: An Overview of the Cantor Financial Futures Exchange (CFFE)

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April 6, 1998

Executive Summary

Financial markets are changing rapidly in response to customer needs and new trading technologies. The role of information systems has evolved from disseminating price data and supporting clerical and back-office functions of floor-based markets, to providing new screen-based markets, which can eliminate time and geographic boundaries. In a number of markets today, automation reliably handles front-office functions including order routing, quote display, price determination, and trade execution. With the introduction of new screen-based trading systems, a "market for markets" has emerged. Exchanges, broker-dealer firms, and market data vendors are competing to offer trade execution services that will attract customer interest and trading volumes. This competition is favored by regulatory bodies such as the SEC and the CFTC, who have taken steps such as approving the listing of equity options on multiple exchanges. We examine the design of the Cantor Financial Futures Exchange (CFFE), a market system for trading futures contracts on U.S. Treasury securities, and describe its capabilities relative to established, floor-based futures markets. We expect that the CFFE will provide market participants with more control over their trading activities and greater access to the price discovery process. In addition, its trading and order matching algorithm provides incentives to participants to place quotes and supply liquidity, and ensures that market participants are given equal treatment in the execution of their orders. The CFFE should enable investors to lower their transaction costs, and improve the returns performance of their investment portfolios.

1. Introduction

Several decades of research into the relative merits of alternative market structure have not yielded a conclusive answer to the question, *What trading mechanism maximizes participants' satisfaction and minimizes transactions costs?* Today, floor markets and screen-based markets, and quote-driven dealer markets and order-driven auction markets co-exist, and both operate and provide good levels of liquidity to participants. (Schwartz, 1993)

History has shown, however, that well-designed trading automation can be valuable to investors and traders in markets. For example, the introduction of the SEAQ screen-based market system as part of the London Stock Exchange's 1986 Big Bang market reforms improved the quality of the LSE market (Clemons and Weber, 1990), and played a part in trading volumes increasing from $280 million a day in 1985, to $4.1 billion a day in 1994. In the same period bid-ask spreads (an important trading cost) for FTSE 100 stocks fell from 1.0% to 0.8% and commissions shrank from 0.33% to 0.17%. Thus, the cost of a round-trip investment fell to 1.14% (= 0.8% + 2×0.17%) from 1.66%. Comparing SEAQ to the floor, London's electronic market proved to be more open and competitive than the floor market, and led to lower transactions costs for investors. Similarly, the introduction of the Nasdaq screen market in 1971 to replace the OTC "pink sheets" led to a reduction of the average bid-ask spread in a 174 stock sample to 40.3 cents from 48.7 cents (Hamilton, 1978). The best explanation for the reduction in trading costs is that market makers quotes were made visible on a computer terminal, which forced dealers to compete by posting more aggressive bid and offer quotes, thus narrowing the bid-ask spread.

2. Treasury Securities Trading and the Need for CFFE

The CFFE is intended to bring improvements to investors initially in U.S. Treasury securities and treasury futures contracts. It will begin by offering trading in four contracts, and calendar spreads, which are based on the price differential between contracts with different delivery months. The CFFE may subsequently provide a trading venue for other futures contracts, and for other types of spread trades. This section will describe the Treasury securities market, and detail current practices in the derivatives markets for treasury securities.

2.1. Environment: Treasury Securities Investors and their Strategies

The U.S. Treasury securities markets is the world's largest fixed income securities market, and is one of the largest and most sophisticated financial markets. The U.S. Treasury debt outstanding was $5.4 trillion as of fourth quarter 1997.

Treasury securities are issued in regularly scheduled auctions. Participating directly in the auctions are the 36 primary dealers, who bid for securities in monthly and quarterly refinancings. There can be as many as 156 separate auctions per year, and recently, about $2 trillion in Treasury securities have been auctioned per year.

Once issued, Treasury securities trade in an active secondary market. This cash market or spot market for treasury securities is primarily an over-the-counter (OTC) dealer market, whose volume was estimated at $125 billion per day in 1996. For comparison, the New York Stock Exchange (NYSE) traded an average of 412 million shares a day, or $16 billion in value per day in 1996.

The Treasury securities market is principally an institutional, as opposed to a retail, market. The 36 primary dealers, and another 1,700 smaller broker-dealers provide their investor-customers with services such as research and trading. These "sell-side" firms account for most of the trading volume. After trading as principals (using their own capital) with their "buy-side" customers, treasury dealers will often reduce their positions through trades with one another. To avoid exposing their positions, most inter-dealer trading is conducted anonymously through one of six interdealer brokers.

The operations of the cash and futures markets for treasury securities facilitates the distribution of the U.S. national debt through as efficient a mechanism as is possible. Investors hold treasury securities because of their high credit quality, and because of the market's vast liquidity. A value chain for a institutional investor in fixed income securities is depicted below:

Figure 1: A Value Chain for institutional investors in fixed income securities depicting the activities at each of four stages. Information technology is increasingly used to integrate and streamline the linkages between theses activities.

→ **Portfolio Decision-Making**	→ **Implementation/ Trading**	→ **Post-Trade Processing**	**Position Accounting and Risk Management**
• Research • Investment analytics • Cash flow needs • Liability matching	• Real-time market data • Order handling • Trading	• Resolution of out-trades, errors, etc. • Clearing and settlement • Margining: original and variation • Settlement and delivery	• Position analysis • Benchmarking • Risk-Adjusted Return on Capital • Value at Risk

Traditionally, exchange markets have supported the middle of the value chain, that is, the trading and trade processing functions. Separate technologies are used by fund managers to support portfolio decision-making, and to manage risk. Electronic markets, such as the CFFE, however, offer the capability of integrating investors' portfolio decision support systems with the placement of orders into the market. And, with an electronic price and clearing feeds, investors can have real-time position accounting in order to manage risks more effectively.

2.2. Derivative markets and risk management for fixed income securities

Derivatives on treasury securities are actively traded. In 1997, the Chicago Board of Trade (CBOT) traded 99.8 million Treasury Bond futures contracts making it the most active futures contract in the world. T-Bond futures accounted for over 41 percent of the 242.7 million futures and options contracts traded at the CBOT. The value of Treasury futures contracts traded on an average day is about $50 billion, and represents about 40% of cash market volume

In the period just after interest rate futures began trading in 1975, there were concerns that futures markets in financial instruments could disrupt the underlying cash markets. Studies of price variability (Bortz, 1984) conducted on treasury securities, however, indicated that, in fact, daily volatility in cash prices is reduced because of the existence of the futures markets.

U.S. Treasury bond and note futures are widely used by a number of different groups. For instance, many fund managers adjust the risk/return characteristics of their fixed income portfolios with futures. Mortgage originators will use futures contracts to hedge the interest rate risk of their mortgage positions. Common uses of futures on treasury securities are:

- *Lock in a Purchase Price:* If an investment manager anticipates positive cash inflows that will be used to purchase fixed-income securities in the future, and is concerned about the possibility of higher prices, he can buy Treasury futures with delivery months near the time of the anticipated cash flows. This establishes a maximum purchase price.

- *Safeguard Investment Value*: By selling Treasury futures, an investment manager can lock in attractive selling prices and preserve the value of a portfolio or a security against possible price falls.

- *Cross-Hedge:* U.S. Treasury securities prices and yields are the benchmark against which most other fixed income instruments are compared. Treasury futures can be used to control risk and enhance the returns from non-U.S. Government securities. For instance, an investment grade corporate bond maturing in 10 years could have its yield quoted as 85 basis points over the benchmark treasury security, which in this case is the 10 year

treasury note. As a result of its benchmark characteristics, treasury futures are useful risk-management tools for corporate bonds, mortgage-backed securities, agency securities, Eurobonds, non-U.S. government and private sector bonds, and other fixed-income instruments.

- *Enhance Returns.* Treasury futures are used to increase exposure to changing rates, allowing investors to profit from anticipated interest rate moves and enhance overall returns.

- *Fine-tune Positions.* Treasury futures are used to adjust positions or to fine-tune risk-management strategies. By buying or selling futures, a fund manager can lengthen or reduce the duration of a portfolio, thereby increasing or decreasing sensitivity to interest rate changes.

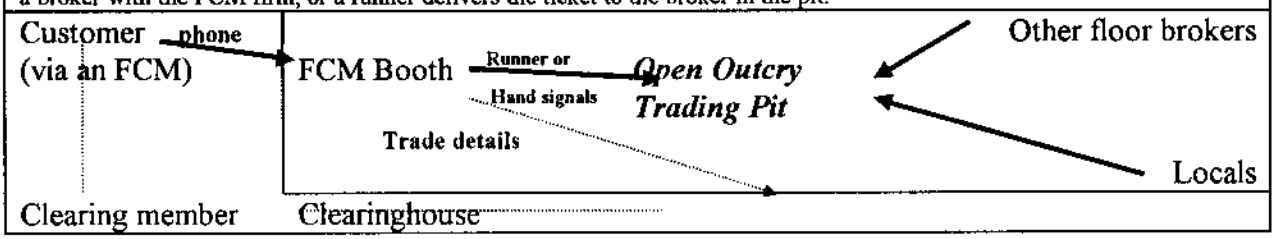
- *Profit from Shifts in the Yield Curve*. Investors can construct trades based on the differences in interest rate movements at different points on the yield curve. For instance, an investor that expects the yield curve to steepen, making short maturity instruments gain in value relative to long dated instruments, can sell bond futures, and buy two-year note futures contracts.

These strategies are beneficial because they give the investor a chance to customize their portfolio to their needs, and to adjust positions to reflect their outlook on interest rates and the market.

2.3. Derivatives Order Handling: Current Practice

The route of an order: To trade most futures contracts, including treasury security futures, a market participant must have an account with a Futures Commission Merchant (FCM). The FCM receiving the customer's order will phone a floor broker with a booth on the appropriate futures exchange. The clerk will write down the order and time stamp it, and then either pass the order ticket to a runner who will deliver it to the firm's trader in the pit, or may flash it to the trader using hand signals. Once the order is executed in the pit, information on the filled order is sent back to the booth and relayed to the customer. The process may take from several seconds to several minutes depending on the complexity of the order and the level of activity in the pit.

Figure 1. Open outcry market flows. A customer's order is phoned to the booth of the Future Commission Merchant (FCM) along the wall of the market floor. The instructions are written on a order ticket, and then either flashed with hand signals to a broker with the FCM firm, or a runner delivers the ticket to the broker in the pit.



In recent years, the major futures markets have installed order routing systems to deliver orders electronically to the FCM booth, or to the trading pit. Systems such as TOPS and COMET are used in the CBOT markets. While such systems eliminate paperwork and speed the transmission of information, they essentially automate existing practices. TOPS transmits the customer's order in electronic form from a remote trading desk to the FCM's booth, or, if it is for 10 contracts or less, directly to an "Electronic Clerk" (EC) terminal in the trading pit. COMET terminals are in place in most FCM booths, and are used to direct orders to an EC terminal in the appropriate pit. Once an order arrives at the EC terminal it is routed to the appropriate trader who fills the order and sends the fill information back to the FCM booth and the customer. In addition, Project A (CBOT), Globex (Chicago Mercantile Exchange), and Access (New York Mercantile Exchange) are screen-based mechanisms for trading derivatives contracts after the normal trading hours.

3. What CFFE Offers

Growing trading volumes in futures markets, and increasing interest in electronic markets indicates that there may be opportunities to provide innovative, screen-based trading mechanisms. Cantor Fitzgerald (Cantor) has designed the CFFE as an extension to its trading system used in the cash market for treasury securities.

Cantor is one of six interdealer brokerage firms, and introduced a major innovation, "electronic brokerage" for cash trading in treasury securities, in 1972. This innovation increased transparency and improved market efficiency. Today, Cantor trades about $40 billion a day in U.S. government securities, and has become the venue for price discovery in benchmark issues

In January 1996, Cantor introduced a computerized system for recording buy and sell orders, and matching them for trading according to a price-and-time priority system. The system is based

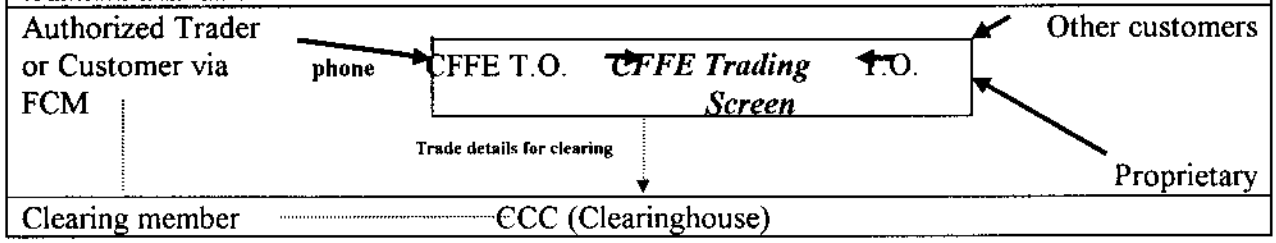
on a terminal operator at Cantor who interacts with authorized cash traders over the phone. The proposed CFFE market will use a similar system to the Cantor trading system for the cash treasury market. It will enable cash and futures trading in treasury securities to be conducted in the same way, and in one phone call with a screen that provides pre- and post-trade anonymity.

3.1. The CFFE Terminal Operator

An important role in the CFFE market is played by the "Terminal Operator" (TO). The TO is responsible for inputting orders into the Cantor System using a specialized keyboard that is designed for rapidly entering and modifying customer orders. The TO provides a clerical function, exercises no trading discretion, and does not accept "not held orders." TOs are supervised and will accept orders only from "Authorized Traders" (AT), who have been approved for trading.

The CFFE's trading mechanism is designed to provide a competitive market, and to handle peak trading volumes efficiently. The CFFE will not maintain an order book or a "deck.", and the CFFE screen will simply show the best bid and offer quotes with size for its contracts. Bids or offers are deleted from the screen after a better priced order arrives.

Figure 2. CFFE market flows. A customer's order is phoned to a CFFE terminal operator, and displayed on a trading screen for other market participants to react to and trade with. Because ATs directly enter orders in the market through a TO, a layer of interaction and information transmission that occurs on the floor is eliminated.



The CFFE is affiliated with the New York Cotton Exchange (NYCE), which was founded in 1870, and is the oldest futures Exchange in New York. Today, it offers trading in futures and options on Cotton, Frozen Concentrated Orange Juice, the U.S. Dollar Index, and the NYSE Composite Index. The CFFE will benefit from its use of the NYCE's administrative and compliance functions, and will avoid the cost of duplicating these activities. The CFFE's clearing and margining functions will be handled by the Commodity Clearing Corporation (CCC), a NYCE affiliate.

3.2. CFFE Pricing and Allocation Priorities

The CFFE system is based on "Interactive Matching"[SM], a pricing and time priority algorithm used now in Cantor's cash market trading system. Interactive Matching creates an incentive to provide liquidity and place orders at attractive prices. Participants and their orders are treated the same, and the CFFE screen displays orders anonymously, showing price and size only. A trade in the system occurs when an order that was entered and displayed is "hit" (sold to) or "lifted" (bought from). The AT that is the "aggressor" – that is, who actively initiates a trade by hitting or lifting a displayed quote – will pay a transaction fee.

There are two time periods in which the placer of the "first best" bid or offer has exclusive rights to trade against the contra order in the CFFE system. The duration of these time periods will be set by the CFFE to create the appropriate level of incentives to place orders. The more liquid and actively traded the contract, the shorter these time periods are likely to be.

- Clearing Time is a period in which the AT that placed the first best bid or offer has an exclusive right to respond to a contra offer or bid that has just arrived. During this time the AT whose bid or offer is showing can trade against the newly arrived contra-side order. If the AT does not respond, then other ATs can trade with the order.

- Exclusive Time is given to the AT who placed the first best bid or offer, and whose order was just hit or taken by a contra order. After the AT's order was traded, exclusive time begins and gives the AT the chance to do any additional quantity that the aggressor has to trade. For example, if two bids for 10 contracts each are displayed 120-01, and a sell order for 20 arrives from another AT who is interested in selling an additional 30 (for a total sale of 50), then the first of the two bidders has the duration of the Exclusive Time to decide how much, if any, of the 30 additional contracts he wants to buy at 120-01.

A third time period, "Execution Time", is not fixed by the CFFE, but determined by the sequence of orders and trades that occur. During Execution Time, the price and current volume transacted flash on the screen, indicating that a trade is being "worked up" to a larger quantity. Once the buying interest or selling interest at that price is exhausted, the Execution Time ends and the price and quantity traded no longer flash.

3.3. Example CFFE Orders and Trades

When an AT phones a CFFE TO, the AT must specify: the code for the customer account or the proprietary order, the contract delivery month, the order type (buy or sell), the quantity, and the price. The following example will illustrate the operation of the CFFE market system.

After trading opens, an authorized trader representing customer A calls a CFFE terminal operator. The AT provides a customer identifier, and indicates a buy order for the September Treasury Bond contract by placing a bid at 120 1/32nd for 100 contracts. On the CFFE screen, this will be displayed as "120.01". An asterisk (*) is placed next to the price to indicate that it is newly arrived.

Price		Quantity	
BID (buy)	OFFER (sell)	BUY (Bids)	SELL (Offers)
* 120.01	--	100×	

The 120 1/32nd bid for 100 is the "first best bid" because it was the first posted on the Cantor System and provided the highest bid at the time. Similarly, AT B calls a CFFE terminal operator and offers to sell 150 contracts at 120 2/32nd

Price		Quantity	
BID (buy)	OFFER (sell)	BUY (Bids)	SELL (Offers)
120.01	-.02 *	100×150	

After the counterpart quote arrives from B, "clearing time" begins. During clearing time, A, by virtue of having placed the first best bid, is given an exclusive right to respond to the offer quote that just arrived. There are several alternatives for A during clearing time:

1) A can do nothing, or any of #2-#5 below:

2) A can be the "aggressor", and lift 100 of the 150 contracts offered. A trade of 100 occurs and flashes on the screen as "TAK 100" indicating that 100 contracts have been "taken" or bought. Both ATs fill out tickets, and the TO passes the trade data on for transmission to the CCC, which forwards it via TIPS (Trade Input Processing System, a clearing system used by the NYCE) to the respective clearing members, who accept or reject it within 30 minutes of posting.

Price		Quantity	
BID (buy)	OFFER (sell)	BUY (Bids)	SELL (Offers)
120.--	-.02		×TAK 100

Price		Quantity	
BID (buy)	OFFER (sell)	BUY (Bids)	SELL (Offers)
120.--	-.02		×50

3) Or, A can be the aggressor, and take the entire offer. The screen will flash the completed trade of 150 contracts at 120 2/32nd. The "Exclusive Time" begins, and A and B have exclusive rights to trade with each other or with others who wish to buy or sell. If both A and B decline to trade any additional quantity, the trade price and size will stop flashing.

Price		Quantity	
BID (buy)	OFFER (sell)	BUY (Bids)	SELL (Offers)
120.--	-.02		×TAK 150

4) If A wants to buy more, and B wants to sell more, A has the exclusive right to buy more at that price. If B offers to sell another 100 contracts, and A accepts, the following will appear.

Price		Quantity	
BID (buy)	/OFFER (sell)	BUY (Bids)	SELL (Offers)
120.--	-.02		×TAK 250

5) If B declines to sell more, then C, another AT who wants to sell, can offer to sell an additional quantity to A.

At any time, except during the Execution Time, any account may improve upon A's bid or B's offer. In that case, the improved quote shows on the screen and the other is automatically removed. For instance, if C offers to sell 100 at 100 1/32nd, then B's offer will be removed, and A has the right to trade with C.

Notice that A's and B's orders, and all others' orders that were transmitted to a CFFE TO were price protected, meaning that no trades could occur at prices worse than their orders. Moreover, the trade algorithm did not require the participants to display the full size of their orders initially. Both features, price protection and the ability restrict the display to a size that will not cause market impact, should improve the quality of the market.

On other electronic trading systems, showing the full size of an order is the only way to prevent it from being traded through. For example, if a customer instructs an FCM to buy 100 contracts at 120-02, the FCM may place a bid at 120-02 for 20 contracts. Assuming there are no other 120-02 bids, but there are other bids at 120-01, a sell order for more than 20 contracts will lead to a trade price of 120-01 for at least 1 contract. The customer willing to buy at 120-02 will be annoyed, since he wished to buy 80 more and can observe a trade at a price *below* her bid price. This could not occur on the CFFE because during Exclusive Time after the bid was hit, the

AT can bid for any or all of the additional contracts that the seller has available. Also, the buyer may only be comfortable bidding for 20, and if the bid were for more, it could move the price higher without any of the buy order being executed.

At certain specified times during the open hours of the CFFE market, the CFFE will operate a market "crossing." In the crossing, submitted buy and sell crossing orders will be traded at a crossing price determined within the system. Orders are matched in the crossing in time priority, and will only pay a crossing transaction fee. The market crossing is expected to appeal to passive traders, who want to minimize transactions costs.

3.4. Comparisons of CFFE with Established Markets

A comparison summary of market characteristics are detailed below for the established market for treasury futures contracts, the Chicago Board of Trade (CBOT).

Table 1: Comparison of market characteristics and traded contracts on CBOT and CFFE.

CBOT	CFFE
• 65,000 sq. ft. floor opened Feb. 1997 at cost of $182 million. Holds 8,000 people. Formed as an agricultural products market in 1848	• Screen-based, interactive matching market. Plan to open in late spring 1998. No physical capacity constraints
• CBOT seat cost $718,000 in 1997	• A seat on the NYCE is not required for trading. Users need only be Authorized Traders.
• Prices determined by open outcry in designated trading pits	• Price determined electronically on screen using an order matching algorithm
• Price data available to the public immediately after trade	• Quotes with size visible before trades, and trade price and quantity information available immediately after trade execution.
• Contract delivery months: March, June, September, December	• Contract delivery months: March, June, September, December
• Trading hours: 7:20 am -2:00 p.m., Chicago time	• Trading hours: 7:30 am-3:00 p.m. and 3:01 p.m.-5:30 p.m., New York time
• Minimum order and trade size: 1 contract	• Minimum order size: 10 contracts, units of 5 thereafter

Table 2 below describes the principal differences in the trading mechanisms.

Table 2: Differences between the CFFE Market and Open Outcry Market

- Anonymity

  The source of an order may be revealed or inferred in an open outcry trading pit. The identify of a CFFE order is not revealed during trading, and is not revealed during clearing and settlement because the CCC steps in and is counterparty to the two sides of each trades.

- Exclusive trading rights are granted to the first best order

In an open outcry market, a broker may represent a buyer that wants to purchase 25 contracts, but to avoid signaling this intention the broker may shout out a new, better bid quote for just 10 contracts. The next seller may hit this broker's bid for 10 and then sell another 15 contracts to another trader who shouted out the same price, or the entire 25 could have been sold to another broker making the same bid. Although the first broker provided liquidity and narrowed the bid-ask spread in the pit, he requires more time to complete the orders and still needs to buy 15 contracts. His customer may wind up paying more. In the CFFE market, the first best bidder has the opportunity to trade more once his bid has been hit by a seller. If the seller wants to trade more the CFFE customer's order is filled more quickly, and there is a better chance of completing the full order without pushing the price up.

- Transparency

The CFFE will provide firm and executable bid and offer quotes with sizes that are visible to all market participants. Open outcry markets do not provide the same degree of pre-trade transparency.

- Form of Access

  Orders need to be signaled or run into trading pits in open outcry markets. In the CFFE market, ATs have direct phone access to the TOs who take their orders and enter them to be displayed on the CFFE screen, or to trade with a displayed order. Because of the direct phone access and the specialization of the TO function, the speed of accessing the market and trading may be faster in the CFFE.

- Liquidity

  Initially, the level of liquidity available in the CFFE market will not match the liquidity of the Treasury securities pits in Chicago. Over time, however, the liquidity of the CFFE may grow.

- Cost Advantage

  The transactions fees charged to CFFE users are expected to be significantly less than floor brokerage commission on the CBOT.

Table 3 summarizes features of the futures contracts that trade on the CBOT and which have been proposed for the CFFE.

Table 3: Comparison of traded contracts on CBOT and first four proposed contracts for the CFFE

T-Bond	**CBOT**	**CFFE**
Introduction:	August 22, 1977	Awaiting CFTC approval
Contract size:	$100,000	$100,000
Price increment:	1/32nd	1/32nd
Daily price limit:	3 points expandable to 4.5	None
Daily volume, 1997	384,360	NA
10-Year Notes		
Introduction:	May 3, 1982	Awaiting CFTC approval
Contract size:	$100,000	$100,000
Price increment:	1/32nd	1/32nd
Daily price limit:	3 points expandable to 4.5	None
Daily volume, 1997:	92,864	NA
5-Year Notes		
Introduction:	May 20, 1988	Awaiting CFTC approval
Contract size:	$100,000	$100,000
Price increment:	1/2 of 1/32nd (1/64th)	1/2 of 1/32nd (1/64th)
Daily price limit:	3 points expandable to 4.5	None
Daily volume, 1997:	52,507	NA
2-Year Notes		
Introduction:	June 22, 1990	Awaiting CFTC approval
Contract size:	$200,000	$200,000
Price increment:	¼ of 1/32nd (1/128th)	¼ of 1/32nd (1/128th)
Daily price limit:	1 points expandable to 1.5	None
Daily volume, 1997:	3,922	NA

In addition to the trading hours listed, the CBOT has an afternoon session on its Project A trading system from 2:30 p.m. to 4:30 p.m. (Chicago time) from Monday to Thursday, and an overnight session from 5:55 p.m. to 6:45 a.m. (Chicago time) from Sunday to Thursday.

4. Market Prospects and Regulatory Environment for the CFFE

4.1. Demand for Screen-based Markets

More sophisticated strategies and investors' desire to have more direct market access and greater control over trading, are leading to more interest in screen-based trading systems. As with other electronic markets, the CFFE will reduce time and geographic barriers to market participation. In this sense, the CFFE will be an important innovation for participants in the treasury securities and derivative markets.

Previous introductions of screen-based markets for institutional (non-retail) trading have provided notable improvements in market quality. The Instinet system is an integral part of the

U.S. Nasdaq stockmarket. On Instinet, traders are able to bid and offer anonymously, and the Reuters-owned system has grown to represent about 20 percent of daily trading volume in Nasdaq stocks.

Compared to current practices, the CFFE provides important advances in the quality of information available in the marketplace, and in the ability of users to access the market. Users can see and act on live bids and offers, and an audit trail will exist that will strengthen confidence in the market. Transactions costs in the CFFE market are expected to be significantly lower than current trading costs, and this could expand overall volumes in the market. Because the CFFE's cost structure is relatively low, new products can be introduced easily and at low risk. In addition, the CFFE will benefit from the New York Cotton Exchange's established rules and surveillance procedures, and from the CCC's clearing systems.

4.2. Market Features and Issues

Because trading volume in treasury securities spikes at times of economic announcements and news, the CFFE market is structured to be able to handle volume peaks. This capacity to handle these concentrations of activity in an efficient and orderly fashion should benefit investors.

At certain times, the CFFE market screen could show a "locked market", i.e., the bid and offer are at the same price. Such a market will remain locked until one or the other quotes is traded or is cancelled. The CFFE market, however, will not have crossed bids and offers because TOs can only input a bid at the level of the offer or less. Since the aggressor pays the transaction fee, lower fees should lead to fewer locked markets.

Advocates of open outcry claim that trading floors provide a better way to fill complex orders such as spreads, multi-legged strategies, or options transactions. In the near future, trading technologies may enable users to program their own strategies which can be highly complex. With a digital data feed from a market such as CFFE, complex strategies can be carried out rapidly and with few or no errors.

While the CFFE provides anonymity, some open outcry participants find value in the information that originates in a trading pit such as who is buying or selling, and why they are trading. For investors using the market, having their trading intentions revealed can be costly to their strategy.

Once the CFFE is operating, Treasury futures trading will take place in two different market venues. In the U.S. equities markets, some stocks trade on more than one exchange. These markets have intermarket price protection, so that if, for instance, the Pacific Exchange has a better (lower) offer quote than the NYSE, trades can only occur at higher prices after the sell order on the PCX is filled and the offer raised. Because the contracts that trade in Chicago and on the CFFE are not entirely equivalent, such protection is not initially feasible in Treasury futures trading.

4.3. Future Plans for the CFFE

The CFFE is part of a broad initiative at Cantor to extend the success of their cash market system into futures trading. At the NYCE and CCC, CFFE is consistent with those organization's effort to introduce new contracts and develop new financial futures markets. The organizations involved with the CFFE will continue to utilize technology in innovative ways to support markets. An important future plan is the development of on-line user entry and access to the CFFE, which will be based on an Application Program Interface (API). An API is a common interface standard which enables firms to connect any in-house order routing and back-office system to the CFFE. After on-line capabilities are in place, CFFE will aid investors in stages of the value chain that are currently not well supported. For instance, future CFFE systems could provide links to portfolio decision-making and risk management, and foster more sophisticated strategies, such as indexing, and basket or program trading.

Another avenue for the CFFE in the future is to participate in the trade message standardization efforts that are taking place in the futures markets and in other markets. For instance, the FIX standard is improving the efficiency of inter-firm trading communication in the equities market. FIX messages can be sent from a fund management firm to a broker-dealer requesting a quote, which if accepted, can feed into an order entry system for transmission to the NYSE floor market over the SuperDOT system. Similarly, the Future Industry Association and the Managed Futures Association have developed standards for electronic transmissions, which enable market participants to share data in electronic form to improve the efficiency, accuracy and costs of exchanging trading and account data.

After the API is added, the CFFE may want to fine-tune the current algorithm to work as effectively as possible once on-line customer access is added to the system. Other possible features that can be considered once ATs have direct access are hidden orders that do not reveal the full size to the market, but cannot be traded through, and other order types such as market open and close orders.

The CFFE may consider allowing multiple prices, so that a buy order at a price less than the bid, or sell order at a price greater than the offer can be accepted and can add depth to the market. This will allow customers to place limit and stop orders.

Other features that could be added to the CFFE screen display to provide richer market information are:

- The number of participants logged on and active
- Activity measures such as orders entered and canceled in the past 5-10 minute
- Number of traders that tried to execute against a quote, and the percentage that were successful
- Indicators such as volume on up-ticks or down-ticks

Another advance in the future will be for the CFFE to introduce cross-margining with the GSCC, so that offsetting positions in the cash and derivatives markets will be recognized and have a single margin applied, which will enable market participants to better utilize their capital in the markets.

5. Conclusions

The CFFE will introduce a new screen-based trading system for derivatives trading that is based on a price and time priority matching algorithm called Interactive Matching. Because the most competitively priced orders in the system are filled first, and because the first best order has exclusivity in trading additional quantity, the CFFE should enable large orders to be completed at competitive prices without undue impact. In addition, the system offers a number of advantages compared to current practices, and should significantly reduce transactions costs for a number of important financial instruments. The CFFE is evidence that a "market for markets" has emerged,

which will improve the trading choices available to market participants, and will improve the quality of the market.

6. References

[1] Bartolini, L. and Cottarelli, C. "Designing Effective Auctions for Treasury Securities", *Current Issues in Economics and Finance*, FRBNY, July 1997, pp. 1-6.

[2] Bortz, G. "Does the Treasury Bond Futures Market Destabilize the Treasury Bond Cash Market", *The Journal of Futures Markets*, Vol. 4, No. 1, Spring 1984.

[3] Clemons, E. and Weber, B. "London's Big Bang: A Case Study of Information Technology, Competitive Impact, and Organizational Change", *Journal of Management Information Systems*, Vol. 6, No. 4, 1990, pp. 41-60.

[4] Clemons, E.K. and B.W. Weber, "Alternative Securities Trading Systems: Tests and Regulatory Implications of the Adoption of Technology", *Information Systems Research*, June 1996, pp. 163-188.

[5] Domowitz, I. and B. Steil, "Automation, Trading Costs, and the Structure of the Securities Trading Industry", Working Paper, Royal Institute of International Affairs, London, UK, February 1998.

[6] Fleming, M. "The Around the Clock Market for U.S. Treasury Securities", *FRBNY Economic Policy Review*, July 1997, pp. 9-32

[7] Grunbichler, Andrea, Francis A. Longstaff, and Eduardo S. Schwartz, Electronic Screen Trading and the Transmission of Information: An Empirical Examination, *Journal of Financial Intermediation*, Vol. 3, 1994, pp. 166-187.

[8] Hamilton, J. "Marketplace Organization and Marketability: Nasdaq, the Stock Exchange, and the National Market System", *Journal of Finance*, Vol. 33, March 1978, pp. 487-503.

[9] Hamilton, J. "Electronic Market Linkages and the Distribution of Order Flow: The Case of Off-Board Trading of NYSE-listed Stocks", in *The Challenge of Information Technology for the Securities Markets: Liquidity, Volatility, and Global Trading*, Lucas, H. Jr. and Schwartz R. (eds.) Dow Jones-Irwin, 1989.

[10] Massimb, M. and Phelps, B. "Electronic Trading, Market Structure and Liquidity", *Financial Analysts Journal*, January-February 1994, pp. 39-50.

[11] Pagano, M. and B. Steil, 1996, Equity Trading I: The Evolution of European Trading Systems, in Benn Steil (ed.), *The European Equity Markets: The State of the Union and an Agenda for the Millennium*, London: European Capital Markets Institute and the Royal Institute of International Affairs.

[12] Schwartz, R.A *Reshaping the Equities Markets: A Guide for the 1990s*, Business One Irwin, Chicago, 1993.

[13] Schwartz, R.A. and B.W. Weber, "Next-Generation Securities Market Systems: An Experimental Investigation of Quote-Driven and Order-Driven Trading", *Journal of Management Information Systems*, Vol. 14, No. 2, Fall, 1997, pp. 57-79.

[14] Weber, B. "Elements of Market Structure for On-Line Commerce" Chapter 2 in *Information Technology and Industrial Competitiveness: How Information Technology Shapes Competition*, Chris F. Kemerer (ed.), Kluwer Academic Publishers, Boston, 1998, pp. 15-32.