# AUTOMATIC FINANCIAL INSTRUMENT TRANSACTION SYSTEM

[0001] This application claims the benefit of U.S. Provisional Application No. 61/020,138, filed Jan. 9, 2008, U.S. Provisional App. Ser. No. 61/020,374, filed Jan. 10, 2008, U.S. App. Ser. No. 12/014,027, filed Jan. 14, 2008, and U.S. Provisional App. Ser. No. 61/022,591, filed Jan. 22, 2008. Each is incorporated by reference.

## BACKGROUND

[0002] This application relates to computer trading systems for financial instruments.

## SUMMARY

[0002a] According to a first aspect, there is provided a method, comprising the steps of: on an electronic trading system for trading assets of an asset type, executing trades among traders of assets of the traded asset type, the traded asset type being a derivative of an underlying asset type; from time to time and as a component of the contractual relationship among the traders of the trading system and the trading system, transferring traders' positions in the traded asset type into positions in the underlying asset type for a period of time, and later transferring the positions in the underlying asset claims back into positions in the traded asset type.

[0002b] According to a second aspect, there is provided a non-transitory computer memory, having stored therein program instructions to cause an electronic trading system to: execute trades among traders of assets of the traded asset type, the traded asset type being a derivative of an underlying asset type; from time to time and as a component of the contractual relationship among the traders of the trading system and the trading system, transfer traders' positions in the traded asset type into positions in the underlying asset type for a period of time, and later transfer the positions in the underlying asset claims back into positions in the traded asset type.

[0003] Disclosed herein is a computer network to provide redundancy for a first transaction clearing computer. The first transaction clearing computer is a computer for clearing for trades for financial instruments of a first type. The network includes terminals, a second server, and a transaction processor. The terminals are trading stations for traders of the first type of financial instruments. The second server is designed to clear trades of a second type of instrument. The transaction processor is programmed to communicate network messages with the second server to effect trades in the second type of instrument over time, the messages containing data describing transactions in the second instrument having times and prices designed to create the functional effect of holding the first instrument.

[0004] Disclosed herein is a method, and computer apparatus for performance of the method. On an electronic trading system for trading assets of an asset type, trades are executed among traders of assets of the traded asset type, the traded asset type being a derivative of an underlying asset type. From time to time and as a component of the contractual relationship among the traders of the trading system and the trading system itself, traders' positions in the traded asset type are transferred into positions in the underlying asset type for a period of time, and later the positions in the underlying asset claims are transferred back into positions in the traded asset type.

[0005] Disclosed herein is a method, and computer apparatus for performance of the method. During trading days, assets of a type are traded among traders on an electronic trading system. At about the close of trading days, positions held by traders are transferred from the traded asset type to positions in another asset type. At about the opening of trading days, the traders' positions are transferred back from the other asset type to the traded asset type.

[0006] Disclosed herein is a method, and computer apparatus for performance of the method. As a systematic feature of a market made by an electronic trading system, and computer apparatus for performance of the method. A first trade is placed with a clearing agent for delivery at a future settlement time; and a second trade opposite the first trade is placed with the clearing agent for opposite delivery at substantially the same future settlement time, thereby netting out the first trade. The offset between the first and second trades is used as a synthesized financial instrument.

[0007] Disclosed herein is an apparatus having a processor and a memory. The memory stores representations of a plurality of positions in a first type of financial instrument. The processor is programmed (a) at a first predetermined time, to convert each position in the first type of financial instrument into a corresponding position in a second type of financial instrument, and (b) at a second predetermined time that is after the first predetermined time, to convert each position in the second type of financial instrument into a position in the first type of financial instrument.

[0008] Disclosed herein is a method in which trades of bond future contracts are executed on a computer-based apparatus. After a first predetermined time, a plurality of positions in bond future contracts are transferred into corresponding positions in bonds, in which each position corresponds to one bond future contract. After a second predetermined time that is after the first predetermined time, each of the positions in the bonds are transferred back into a corresponding position in a bond future contract.

[0009] Disclosed herein is an apparatus having a processor and a memory. The memory stores representations of a plurality of bond

future contracts, in which each futures contract defines a long position and a short position. The processor is programmed to: (a) after a first predetermined time, for each bond future contract, calculate a first price of bonds based on the bond futures contract and enter, with a clearinghouse, a buy trade and a sell trade for the bonds at the first price; and (b) after a second predetermined time that is after the first predetermined time, for each of the buy trades and the sell trades, enter with the clearinghouse, a second sell trade and a second buy trade for the bonds at a second price.

[0010] Disclosed herein is a method, and computer apparatus for performance of the method. Trades of bond future contracts are executed on a computer-based apparatus. After approximately the end of a first trading day, for each of the positions in the bond future contracts, a respective bond and a respective price for the bond is determined based on a price of the bond future contract. The position in the bond future contract is transferred into a corresponding position in the respective bonds. Approximately at the beginning of a second trading day, being the soonest trading day that is after the first trading day, for each of the positions in the bonds, a respective price of the bond and a respective price of the bond future contract are determined, and the position in the bonds is transferred back into a corresponding position in a bond future contract.

[0011] The above advantages and features are of representative embodiments only, and are presented only to assist in understanding the invention. It should be understood that they are not to be considered limitations on the invention as defined by the claims. Additional features and advantages of embodiments of the invention will become apparent in the following description, from the drawings, and from the claims.

## DESCRIPTION OF THE DRAWINGS

[0012] **FIG. 1a** is a diagram of entities in an automated trading system.

[0013] **FIG. 1b** is a diagram of flows and states in an automated trading system.

[0014] **FIG. 2** is a display from an automated trading system.

[0015] **FIG. 3** is another display from an automated trading system.

[0016] **FIG. 4** is another display from an automated trading system.

[0017] **FIG. 5** is another display from an automated trading system.

## DESCRIPTION

[0018] The Description generally is organized as follows.


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### I. Overview

[0019] Referring to FIGS. 1a and 1b, a computer network includes computers that perform functions on behalf of various parties in an electronic trading system. Financial instrument transaction system 100 manages data storing customer positions 110, 112 in and/or trading of one or more types of financial instruments (*e.g.*, bonds, bond futures contracts, interest rate swaps, other securities, or derivatives of any of the foregoing).

Transaction system 100 may perform processing and transmit data to cause positions 110, 112 held in a first type of financial to be converted into positions 140, 142 in a second type of financial instrument. The second type of positions may be stored on a Clearinghouse computer 102 that is different than the computer 190 for clearing the first type of instrument. The converting 114 of positions may occur at various times (*e.g.*, at one or more predetermined times, upon the occurrence of predetermined events, as commanded or specified by a user, from time to time). Transaction system 100 may then perform processing and transmit data to cause positions 140, 142 in financial instruments of the second type back to be converted back to positions 110, 112 in financial instruments of the first type.

[0020] In some cases, transaction system 100 may be used to offload network traffic from servers at clearinghouse 190, the traditional clearer for the first type of financial instrument (in the example of the previous paragraph, the bond futures) in order to avoid system overloads due to insufficient bandwidth or server capacity. In some cases, transaction system 100 may be used to provide redundancy in case the computers at traditional clearinghouse 190 become unavailable due to server or power supply failure. In some cases, trading customers may wish not to store certain classes of data on traditional clearing servers 190, *e.g.*, because the server is not secure or its security is compromised, or may prefer to consolidate their data with only one clearinghouse, and transaction system 100 makes it feasible to store clearing data for both types of financial instruments (in the example of the previous paragraph, both the bonds and the bond futures) on the computers at Clearinghouse 102 by converting the trades and rerouting the network traffic to avoid the use of traditional clearinghouse 190. In some cases, consolidating clearing of trades for both types of instruments through one clearinghouse 102 (rather than through two, 102 and 190) may result in technical efficiencies

[0021] In some cases, transaction system 100 may permit an alternative or additional trading venue for the first type of financial instruments to develop, and to use a clearer other than traditional clearinghouse 190. In some cases, clearing both types of instruments through Clearinghouse 102 may permit reductions in both network capacity and routing equipment, as well as in margin charges paid by customers 120, 122. In some cases, consolidating clearing of trades for both types of instruments through one

clearinghouse 102, rather than through two, 102 and 190, may simplify relationships among the parties and processors for the transactions.

[0022] One of the two types of financial instruments may be a derivative of the other, for example, the first type may be bond futures contracts, and the second type may be bonds (*e.g.*, U.S. government bonds or other government or corporate bond issues, often referred to as "cash bonds" or "physical bonds," a term of art that includes bonds held as traditional paper certificates, in electronic book entry form, etc.). For discussion purposes, the conversion from the first type (*e.g.*, the derivative) into the second type (*e.g.*, the financial instrument underlying the derivative) is referred to as "going to sleep," and the conversion back from the second type to the first type is referred to as "waking up." The identity of the bonds selected for the "sleep" trade 130, 132, and the prices at which the "going to sleep" and "waking up" trades are entered, may be determined so that the risks and economics of the positions in the futures contract are embodied in the underlying bonds.

## II. Further Details and Alternatives

[0023] Referring to FIGS. 1a and 1b, a computer for transaction system 100 may coordinate and interconnect computers of the network that act on behalf of traders 120, 122, and one or more clearinghouses 102, 190. Acting through computers 120, 122, parties enter into long and/or short positions 110, 112 in various financial transactions. A single party 120, 122 may be enter into several trades for different financial instruments with different counterparties. As trades occur, transaction system 100 registers the trades as long or short futures positions 110, 112.

[0024] To put a long futures position 110 to sleep, transaction system 100 issues messages, for example in SWIFT or FIX protocol, to other computers in the network, and updates its own records. Transaction system 100 may close the futures position by way of a sell trade 134 to sell long futures position 110, and also enter 130 a "buy" trade of an amount of bonds equivalent to the notional value defined by that futures position Buy trade 130, 140 is for an amount of bonds equivalent to the notional value controlled by futures contract position 110, at T+2 (*i.e.*, Trade date plus two trading days) settlement, and may be effected by a message from transaction system 100 to Clearinghouse

computer 102. Clearinghouse computer 102 may register trade 130, 140 as a long bond position 140, for T+2 settlement. Clearinghouse computer 102 may be operated by a clearer (*e.g.*, the Fixed Income Clearing Corporation division of the Depository Trust & Clearing Corporation) for subsequent settlement by the clearing agent (*e.g.*, JPMorgan Chase or Bank of New York via the Fedwire clearance system). A "T+2" buy is a trade in which the parties to the trade agree that that each party will deliver its respective obligation on the trade to the clearing agent by a certain time (*e.g.*, 3:00 PM) two trading days after the date of the trade. Thus, for a T+2 trade anytime on Monday, the buyer is obligated to deliver cash, and the seller is obligated to deliver instruments, to the clearing agent by 3:00 PM Wednesday. The clearing agent would effect the transfer of the cash to the seller and the instruments to the buyer Wednesday after 3:00 PM.

[0025] To put a short position in a futures contract 112 to sleep, transaction system 100 causes an opposite closure of the futures position by issuing messages (*e.g.*, in SWIFT or FIX or another protocol) that reflect a "buy" trade 136 of the futures position and also a T+2 "sell" trade for a corresponding amount of bonds to be entered with Clearinghouse computer 102 for subsequent delivery via the clearing agent.

[0026] After transaction system 100 issues network messages to put long position 110 and short position 112 in the futures contract to sleep 140, 142, transaction system 100 transmits messages to enter "reverse" trades 150, 152 into Clearinghouse computer 102 the morning of the next trading day. For example, transaction system 100 "wakes up" long position 110 in the futures contract by entering a buy trade 154 for the futures that re-establishes that position and also sending messages over the network to Clearinghouse computer 102 to enter a T+1 sell trade 150 of the bonds for long party 120. Similarly, transaction system 100 "wakes up" short position 122 by sending messages to initiate a sell trade 156 for the futures that re-establishes short futures position 112 and also sending messages to Clearinghouse computer 102 to enter T+1 buy trade 152 of the bonds for short party 122. After the T+2 and subsequent T+1 bond trades 130, 132, 140, 142 have been entered into Clearinghouse computer 102, the bond trades may quickly novate into trades that are legally contracted between each counterparty 120, 122 and Clearinghouse 102, rather than between the counterparties 120, 122 as originally traded. ("Novation" is a substitution of a new contractual obligation for an old one. Most

transactions on most exchanges are originally formed as an obligation of the seller to deliver the financial instrument to the buyer, and the buyer to deliver cash to the seller. After novation, a clearing agent is inserted: the seller's obligation is novated to require delivery to the clearing agent, the clearing agent assumes an obligation to deliver to the buyer, and the seller's original obligation to the buyer is extinguished. Similarly, the seller's obligation is novated to require delivery of cash to the clearing agent, the clearing agent assumes an obligation to deliver cash to the seller, and the seller's original obligation to the buyer is extinguished. The clearing agent's obligation survives default of either party.).

[0027] The T+1 "wake up" bond trades 150, 152 are entered the morning after the sleep trades 130, 132, and so would settle on the same day as the corresponding T+2 "sleep" trades 130, 132 of the previous trading day. Therefore, Clearinghouse computer 102 may net those bond trades 130, 132, 150, 152 so none will go to delivery via the clearing agent. Also, long positions 110 and short positions 112 in futures contracts are always matched – *i.e.*, for every long counterparty 120 that promises to buy under a long future, there is a short counterparty 122 who promises to sell under a short future, and the two total quantities necessarily match exactly. When a futures position 110, 112 is effectively transferred into a bond position 140, 142 in the described manner the bond position also necessarily matches. Thus, in many situations, transaction system 100 need not cause delivery of any bonds via the clearing agent, and thus there may be little or no financing cost for the "sleeping" bond positions 140, 142 with Clearinghouse computer 102

[0028] FIG. 1b illustrates states in an embodiment. In particular, for each of five times (five rows in FIG. 1b) two states are described, one for a long position 110 in a first instrument and one for a short position 112 in the first instrument. The first time (at market close – first row in FIG. 1b) illustrates long and short positions 110, 112 for a futures contract for 1000 lots at $100,000 per lot. At the second time (soon after the close of trading – second row in FIG. 1b), transaction system 100 sends messages 130, 132, 134, 136 to other computers of the network to convert long position and short position 110, 112 of the futures contract into corresponding buy and sell trades 140, 142 for bonds. At the third time ("overnight", or well after the close of trading – third row in FIG. 1b),

Clearinghouse computer 102 stores long and short positions 140, 142 in bonds, subject to an agreement to reverse around the time of the market open. At the fourth time (before the market opens – fourth row in FIG. 1b), transaction system 100 sends messages to other computers in the network to reverse the positions in the bonds through sell and buy trades 150, 152. At the fifth time (around the time of the open – fifth row in FIG. 1b), upon the re-opening of the positions 110, 112 in the futures contract, the T+1 bond trade price may be adjusted to reflect the difference, if any, between the closing and opening prices of the futures contract.

[0029] Because most of the economic risks of the future contracts 110, 112 can be embodied in the bonds 140, 142 during the "sleep" period when the bond trades are stored on Clearinghouse computer 102, and thus are transferred to Clearinghouse 102 by the "sleep" trades, the operator of transaction system 100 holds relatively little risk were a counterparty 120, 122 to the trades to default. The overnight risk of a counterparty default to futures market operator 100 may also reduced as the bond Clearinghouse 102 may effectively assume some of that risk.

**II.A. Trading of other instruments**

[0030] Two futures exchanges may permit the trading of futures contracts on the same underlying product, but those contracts may not be fungible due to them being cleared by different clearinghouses. For example, U.S. Government bond futures traded on the Eurex U.S. futures exchange were not fungible with U.S. Government bond futures traded on the Chicago Board of Trade (CBOT). In this case, an entity that has a long position in the Eurex Ten Year U.S. Government bond futures contracts and also has a short position of an equivalent amount of CBOT Ten Year US Government bond futures contracts could put to sleep their Eurex U.S. long position with the FICC bond clearinghouse 102 and then enjoy up to 75% margin relief from their net bond position in FICC against their short position at the CBOT's clearinghouse. The up to 75% margin relief comes from an agreement between FICC and the CBOT's clearinghouses 102, 190 across similar futures types. In other cases, the amount of margin relief between clearinghouses may be greater or less than 75%.

[0031] In another example (again simplified for expository purposes), positions 110, 112 in bilateral Interest Rate Swap contracts may be put to sleep as bonds 140, 142

and later woken up back into Interest Rate Swap contracts. Generally, an Interest Rate Swap (IRS) contract is an agreement between two parties to exchange interest payments on a periodic basis on a given principal amount. The IRS contract can sometimes be analogous to a bond in its coupon cash flows, but only the interest on the principal amount of the IRS is exchanged; the principal amount of the IRS contract itself is not exchanged. One party to the IRS contract will pay the same interest rate determined at the start of the agreement, multiplied by the notional value of the contract. The other party will pay a rate of interest which varies over time and which is determined periodically based on regularly published indices (e.g. LIBOR - London Interbank Offered Rate, which is an average rate of quotes from the interbank market calculated for a range of popular benchmark interbank loan maturities), multiplied by the notional value of the contract. For example, a 100 million Ten Year U.S. Dollar IRS contract ("from now to 10 years time") with a fixed rate of 4.40% may have interest payments based on the principal amount of $100 million, with one counterparty to the IRS contract paying 4.40% per annum and the other counterparty paying the 6 Month LIBOR rate as determined every six months on $100 million. This exchange of payments typically occurs every six months for ten years (the maturity of that IRS contract). The payment flows mimic a Ten year maturity bond bought with borrowed money and refinanced every six months for then another six months.

[0032] A Ten Year maturity IRS instrument can also be analogous to a Ten year fixed interest Dollar deposit that has been deposited with money borrowed and refinanced every six months for then another six months.

[0033] The similarities between an IRS contract and bond payment flows can allow for an IRS contract to be "put to sleep" as a bond with, for example, a bond Clearinghouse. Counterparties typically accrue large bilateral portfolios of IRS trades with each other due to the structure of the market favoring liquid trading of yearly maturity bilateral IRS contracts (often called "tenor" or "term"). For example, a benchmark Ten Year IRS traded today is for a maturity of T+2 plus Ten Years but a similar benchmark Ten Year IRS traded in one week's time is for that date +2 plus Ten years: although both IRS are termed "Ten Year IRS," because they are traded on different days they have different payment dates and thus cannot immediately be offset and

cancelled. IRS trades may be slept as a bond via a T+2 sleep trade with a T+1 wake up trade entered the following day, to allow large multiple portfolios of often disparate IRS trades outstanding bilaterally between counterparties to net down against each other overnight on account of being slept as one or more bonds. Preferably the counterparty default exposure between IRS counterparties may be substantially reduced due to the effective netting of the IRS trades via the novating of the bond sleep trades to a Clearinghouse.

[0034] An IRS contract may be put to sleep as a bond when payments are due to effect those payments by means of the sleep and wakeup bond prices used. In another embodiment, the IRS contract may be slept as a bond more frequently when market movements require collateral or monies to be transferred from one counterparty to the other. In still further embodiments, the IRS contract may be slept at expiry (often called maturity) or premature expiry to engineer the necessary cash payments (premature expiry of an IRS contract is often called "Rip-UP" and is whereby a previously traded IRS contract is cancelled using current market values to determine a single final cancellation payment due from one counterparty to the other to prematurely end the previously agreed cashflows).

[0035] Trades may be entered into Clearinghouse computer 102 in many ways. Trades may be entered as "Name-give-Up", whereby the buyer and seller to the sleep trade are made known to each other and they send their trades to Clearinghouse computer 102 directly. The operator of transaction system 100 (or another entity) may also become initial counterparty to the buy and sell trades acting as principal. Alternatively, the operator of transaction system 100 (or another entity) may enter the trades into Clearinghouse computer 102 without the entity actually becoming counterparty to either trade.

### II.B. Times and Conditions for Performing the Sleep and Wake-Up Trades

[0036] In some cases, it may be preferable for transaction system 100 to issue network messages to put positions 110, 112 to sleep relatively infrequently, because each trade 130, 132, 150, 152 entered with Clearinghouse computer 102 incurs transaction fees. Thus, during the day, transaction system 100 may store futures positions 100, 112 (*e.g.* futures trades) during the trading day. At the end of the trading day, the

counterparties' net trading positions can be calculated, and only the net position put to sleep 130, 132 as bond trades 140, 142 with Clearinghouse computer 102. The counterparty default risk may lie with the operator of transaction system 100 for any positions 110, 112 not yet "slept" or effectively rolled to Clearinghouse computer 102.

[0037] In some cases, it may be preferable to put most positions 110, 112 to sleep very quickly after a transaction of the futures position, or at an agreed time to allow the operator of transaction system 100 to more promptly transfer counterparty default risk to Clearinghouse computer 102 and effectively pay/receive mark-to-market monies between the counterparties 110, 112. An inherent part of the service of Clearinghouse 102 is to hold counterparty default risk by quickly novating bilateral trades between counterparties 120, 122 into trades between the counterparties 120, 122 and Clearinghouse 102, so quickly sending messages from transaction system 100 to Clearinghouse computer 102, instructing Clearinghouse computer 102 to hold the positions as bond trades 140 stored in the memory of Clearinghouse computer 102 may be desirable to effectively transfer this risk to the party whose very reason for existence is to hold such risk. In the event that traditional clearing computer 190 is unavailable, transferring positions 100, 112 to Clearinghouse computer 102 may an appropriate alternative.

[0038] In many cases, Clearinghouse 102 for the underlying instrument (in the example, the bonds) will require that their customers (counterparties to trades) post margin (initial margin to cover the risk of a newly opened position, and/or variation margin monies and/or securities to cover the mark-to-market profit or loss of a previously opened position) with Clearinghouse 102 to mitigate risk to Clearinghouse 102 of default by the customer. Because the counterparties for transaction system 100 will typically already have Clearinghouse customer margin accounts and margin lodged for bond positions with Clearinghouse 102, the Clearinghouse's accounting and policies for margin can also accommodate bond trades forwarded by transaction system 100, with at most relatively little change. In some cases the margin required at Clearinghouse 102 for a counterparty may be reduced by new trades in financial instruments entered as a result of futures trades being "slept," due to these new bond positions netting down that counterparty's opposing bond positions already existing at Clearinghouse computer 102. Additionally, the margin positions held by the clearer for bond positions can often be

offset against margin requirements for the same customer's futures positions at other futures exchanges, reducing margin costs for the customer.

[0039] Transaction system 100 may from time to time make "intraday margin" requirements, typically at noon, to account for sudden market volatility and to collect and pay margin to effectively mark counterparty's positions to market intraday rather than wait for that night (often referred to as a "margin call" to pay and receive margin to and from counterparties during a trading day that has shown significant market movement). "Margin calls" may be effected by network messages sent from transaction system 100 to parties' trading computers 120, 122. Transaction system 100 may put futures positions 110, 112 to sleep intraday, rolling them to bond positions 140, 142 stored in the memory of Clearinghouse computer 102 to allow the operator of transaction system 100 to transfer counterparty default risk to Clearinghouse 102 and to pay and receive mark-to-market monies between the counterparties (equivalent to an intraday "margin call"). The trade may require a cash settlement amount (either positive or negative) in an amount that mirrors the amount of a traditional intraday margin call. In some cases the trade may even be immediately reversed to effect just that transfer of margin call monies, but via trades 130, 132, 150, 152 entered into the bond Clearinghouse.

### II.C. Parties and Entities

[0040] Network messages 130, 132, 150, 152 sent to effect the "sleep" and "wakeup" trades may be registered with Clearinghouse computer 102 may designate market operator 100 as a principal to the trades, or may designate market operator 100 as agent for the trade counterparties 120, 122, to register trades with Clearinghouse computer 102 on behalf of the counterparties.

[0041] In some cases, the bookkeeping, and particularly the obligation to enter the "wakeup" trades, may be lodged in a bankruptcy-remote special purpose entity that receives fees for performing this task. Because this entity is bankruptcy-remote from other entities, the wakeup trades will be entered even if other entities, for example market operator 100, goes bankrupt or otherwise defaults. In other cases, in the event of a default of market operator 100, the counterparties would wake up with the equivalent bond position previously novated to Clearinghouse computer 102 instead of the futures position from the close of the previous day. In some cases, a master contract between the

counterparties may survive dissolution of market operator 100, so that the obligations to perform the "wakeup" trades survives.

### II.D. Bonds for the Transaction

[0042] In some cases, the bonds identified by the parties for use in the "sleep" and "wakeup" transactions 130, 132, 150, 152 are bonds that have a duration or DV01 (Dollar Value in price of a basis point change in yield of a bond) corresponding to the effective duration or DV01 of the futures contract, or corresponding to the duration or DV01 of bonds that fall within the basket of bond issues that are acceptable for final delivery into the futures contract at contract expiry, within the specification of the bond contract. An example of such a futures contract would be bond futures contracts as traded on the Chicago Board of Trade (CBOT) that define a basket of substitutable bonds that may be delivered into the futures contract at expiry, with price adjustments for delivery of various different bonds in the basket. As used herein, the "duration" of a bond is the weighted average maturity of a bond's cash flows, DV01 is a property of a bond that expresses the price fluctuation of a bond relative to a change in underlying interest rate (DV01 tends to be higher for longer term and higher coupon fixed income bonds.) The identified bonds may be the most liquid in the futures contract's delivery basket, or bonds that well approximate the bond that is viewed by market counterparties as the cheapest-to-deliver of the basket at futures contract expiry. Multiple Bond issues may also be combined so that the average duration is at or near the desired duration. The bonds may be "on the run" (recently issued benchmark bonds) or "off the run" (older less liquid issues) or "general collateral" (securities that are not highly sought after in the market by borrowers; demand for general collateral is not issue specific).

[0043] In some cases, a customer 120, 122 may designate the precise bond to be bought or sold into the sleep and wakeup transactions. In a typical exercise of this option, customer 120, 122 may designate to sell overnight a bond he/she already holds long in his/her account at Clearinghouse computer 102, or buy overnight a bond in which he/she holds a short position at Clearinghouse computer 102. This permits the two positions to be netted off against each other for purposes of computing margin required by Clearinghouse 102 while sleep trades 140, 142 are open.

[0044] In most cases, the bonds that are identified in "wakeup" transaction 150, 152 for each counterparty will be exactly the same bonds as the bonds that are identified in "sleep" transaction 130, 132, so that the two trades exactly offset each other and neither requires delivery. In some cases, "sleep" trade 130, 132 and "wakeup" trade 150, 152 may be for different bonds, in the event that the holder of the futures contract wishes to adjust shift his inventory from one bond to another and a subsequent amendment is agreed for the wakeup trade. This amendment may take the form of a swap trade of one bond for another.

### II.E. Prices for the Trades and Variation Margin

[0045] Transaction system 100 may be structured so that daily "mark to market" price movement Profits and Losses (P&L) or variation margin are recognized by means of transaction pricing, differences between the buy and sell prices of trades 130, 132, 134, 136, 150, 152, 154, 156.

[0046] In some cases, the price for "sleep" T+2 bond trade 130, 132 will be at the prevailing market closing price for the bond, with an adjustment (positive or negative) to cause recognition of P&L for futures price movements since the last sleep or wakeup trade that caused a P&L recognition.

[0047] In some cases, the price for wakeup trade 150, 152 of the bond may be based on the opening price of the futures contract, rather than the opening price of the bond itself. This wakeup price may be set to reflect the overnight price movement of the futures contract – which will, in most cases, be very close to the price movement of the bonds themselves:

wakeup bond price = sleep bond price +

(futures market open price – last night's futures market close price)

[0048] In some cases, the price for the "wakeup" trade may be at a the current market price or at a price calculated from the futures market opening price to cause recognition of P&L for overnight futures contract price movement. For example, if a futures closing price is 108% for 100 lots of $100,000 contract size and the sleep bond equivalent trade is priced at 109.5% for a bond size of $9,500,000 nominal value; the wakeup price of the bond trade needed to equate P&L incurred from a futures opening price the next day of 108.5% [futures contract P&L = (108.5 -108)% x 100 x $100,000 =

$50,000] would be 109.5% + $50,000/$9,500,000 = 110.002631%. The wakeup futures price may then be the opening price of 108.50% as the P&L has been paid/received between the long and short counterparties from the bond sleep and wakeup trades. The wakeup bond trade price may thus be adjusted, or intra-day put-through trades (same day buy and sellback trades) may be entered, to recognize P&L of day's futures price movements via the bond Clearinghouse, and/or to effectuate intra-day margin calls. In some cases, where the futures positions are closed 134, 136, and reopened 154, 156, daily P&L may be collected by setting the price of trades in futures positions 134, 136. The price of "sleep" futures trades 134, 136 may be set at the daily settlement price for the futures contracts, adjusted for any P&L of the day's price fluctuation. In some cases, the bonds transacted may have a duration near the futures contract expiry date, and in other cases, futures contracts with different expiry dates may be rolled into the same bond. Increased calendar spread to cross margin may be effected via small DV01 difference in overnight trades for each contract month.

[0049] The amount of bonds bought and sold 130, 132 may be the notional amount of the contract, or an amount of bonds calculated with a DV01-weighting, for example by this formula:

$$\frac{\text{amount of futures transacted}}{\text{DV01 for futures}} = \frac{\text{amount of bonds transacted}}{\text{DV01 for bonds}}$$

so that the price fluctuation for an interest rate movement in the bonds will equal the price fluctuation for the same interest rate movement for the futures. The next morning, trading system 100 may send messages and store data in its memory to reinstate futures positions 110, 112, by buying 154 a future for the long party, selling 156 a future for the short party. Messages to effect "wakeup" bond trades 150, 152 may be sent, to transact bonds at a price adjusted to realize the P&L on overnight price fluctuations on the futures position. Messages 130, 132, 150, 152 sent by transaction system 100 to transact bonds may designate parties other than the operator of transaction system 100 as principal, to reduce transaction fees.

### II.F. Final Settlement at Contract Expiry

[0050] In some cases, a futures contract traded on transaction system 100 may be defined to require delivery of a particular bond or a choice from a basket of bonds at

contract expiry, analogous to a Chicago Mercantile Exchange (CME) futures contract for treasury bonds. In other cases, the contracts traded on transaction system 100 may specify cash settlement, in which counterparties pay and receive monies directly according to an expiry value of the futures contract usually ascertained in reference to, but without any actual delivery of, referenced underlying financial instruments or bonds. In still other cases, on expiry, the short futures counterparty may be required to deliver a specified bond to the long futures counterparty. In such cases, transaction system 100 may allow for the substitution of a bond sleep trade into this final settlement process.

### II.G. Margin

[0051] In some of the embodiments above, where a futures contract position is slept as a bond position at the bond Clearinghouse for a counterparty, the required margin at Clearinghouse 102 (from the counterparty) may be affected by the introduction of the new bond position. For example, modern bond Clearinghouses charge initial margin to cover risk on new positions but their systems mostly calculate overall margin requirements on a net Value-at-Risk (VAR) calculation applied to the counterparty's aggregate bond "book" of all individual bought (long) and sold (short) bond issue positions. Additional bond positions introduced into counterparty's aggregate bond book, as a result of a futures position sleeping as a bond position, may thus increase, decrease or leave unchanged that counterparty's required margin from the calculated net VAR For example, if a counterparty has a net long bond position at Clearinghouse computer 102, the introduction of an additional long bond position would be expected to increase the margin calculated from the net VAR on the counterparty's aggregate bond book. If a short position were introduced from a short futures position sleeping as a short bond position then the required margin from the calculated net VAR on the counterparty's (net long) bond book would be expected to decrease. If that additional short position was opposite to an existing long position in an exact bond issue in the counterparty's aggregate net long position, then the net VAR reduction would be expected to be particularly effective.

### II.H. Exploiting Existing Bilateral Collateral Agreements, Anonymous vs. Name Give-Up Trades

[0052] A sizeable fraction of futures trades occur between counterparties that have existing bilateral collateral agreements as a result of other business traded bilaterally between them. This is where a counterparty posts cash or financial instruments with another counterparty as collateral to secure future payments due. Transaction system 100 may exploit the existence between counterparties (*e.g.*, banks and securities firms) of an extensive web of these agreements, for example, by allowing futures positions to be slept as trades in other instruments (*e.g.*, derivatives, securities or other financial instruments) bilaterally between the long and the short counterparties in order to avoid transaction fees involved in novation with a Clearinghouse. In this embodiment transaction system 100 may effect the sleep trades as "Name-give-up" whereby the opposing futures long and short counterparties are given up to each other for the purpose of the sleep trade, so that the appropriate collateral agreement can be invoked. By avoiding Clearinghouse computer 102, transaction fees for such trades may be reduced. Counterparties may also bilaterally elect to hold the positions in "sleep" condition rather than reversing them into "awake" condition to further reduce transaction fees as the daily mark-to-market bilateral risk between the counterparties may be covered by the collateral agreements already in place and the risk may be regularly adjusted as a result of other business between the counterparties

[0053] In some cases, for example, where the trading parties are relying on bilateral agreements, the sleep trades and/or the original trades done on transaction system 100 may be on a name-give-up basis. In other cases, trading may occur on an anonymous basis, especially prevalent when a Clearinghouse is used for the sleep trades.

[0054] In some cases, the operator of transaction system 100, the trading parties, and/or the special-purpose entity discussed in § II.C, may own and operate a computer system that is a trusted repository of credit and inter-counterparty collateral agreement information. This computer system may hold credit information in a database in a way does not permit anyone other than the owner of each particular datum to review it or change it, but does permit those limited queries that are necessary to identify counterparties to each other that may prefer to use bilateral collateral agreements to secure name-give-up sleep trades rather than novating to a clearinghouse. The computer

system's server may permit a "yes/no" query by the party seeking a trade, to confirm the eligibility of the counterparty to do the trade against the querying party's credit and other qualification information. A sequence number on each order may be used by this trusted computer to identify the owner of the order to permit credit qualification by the server.

[0055] In some cases, each order in transaction system 100 may have a tag identifying the party who entered the order, and the tag may be generated individually for each order, or otherwise be made to be anonymous, so that the tag does not reveal the identity of the owner of the order, but does identify the order sufficiently to permit the server to suggest collateral agreements may be used for positions between counterparties for sleep trades either in alternative instruments (for example short term interest rate swaps) or in the original security or futures contract traded, secured by those collateral agreements in place.

### II.I. Positions Held for Portfolio

[0056] In some cases, especially when the customer indicates that he may hold the futures position for some time (as opposed to traders who may hold the position for seconds or up to a day), the futures position may be agreed between counterparties to be put to sleep as a fairly long "forward" trade (a forward trade is one whereby settlement is agreed to be a non-standard date later than the agreed market standard for usual conventional trades in an instrument) , for example, up to T+22 (Trade date plus twenty two business days), to "wake up" up to a month hence (there are often typically 22 trading days in a calendar month) , or earlier if the futures position is closed. For example a position may be put to sleep as a T+22 bond trade and stay as a bond trade every day (not wake up as a futures position again) unless the futures position is closed by the counterparty, precipitating a wakeup reversal trade upon closure. If the futures position is closed before the expiration of the 22 trading days, an offsetting wakeup reversal trade may be entered at Clearinghouse computer 102, for delivery on the same day as whatever remains of the original "long sleep" trade. Any day that the counterparty has not closed his futures position in the market that day the next morning it stays asleep as a bond trade until 21 business days later when it must necessarily wakeup as a T+1 trade for the last trading day of the cycle, and then be put back to sleep with a new T+22 trade to start the cycle again. This may provide certain advantages for transaction system

100 to permit improved matching of sleep trades between counterparties, to further reduce transaction costs.

### II.J. Accounting and Reporting

[0057] In some cases, transaction system 100 may be arranged using a financial instrument such that the "sleeping" position is reportable for financial accounting, tax accounting, debt or asset ratio covenants, Securities and Exchange Commission regulations, Commodities Futures Trading Commission regulations, and other reporting and accounting purposes as an off-balance-sheet asset, booked in a manner analogous to other off-balance-sheet futures contracts. In other cases transaction system 100 may be arranged in a financial instrument so that the "sleeping" position is reportable as an on-balance-sheet item to advantageously manage counterparty risk.

[0058] In some cases, some of the counterparties may be FCM's (Futures Commission Merchants, those merchants involved in the solicitation or acceptance of futures contract orders, and having the ability to extend credit to those who place such orders and facilitate clearing of their obligations) regulated by the Commodities Futures Trading Commission (CFTC). In some cases, FCM's may sleep futures trades as a series of bonds designated by operator of transaction system 100 on behalf of their customers. In other cases the FCMs may elect to sleep futures trades as different instruments on behalf of their customers than when trading on behalf of their own accounts. In some cases, the FCM may obtain a limited power of attorney or similar consent to enter the sleep/wakeup trades on the customers' behalf. In other cases the FCMs may enter the sleep/wakeup trades only on the FCM's overall net futures contract positions resulting from when their individual customer's positions are netted against each other.

[0059] The trades may be entered using any protocol appropriate to the transaction. Trades may be entered as "name-give-up" whereby the buyer and seller to the sleep trade are introduced to each other and send their trades to Clearinghouse computer 102 directly. Transaction system 100 may also become initial counterparty to the buy and sell trades acting as principal. Alternatively the operator of transaction system 100 may enter the trades into Clearinghouse computer 102 via an "introducing broker mechanism" whereby the trades are entered to Clearinghouse computer 102 without the operator becoming counterparty to either trade.

### II.K. Margin and facilities for reducing margin requirements

[0060] Various clearers and trading parties have arrangements for "cross margining" of offsetting positions held in different accounts. For example, if a party holds bonds long at FICC (Fixed Income Clearing Corporation, the clearer for bonds) and short futures for similar bonds at CME Clearing (Chicago Mercantile Exchange, the clearer for bond futures), the two may have an agreement that permits the two positions to be offset against each other so that the total margin required may be reduced by an amount that may be up to 75% of the value of the offsetting positions (or whatever percentage is agreed among the parties). Transaction system 100 may enter cross-margining agreements with other clearers for traditional cross margining relief between futures and bonds, and/or futures to futures. Alternatively, or additionally, transaction system 100 may use a sleep as cash procedure for futures trades such that the cross margining of the bond Clearinghouse is effectively leveraged automatically. Transaction system 100 may provide a facility as shown in figure 6, available throughout the trading day, to allow dealers to put their futures positions to sleep through an EFP (exchange for physical) for physical (cash) bonds of their choice on a T+2 basis, with an agreed T+1 reversal the next morning as described herein. Use of this facility may permit dealers to improve use of margin already held by FICC against bond positions for cross margining against futures positions held at CME Clearing, or to reduce margin needed at FICC for opposing physical or futures positions. This "sleeps-as-cash" facility (bonds are sometimes referred to as "cash bonds," sometimes shortened to just "cash"), to effectively transfer positions into FICC bond positions overnight, may be provided for dealers to buy or sell specific bonds against selling or buying futures contracts, at current market levels.

[0061] Referring to FIG. 5, transaction system 100, or an associated bond trading system, may list a series of bond/futures pairs so dealers looking for futures positions to be "slept as cash" in certain bonds may bid/offer for the pairings at current market spreads as indicated on the system. A reserve size functionality may be useful in arranging such trades at a favorable price without showing to the marketplace the full size of the desired trades (a reserve size functionality may preferably add size to a trade once that trade has been agreed to facilitate a larger trade without initially disclosing the full nature of the counterparty's intent). The current market price spread may be expressed as a traditional "basis" price using previously published conversion factors to convert a

futures price into an equivalent bond price, and the number of futures contracts exchanged per million of each bond in the Exchange for Physical trade ("EFP" trade; market parlance for trades where futures are exchanged for bonds, often termed as "physical" bonds) may be controlled by a published hedge ratio that is equivalent to the DV01 of the bond divided by the DV01 of the futures to give a fair risk equivalent amount of bond and futures on the trade. Herein the DV01 of the futures may be calculated as the DV01 of the most likely bond to be delivered at futures contract expiry (the "cheapest to deliver" bond) on its most likely delivery date, then divided by its conversion factor. The published conversion factor for a specific bond is mostly calculated as the price of the bond at a yield of a particular value (often 6%), calculated for the futures delivery day, as defined by a futures contract specification.

[0062] Counterparties can thus transfer exposure out of transaction system 100 to bond positions held at a Clearinghouse to:

- Net down specific bond positions at Clearinghouse computer 102 to remove a particular position from Clearinghouse 102's Value-at-Risk margin calculations.
- Trade a selection of bonds to minimize Clearinghouse 102 margin requirement by using the new bond position to offset against aggregate net long or net short Clearinghouse bond positions.
- Effectively transfer margin obligations from transaction system 100 into the counterparty's requisite Clearinghouse margin, using that increased Clearinghouse margin as then eligible for cross margining against other aggregate futures clearing positions at another futures exchange Clearinghouse.

[0063] Thus the facility provides a secure and cost effective way for participants to manage aggregated net positions to minimize margin requirements on transaction system 100 where their balance sheet considerations are not limiting.

[0064] There may be a minimum trade size at the facility, for example, $50 million. Trading fees for the guaranteed reversal exchange-for-physical trades may be waived by the clearer, may be absorbed by transaction system 100, or may be payable by the dealer. Transaction costs, which may be about 1 cent per $100,000 contract, may be covered by a nominal brokerage charge. Initial margins charged by the transaction system 100 may be smaller than the initial margins charged by traditional futures exchanges. For FCM's using interest bearing financial instruments lodged with the clearing house's custodial account as collateral for initial margin requirement, the cost of

financing initial margin will be close to $zero. However, for clearing users not posting collateral the CME funding could be upwards of 20 cents per night per lot.

## III. Electronic Trading and Trading Systems for Underlying Financial Instruments

[0065] The trading of the spread between two instruments is called "basis trading." A party that believes that one instrument will outperform another may enter opposing long and short positions of the two instruments, in order to attempt to profit on their price convergence or divergence characteristics. In some cases, basis instruments become listed contracts, often with cash settlement. Two parties who differ in their expectations of which of two instruments will outperform the other contract for a predicted price spread between the two instruments on a set future date. On that future date, the difference between the actual spread in market prices of the two instruments and the contracted-for spread determines an outcome, and one party pays the other the difference between the actual spread and the contracted-for spread.

[0066] Referring to FIG. 2, there may be synergies if transaction system 100 is hosted with, or has ready ability to cooperate with, a transaction system for the underlying or "sleep" security. The relationship between two instruments that determines the market prices at which one trading position may be "slept as another" trade position in an alternative Clearinghouse venue may itself be traded between the two marketplaces. The trading of the spread between a futures contract and a bond is called "basis trading" whereby opposing long and short positions of each instrument may be entered into, in order to attempt to profit on their price convergence or divergence characteristics over time. Two financial instruments may be traded on the same exchange as a basis trade whereby the exchange facilitates the simultaneous trade in both instruments between contra-counterparties (e.g. of a bond or other instrument against a futures instrument), in which the parties trade each instrument at a relative price difference of the two instruments in the expectation that at some future date the difference between the relative market prices of the two instruments (the "basis") on that date will change – one party benefits if the first instrument does better than the second relative to the initially traded price, and the other party benefits if the second instrument does better than the first. If the exchange facilitates basis trading and/or has access to be able to electronically trade each

component instrument to effect such basis trades on individual markets then the exchange may use market data (e.g. the end of day settlement price of the futures contract as published by the futures exchange and an equivalent end of day price for the bond) from such trading to accurately price sleeps-as-cash trades at then current market price levels to more effectively equate futures risk with the sleep bond trade risk. .

[0067] Counterparties may be permitted to bid and offer basis trades that set off trades in instruments from the two types against each other, for example, the derivatives against the underlying instrument, or U.S. Treasury bonds against U.S. Treasury futures. These basis trades may be bid or offered as a composite "instrument" tradable on transaction system 100 (whereby trades on that instrument would precipitate two or more trades in each of the underlying instruments), to attract contra markets. Counterparties may also permit a system to attempt to execute a basis trade between the component bond and futures components individually but substantially simultaneously. In other cases, various basis trades may only be exposed privately, to only be executed simultaneously by underlying automated processes of the transaction system 100 as separate trades in each market, which may reduce the need for exchange overquoting restrictions (restrictions placed on electronic users of trading systems to stop too many price quotes being entered into those systems).

[0068] Transaction system 100 may also list composite basis instruments of bonds against longer or shorter duration futures which may use a conversion factor that has been weighted according to the differences in DV01 of the component instruments to give a "basis" price reflecting the bond-to-futures difference that is less influenced by outright up or down market movements..

**III.A. Clip Size Trades**

[0069] Where an exchange facilitates basis trading between counterparties, and where the exchange supports trading a basis trade in the component bond and futures markets for substantially simultaneous execution, transaction system 100 may support "clip trades" or clip size orders. "Clip orders" are designed to increase functionality for simultaneously executing trades between two markets. "Clips" are a series of quantity levels that allow the counterparty or transaction system 100 to define specific amounts, or "clips", of an overall order to be traded. The counterparty or transaction system 100

specifies a clip order ratio, and the ratio defines the clip sizes that order may be traded in. For example, if a minimum tradable size of one million face amount of the bond component of a basis trade equates to an equivalent of 9.7 futures contracts, and if an order is to sell 97 futures contracts in clips of 9.7 contracts is worked in a futures trading system against simultaneously selling 10,000,000 nominal of the bond in the bond trading system (to give a properly weighted basis trade such that the DVO1 of the component futures contract trade is equivalent to the DV01 of the bond trade); that futures order is subsequently tradable by the system in amounts (clips) of only 10, 20, 29, 39, 49, 58, 68, 78, 87 and 97 contracts. The result is that any futures trade will then be in a size that equates to $1million, $2million, $3million nominal etc of the bond that is only tradable in round amounts of $1m nominal, thus allowing for an optimal weighting of such basis trades when individually traded in both markets substantially simultaneously.

[0070] In some cases, a clip size order may be placed by transaction system 100 as resting futures orders on a futures exchange (that is, limit bids that are at a price at or below the prevailing market price, or limit offers at a price at or above the market, which therefore do not trade immediately but rest on the market's book waiting for a price movement in their direction) which may be left "leaning" against a linked bond order on a bond exchange or marketplace, to trade both simultaneously. When the futures order is completely traded or partially traded according to its prescribed clip size the corresponding bond order is also traded substantially simultaneously in an equivalent amount. When a clip sized order exists at the best price and is partially traded, transaction system 100 may in some cases cancel the remaining clip sized order if a contra order could then trade at that price level but not in the full clip size needed. For example, if a resting clip sized bid order is alone at a bid price of 101.00 for 97 contracts in clip sizes of 9.7 contracts, and a contra 101.00 sell order in any size of less than 97 lots except 10, 20, 29, 39, 49, 58, 68, 78 is entered, the clip sizes can trade but remainder cannot. Transaction system 100 may then preferably remove the remaining clip size order.

### III.B. Curve and Spread Trades

[0071] In some cases, a further composite derivative instrument may be defined and traded, as an instrument that denotes the spread between the contract traded on transaction system 100 and another economically-similar instrument, for example, the

spread between a five year equivalent bond futures contract and a ten year equivalent bond futures contract, traded on transaction system 100. Such a derivative instrument may be referred to as a "spread" instrument. The round amount tradable for this spread instrument may be set to be correspond to the minimum amount of one of the contracts (the Five year bond futures contract lot size for example) that equates to a corresponding amount of the other futures contract. For example, in order to be correctly weighted according to their individual DV01 numbers, 5 contracts of the five year bond futures contract would be traded with 3 contracts of the ten year bond futures contract; thus this spread contract would be tradable in round amounts of 5 contracts of the five year bond futures contract versus 3 lots of the ten year bond futures contract. Where transaction system 100 attempts to execute orders in such spread instruments by simultaneously executing trades in both component contracts, clip sized orders would be particularly helpful.

[0072] Referring to FIG. 3, automated trading system technology may be used to offer a market and to trade in both futures contracts described above with paired order execution used to create linked orders. For example, a trading system's linking feature may be used to link a five year bond futures contract order and a ten year bond futures contra order into a single transaction for substantially simultaneous execution. Popular or highly-liquid pairs of futures may be featured as listed spreads, for another example a 2-year/30-year futures spread in an 8 contract to 1 contract ratio. Where automated trading system technology attempts to execute spread orders of this nature it is preferable to utilize clip sized orders to adhere to the prescribed 8:1 ratio.

[0073] Where a counterparty has positions resulting in a futures calendar spread (a futures calendar spread is where a counterparty has opposing long and short positions in two futures contracts that have different maturities but identical futures contract specifications, or where a composite instrument to trade such positions is listed on a futures exchange or financial instrument transaction system, traditionally, margin relief may be given by a futures exchange whereby lower margin is required due to the almost equally offsetting nature of each position. In some cases this long one contract versus short another contract "spread" position may be slept-as-cash on some proportion of the net exposure of the spread trade. In other cases the spread position's individual

component long and short positions may be each slept as cash individually and either the net of both sleep trades entered into Clearinghouse computer 102 or both trades entered so Clearinghouse computer 102 can accommodate with their preferred net margining procedure.

[0074] Referring again to FIG. 3 and to FIG. 4, traders may be given facilities to used a linked trade feature to synthesize their own spreads. Linked trades may provide some level of guarantee that the underlying legs of listed spreads are guaranteed to be executed simultaneously, reducing overquoting or legging risk. In some cases, customers may use spreader tools to create spread trades, with some risk that the two legs of the spread may be executed non-simultaneously, with some risk of underlying price movement that may disrupt the hoped-for trading gain.

[0075] In some cases, the linked orders may be for two different financial instruments, for example, futures contracts and bonds in offsetting amounts. The two linked orders may be exact mirror images, or may be at different prices, different settlement dates, or different bond durations, to permit investors to hedge certain risks or to make money on certain predicted market movements.

### III.C. Order routing, exchangeability and substitutability

[0076] Although transaction system 100 creates considerable advantages in margin reduction across similar asset classes, price convergence and economic equivalence between contracts traded on an exchange using the above-described mechanisms and other competing exchanges (offering economically similar but non-fungible contracts) may be further improved by smart order routing. In some cases, a customer may require that a futures order be traded on a specific exchange, or may specify that the order be preferentially routed to whichever venue has the better price, shorter routing time, or other considerations. Preference factors for smart order routing may include the following:

- Preferred first exchange
- Routing Price Delta (a counterparty's perceived price offset between one exchange instrument of contract versus another exchange's instrument or contract)
- Routing Trigger (a number that defines the number of increments a resting order must be within the best bid price or best offer price on the first exchange before any part of it is routed to the second exchange).

- Routing Percentage (% of an order untraded on the first exchange when subjected to the routing trigger that the counterparty would then prefer to see routed to the second exchange)
- Routing Delay (once triggered the time delay down to milliseconds that any part of the unexecuted order should exist on the first exchange before going to second exchange)

## IV. Additional Alternatives

[0077] In some cases for a sleeps-as-cash trade, bonds may be borrowed from counterparties outside transaction system 100 overnight to facilitate a regular T+1 sleep trade and a T+0 (same day delivery) or T+1 reversal trade that would be effected via the counterparty's clearing agent (e.g. JPMorgan Chase or Bank of New York). This permits the initiating sleep trades to be entered with the clearer as T+1 settlement, but requires financing costs to be paid among the parties and to the lender who lends bonds into transaction system 100.

## V. Conclusion

[0078] For the convenience of the reader, the above description has focused on a representative sample of all possible embodiments, a sample that teaches the principles of the invention and conveys the best mode contemplated for carrying it out. Throughout this application and its associated file history, when the term "invention" is used, it refers to the entire collection of ideas and principles described; in contrast, the formal definition of the exclusive protected property right is set forth in the claims, which exclusively control. The description has not attempted to exhaustively enumerate all possible variations. Other undescribed variations or modifications may be possible. Where multiple alternative embodiments are described, in many cases it will be possible to combine elements of different embodiments, or to combine elements of the embodiments described here with other modifications or variations that are not expressly described. In many cases, one feature or group of features may be used separately from the entire apparatus or methods described. Many of those undescribed variations, modifications and variations are within the literal scope of the following claims, and others are equivalent.

## CLAIMS

1. A method, comprising the steps of:

on an electronic trading system for trading assets of an asset type, executing trades among traders of assets of the traded asset type, the traded asset type being a derivative of an underlying asset type;

from time to time and as a component of the contractual relationship among the traders of the trading system and the trading system, transferring traders' positions in the traded asset type into positions in the underlying asset type for a period of time, and later transferring the positions in the underlying asset claims back into positions in the traded asset type.

2. The method of claim 1, wherein the asset type is bond futures contracts, and the underlying asset type is bonds.

3. The method of claim 2, wherein prices for purchase or sale of the bonds are set to recognize profit and loss in the bond futures contracts.

4. The method of claim 2, wherein a quantity of bonds transferred pursuant to the contractual relationship is computed relative to a quantity of futures positions approximately in the ratio of the DV01 of the bonds (DV01 of an instrument being the change in value of the instrument per change in interest rates) to the DV01 of the futures positions.

5. The method of claim 2, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a duration approximately equal to the duration of the bond futures.

6. The method of claim 2, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a DV01 (DV01 of an instrument being the change in value of the instrument per change in interest rates) approximately equal to the DV01 of the bond futures.

7. The method of claim 2, wherein the bonds transferred pursuant to the contractual relationship are selected by a party to the bond futures contract.

8. The method of claim 1 wherein time to time is a regularly scheduled time of day.

9. The method of claim 1, wherein the purchasing or selling is performed about at the close of each trading day, and the reselling or repurchasing is performed about at the opening of each trading day.

10. The method of claim 1 wherein time to time is determined to manage risk held by an operator of the trading system.

11. The computer network of claim 1, wherein the underlying assets are traded for T+*n* delivery (delivery *n* days after the trade date), then *m* days later for T+*n*-*m* delivery.

12. The method of claim 2, wherein the step of executing trades comprises communicating orders to trade the bond futures contracts among bond futures traders, and receiving acceptances of orders from the traders to result in executed bond futures trades and resultant bond futures positions; and wherein the step of transferring traders' positions comprises from time to time on a plurality of occasions and under management of the trading system pursuant to the contractual relationship among the traders and the operator of the trading system, by computer purchasing or selling bond positions economically equivalent to a traders' positions in bond futures and relieving the traders of delivery obligations under the bond futures contracts, and later reselling or repurchasing bonds and reestablishing the delivery obligations under the bond futures contracts.

13. The method of claim 12, in which the occasions from time to time include occasions at a regularly scheduled time of day.

14. The method of claim 13, in which the purchasing or selling is performed about at the close of each trading day, and the reselling or repurchasing is performed about at the opening of each trading day.

15. The method of claim 12, in which the bonds determined to be economically equivalent to the bonds futures contract are determined by steps including:

for each of the positions in bond futures contracts, determining a DV01 of at least one bond (DV01 of an instrument being the change in value of the instrument per change in interest rates) that is acceptable for final delivery into the respective bond futures contract; and

for each of the positions in bond futures contracts, determining the corresponding bond by selecting a bond having a DV01 approximately equal to the determined DV01.

16. The method of claim 12, in which time to time is determined to manage risk held by an operator of the trading system.

17. The method of claim 12, in which prices for purchase or sale of the bonds are set to recognize profit and loss in the bond futures contracts.

18. The method of claim 12, wherein the bonds purchased or sold pursuant to the contractual relationship are selected by a party to the bond futures contract.

19. The method of claim 12, in which a quantity of bonds purchased or sold pursuant to the contractual relationship is related to a quantity of futures positions approximately in the ratio of the DV01 of the bonds (DV01 of an instrument being the change in value of the instrument per change in interest rates) to the DV01 of the futures positions.

20. The method of claim 12, in which entering, with a clearinghouse for the purchasing or selling transactions, a buy trade and a sell trade for the bonds comprises:

entering, with the clearinghouse, a buy trade for T+2 settlement (trade date plus two days) and a sell trade for T+2 settlement for the bonds.

21. The method of claim 12, in which entering, with a clearinghouse for the purchasing or selling transactions, the second sell trade and the second buy trade for the bonds at the second price comprises:

entering, with the clearinghouse, a sell trade for T+1 settlement (trade date plus one day) and a buy trade for T+1 settlement for the bonds.

22. The method of claim 12, wherein the bonds purchased or sold pursuant to the contractual relationship are chosen to have a duration approximately equal to the duration of the bond futures.

23. The method of claim 12, wherein the bonds purchased or sold pursuant to the contractual relationship are chosen to have a DV01 (DV01 of an instrument being the change in value of the instrument per change in interest rates) approximately equal to the DV01 of the bond futures.

24. The method of claim 12, in which calculating the second price comprises:

calculating the second price based on a then-current price of a bond futures contract.

25. The method of claim 12, in which the contractual relationship specifies that the bond positions are positions in bonds drawn from baskets of bond issues specified within the terms of the respective bond future contracts.

26. The method of claim 12, wherein the second instruments are traded for T+*n* delivery (delivery *n* days after the trade date), then *m* days later for T+*n*-*m* delivery.

27. A non-transitory computer memory, having stored therein program instructions to cause an electronic trading system to:

execute trades among traders of assets of the traded asset type, the traded asset type being a derivative of an underlying asset type;

from time to time and as a component of the contractual relationship among the traders of the trading system and the trading system, transfer traders' positions in the traded asset type into positions in the underlying asset type for a period of time, and later transfer the positions in the underlying asset claims back into positions in the traded asset type.

28. The non-transitory computer memory of claim 27, wherein the asset type is bond futures contracts, and the underlying asset type is bonds.

29. The non-transitory computer memory of claim 28, wherein prices for purchase or sale of the bonds are set to recognize profit and loss in the bond futures contracts.

30. The non-transitory computer memory of claim 28, wherein a quantity of bonds transferred pursuant to the contractual relationship is computed relative to a quantity of futures positions approximately in the ratio of the DV01 of the bonds (DV01 of an instrument being the change in value of the instrument per change in interest rates) to the DV01 of the futures positions.

31. The non-transitory computer memory of claim 28, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a duration approximately equal to the duration of the bond futures.

32. The non-transitory computer memory of claim 28, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a DV01 (DV01 of an instrument being the change in value of the instrument per change in interest rates) approximately equal to the DV01 of the bond futures.

33. The non-transitory computer memory of claim 28, wherein the bonds transferred pursuant to the contractual relationship are selected by a party to the bond futures contract.

34. The non-transitory computer memory of claim 27 wherein time to time is a regularly scheduled time of day.

35. The non-transitory computer memory of claim 27, wherein the purchasing or selling is performed about at the close of each trading day, and the reselling or repurchasing is performed about at the opening of each trading day.

36. The non-transitory computer memory of claim 27 wherein time to time is determined to manage risk held by an operator of the trading system.

37. The computer network of claim 27, wherein the underlying assets are traded for T+*n* delivery (delivery *n* days after the trade date), then *m* days later for T+*n*-*m* delivery.

38. The non-transitory computer memory of claim 28, wherein when executing trades, the electronic trading system communicates orders to trade bond futures contracts among bond futures traders, and receives acceptances of orders from the traders to result in executed bond futures trades and resultant bond futures positions; and wherein when transferring traders' positions, the electronic trading system from time to time on a plurality of occasions and as a component of a contractual relationship among the traders of the trading system and the operators of the trading system, purchases or sells bonds economically equivalent to a trader's position in bond futures and relieves the trader of delivery obligations under the bond futures contract, and later resells or repurchases the bonds and reestablishes the delivery obligations.

39. The non-transitory computer memory of claim 38 wherein time to time is a regularly scheduled time of day.

40. The non-transitory computer memory of claim 39, wherein the purchasing or selling is performed about at the close of each trading day, and the reselling or repurchasing is performed about at the opening of each trading day.

41. The non-transitory computer memory of claim 38 wherein time to time is determined to manage risk held by an operator of the trading system.

42. The non-transitory computer memory of claim 38, wherein prices for purchase or sale of the bonds are set to recognize profit and loss in the bond futures contracts.

43. The non-transitory computer memory of claim 38, wherein a quantity of bonds transferred pursuant to the contractual relationship is computed relative to a quantity of futures positions approximately in the ratio of the DV01 of the bonds (DV01 of an instrument being the change in value of the instrument per change in interest rates) to the DV01 of the futures positions.

44. The non-transitory computer memory of claim 38, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a duration approximately equal to the duration of the bond futures.

45. The non-transitory computer memory of claim 38, wherein the bonds transferred pursuant to the contractual relationship are chosen to have a DV01 (DV01 of an instrument being the change in value of the instrument per change in interest rates) approximately equal to the DV01 of the bond futures.

46. The non-transitory computer memory of claim 38, wherein the bonds transferred pursuant to the contractual relationship are selected by a party to the bond futures contract.

47. The non-transitory computer memory 38, wherein the second instruments are traded for T+$n$ delivery (delivery $n$ days after the trade date), then $m$ days later for T+$n$-$m$ delivery.