

METHOD AND SYSTEM OF TRADING A SECURITY IN A FOREIGN CURRENCY**FIELD OF INVENTION**

5 The invention relates to a method and system of trading a security in a foreign currency.

BACKGROUND

10 An investor who wishes to trade on a security in a non-native Exchange will be required to perform a currency conversion (i.e. Foreign Exchange or FX) as all Exchanges currently offer stock quotes in local currency (LCY) only. For example, a US Dollar-based investor wanting to buy a particular company's stock on the Singapore Exchange (SGX), which is quoted only in Singapore Dollars, will have to
15 perform a US Dollar – Singapore Dollar FX. In other words, a foreign currency (FCY) based investor has limited direct access to LCY-quoted products.

 Currently, a broker can assist the investor in the purchase or sale of the security. At the same time, the broker can handle the FX conversion for the investor
20 on a post trade basis. In other words, the FX conversion takes place after the securities trade has been successfully executed. At the point of execution of the securities trade, no imputing of the level of FX rates is done. Therefore, determination of the actual profit or loss (in native currency) by the investor can only be known after the FX transaction is completed.

25 If the broker attempts to "front run", wherein a FX transaction is carried out before the purchase of a security, there is a likelihood of 'slippage'. This 'slippage' occurs because the broker is typically unable to execute a FX transaction in the exact amount due to the uncertainty in price fluctuations of the security. As a result, there is
30 either an excess or insufficient amount of foreign currency when trading the security.

 Currently, during a foreign stock investment trade, 4 main entities are involved: an Exchange, a broker, an investor and a FX Liquidity Provider (e.g. a FX bank). The Exchange distributes market data (e.g. current best Bid/Offer and Last
35 Traded Price) and the market data is received by the broker, whom in turn distributes the market data to the investor. If the investor decides to make a trade, he can place an order with the broker, and provide instructions such as the symbol of the security,

whether to buy or sell the security and the quantity to be bought or sold. The broker places the order on behalf of the investor with the Exchange and the order is queued. In addition to the information regarding the symbol of the security, whether to buy or sell the security and the quantity to be bought or sold; the time that the order is placed is noted by the Exchange. If the order is matched, the Exchange notes information such as the symbol of the security, whether the security was bought or sold, the quantity that was bought or sold, the time that the order was matched and the status of the trade. The Exchange then notifies the broker of the execution of the order, whom in turn notifies the investor. After the investor acknowledges the execution of the order, he proceeds to request for a FX price from the FX Liquidity Provider. The investor provides the FX Liquidity Provider with information such as the currency pair, whether to buy or sell, and the quantity to be bought or sold. The FX Liquidity Provider quotes a FX price to the investor, providing information such as FX Quote ID and FX price. If the investor accepts the FX price, the latter is informed and the FX Quote ID and Accept status is relayed to the FX Liquidity Provider and the FX order is executed.

Currently, as illustrated above, when an investor deals with a broker, for example, through an online system or through voice broking, the broker performs the FX conversion on a post trade basis at carted rates, typically ranging from 50-80bps, compared to Interbank FX rates that usually range from 1-3bps. In the institutional space, Fund Managers are typically able to source for FX rates ranging from 3-5bps, either through their internal FX desks or via their parent banks. Fund Managers have the fiduciary duty to secure the best FX rate for the fund that they are managing, notwithstanding that this Fund Manager may be owned by a FX Bank. Such a process requires the need to source for competitive FX quotes (usually from 3-5 banks) and maintain an audit trail of such proof of Best Execution. Again, these activities are done on a post trade basis. As such, overseas retail investors often trade with an unknown, inaccurate and/or high FX conversion cost.

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Due to the above disadvantages, interest in counters listed in non-native Exchanges are usually dampened due to the uncertainty on the FX conversion, resulting in many investors avoiding investing in securities that are denominated in a foreign currency. Overseas investors are further discouraged from trading in a security in a non-native Exchange in an environment of high FX volatility.

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Online brokers such as E*Trade and Charles Schwab provide a "one-click" post-securities-trading FX conversion system. However, this is done on a post trade basis and at a private price rather than at an Exchange price. On the other hand, FXAll, Currenex, OANDA, 360T, Hotspot and FXConnect provide investors with an open view of FX prices from different banks. However, these platforms are for currency trading. There are no links to security trades in said systems.

A need therefore exists to provide a multi-denomination automated quotation system that seeks to address at least one of the abovementioned problems.

SUMMARY

According to the first aspect of the present invention, there is provided a system for trading a security in a foreign currency comprising: an FX pricing module for maintaining FX data streamed from one or more liquidity providers; and a market manager module configured to receive original trade data associated with the security in a trading currency of the security and to generate converted trade data associated with the security in the foreign currency; wherein the market manager module generates the converted trade data based on an FX rate provided by the FX pricing module.

The system may further comprise an order manager module configured to execute a trade of the security in the trading currency.

The system may further comprise an FX execution manager for executing a foreign/trading currencies trade.

The system may further comprise an order manager module for receiving an order for trading in the security in the foreign currency.

The order may comprise a market order identifying the security, an order quantity, and an order type.

The order manager module may initiate queuing and matching of the market order in the trading currency based on a current price, and the FX execution manager may execute the foreign/trading currencies trade based on the FX rate provided by the FX pricing module.

The order may comprise a limit order identifying the security, an order quantity, an order type, and a set price in the foreign currency.

- 5 The order manager module may initiate queuing and matching of the limit order in the trading currency based on a converted price from the set price in the foreign currency using the FX rate provided by the FX pricing module.

- 10 The order manager module may be configured to adjust the converted price based on an updated FX rate from the FX pricing module, and to replace the limit order with an updated limit order for queuing and matching.

- 15 The FX execution manager may execute the foreign/trading currencies trade based on the FX rate provided by the FX pricing module upon matching of the limit order.

- 20 The system may further comprise an eBlotter module configured to aggregate and net executed foreign/trading currencies trades with respective ones of the liquidity providers.

- 25 According to a second aspect of the present invention, there is provided a method for trading a security in a foreign currency comprising: maintaining, in a FX pricing module, FX data streamed from one or more liquidity providers; and receiving, in a market manager module, original trade data associated with the security in a trading currency of the security and automatically generating, in the market manager module, converted trade data associated with the security in the foreign currency; wherein the market manager module automatically generates the converted trade data based on an FX rate provided by the FX pricing module.

- 30 The method may further comprise executing a trade of the security in the trading currency using an order manager module.

- 35 The method may further comprise executing a foreign/trading currencies trade using an FX execution manager.

The method may further comprise receiving an order at an order manager module for trading in the security in the foreign currency.

The order may comprise a market order identifying the security, an order quantity, and an order type.

5 The order manager module may initiate queuing and matching of the market order in the trading currency based on a current price, and the FX execution manager may execute the foreign/trading currencies trade based on the FX rate provided by the FX pricing module.

10 The order may comprise a limit order identifying the security, an order quantity and an order type in the foreign currency.

 The order manager module may initiate queuing and matching of the limit order in the trading currency based on a converted price from the set price in the
15 foreign currency using the FX rate provided by the FX pricing module.

 The order manager module may adjust the converted price based on an updated FX rate from the FX pricing module, and replace the limit order with an updated limit order for queuing and matching.

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 The FX execution manager may execute the foreign/trading currencies trade based on the FX rate provided by the FX pricing module upon matching of the limit order.

25 The method may further comprise aggregating and netting executed foreign/trading currencies trades with respective ones of the liquidity providers using an eBlotter module.

 According to a third aspect of the present invention, there is provided a data
30 storage medium having stored thereon computer program code means for instructing a computer system to execute a method for trading a security in a foreign currency, and as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

35 Example embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by

way of example only, and in conjunction with the drawings, in which:

Figure 1 is a flow chart illustrating the events that occur during a foreign stock investment trade in accordance with an embodiment of the invention.

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Figure 1A is a MTR stock performance chart in HK Dollars from 9 January 2009 to 6 January 2010.

Figure 1B is the corresponding MTR stock performance chart of Figure 1A
10 converted into Australian Dollars based on the respective FX conversion rates.

Figure 2 is a schematic diagram illustrating the interactions that occur between entities and application modules during a foreign stock investment trade, according to an embodiment of the present invention.

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Figure 3 is a schematic diagram illustrating the processes performed by an Order Manager during a "No Fill" condition when a Market Order is placed, according to an embodiment of the present invention.

20 Figure 4 is a schematic diagram illustrating the processes performed by an Order Manager during a "Filled" condition when a Market Order is placed, according to an embodiment of the present invention.

Figure 5 is a schematic diagram illustrating the processes performed by an FX Execution Manager, according to an embodiment of the present invention.

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Figure 6 is a flow chart illustrating the events that occur during a Limit Order foreign stock investment trade in accordance with an embodiment of the invention.

Figure 7 is a schematic diagram illustrating the processes performed by an
30 Order Manager during a "No Fill" condition when a Limit Order (i.e. "No Worse Than" (NWT) Order) is placed, according to an embodiment of the present invention.

Figure 8 is a schematic diagram illustrating the processes performed by an
Order Manager during a "Filled" condition when a Limit Order (i.e. "No Worse Than"
35 (NWT) Order) is placed, according to an embodiment of the present invention.

Figure 9 is a flow chart illustrating a method for trading a security in a foreign currency, according to an example embodiment of the present invention.

Figure 10 is a schematic of a computer system for implementing the system and method for trading a security in a foreign currency in example embodiments.

DETAILED DESCRIPTION

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Embodiments of the present invention relate to multi-denomination automated quotation system that advantageously provides a platform to price and trade any exchange-traded product in more than one currency by blending 'executable' foreign exchange (FX) rates into equities and securities products. Embodiments of the present invention provide a paradigm shift that moves from a post-trade to a pre-trade model and can integrate with the quoting/trading platform of a National Stock or Securities Exchange so as to provide real-time market data distribution to the Exchange's market data system in foreign currencies. In addition, embodiments of the present invention may allow investors to place securities orders in a quoted foreign currency of their choice, and foreign currency denominated orders are converted into local currency for the Exchange to perform order queuing and matching on their current platform. Moreover, the best bid/offer among a number of FX quotes from liquidity providers (LPs) can be determined and applied when currency conversion takes place.

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Embodiments of the present invention may further provide each LP with a tool to manage their FX trades and aggregation and may keep additional latency to the existing processes of market data distribution and order management to as minimal as possible – which is typically up to some microseconds. Embodiments of the present invention may also provide a single data field containing both Securities Trade (Parent) and FX Trades (Child) details where a One-to-Many and Many-to-One tracing can be done without the need for a data reconciliation process.

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Embodiments of the present invention may be implemented via the real time, low latency, high frequency platforms such as Linux RT kernel, Java RTS, ULink MD solution, In-memory Database etc.

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Some portions of the description which follows are explicitly or implicitly presented in terms of algorithms and functional or symbolic representations of operations on data within a computer memory. These algorithmic descriptions and functional or symbolic representations are the means used by those skilled in the data processing arts to convey most effectively the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities, such as electrical, magnetic or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated.

Unless specifically stated otherwise, and as apparent from the following, it will be appreciated that throughout the present specification, discussions utilizing terms such as "scanning", "calculating", "determining", "replacing", "generating", "initializing", "outputting", or the like, refer to the action and processes of a computer system, or similar electronic device, that manipulates and transforms data represented as physical quantities within the computer system into other data similarly represented as physical quantities within the computer system or other information storage, transmission or display devices.

The present specification also discloses apparatus for performing the operations of the methods. Such apparatus may be specially constructed for the required purposes, or may comprise a general purpose computer or other device selectively activated or reconfigured by a computer program stored in the computer. The algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various general purpose machines may be used with programs in accordance with the teachings herein. Alternatively, the construction of more specialized apparatus to perform the required method steps may be appropriate. The structure of a conventional general purpose computer will appear from the description below.

In addition, the present specification also implicitly discloses a computer program, in that it would be apparent to the person skilled in the art that the individual steps of the method described herein may be put into effect by computer code. The computer program is not intended to be limited to any particular programming language and implementation thereof. It will be appreciated that a variety of programming languages and coding thereof may be used to implement the teachings

of the disclosure contained herein. Moreover, the computer program is not intended to be limited to any particular control flow. There are many other variants of the computer program, which can use different control flows without departing from the spirit or scope of the invention.

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Furthermore, one or more of the steps of the computer program may be performed in parallel rather than sequentially. Such a computer program may be stored on any computer readable medium. The computer readable medium may include storage devices such as magnetic or optical disks, memory chips, or other
10 storage devices suitable for interfacing with a general purpose computer. The computer readable medium may also include a hard-wired medium such as exemplified in the Internet system, or wireless medium such as exemplified in the GSM mobile telephone system. The computer program when loaded and executed on such a general-purpose computer effectively results in an apparatus that
15 implements the steps of the preferred method.

The invention may also be implemented as hardware modules. More particular, in the hardware sense, a module is a functional hardware unit designed for use with other components or modules. For example, a module may be
20 implemented using discrete electronic components, or it can form a portion of an entire electronic circuit such as an Application Specific Integrated Circuit (ASIC). Numerous other possibilities exist. Those skilled in the art will appreciate that the system can also be implemented as a combination of hardware and software modules.

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Figure 1 is a flow chart, designated generally as reference numeral 100, illustrating the events that occur during a foreign stock investment trade in accordance with an embodiment of the invention. 4 main entities are involved in the foreign stock investment trade: an Exchange 102, a broker 104, an investor 106 and
30 a FX Liquidity Provider 108 (e.g. a FX bank).

At step 109, the FX Liquidity Provider (LP) 108 streams real-time executable FX rates to the Exchange 102, for instance, via the industry standard Financial Information eXchange (FIX) protocol. Information such as the currency pair, whether
35 to buy or sell, the quantity to be bought or sold, and the FX rate are streamed. Each FX LP can provide a particular bid / offer rate that is only valid for a pre-determined period of time (e.g.: 1s, 10s, etc). In this "time-to-live" (TTL) scheme, bid / offer rates

have a pre-determined lifetime. Alternatively, in a "good-till-replaced" (GTR) scheme, a particular bid / offer rate is valid until it is replaced by another subsequent bid / offer rate. In both cases, a particular bid / offer rate is accompanied by a fixed amount of currency for which the bid / offer rate applies. For instance, a FX bank guarantees a USD-SGD bid / offer rate of 1.395 / 1.405 for USD 1 million. The plurality of bid / offer rates from each of the FX LPs are compiled and the best bid / offer rate is determined. In both schemes, when an updated bid / offer rate is provided, a new best bid / offer rate may be determined. Further details of the FX pricing in an example embodiment will be disclosed below.

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At step 110, the Exchange 102 distributes market data such as current best Bid/Offer and Last Traded Price. The data provided is in a currency foreign to the Exchange 102 (e.g. the native currency of the foreign investor 106). The market data from step 110 is received by the broker 104 at step 112. The broker 104 in turn distributes the market data to the investor 106. At step 114, if the investor 106 decides to make a trade, he can place an immediate order in the foreign currency, and provide instructions regarding the symbol of the security, whether to buy or sell the security and the quantity to be bought or sold. At step 116, the broker 104 places the immediate order in the foreign currency on behalf of the investor 106 with the Exchange 102. The Exchange 102 queues the order at step 118. In addition to the information regarding the symbol of the security, whether to buy or sell the security and the quantity to be bought or sold; the time that the order is placed is noted by the Exchange 102. At step 120, the order is matched and the Exchange 102 notes information such as the symbol of the security, whether the security was bought or sold, the quantity that was bought or sold, the time that the order was matched and the status of the trade. At step 122, the Exchange notifies the broker 104 of the execution of the order, including the information mentioned above at step 120. Here, the information is provided in the foreign currency. In parallel with step 122, the Exchange 102 notifies the FX Liquidity Provider 108 of the FX execution. Information such as the currency pair, whether to buy or sell, and the quantity to be bought or sold, is provided. The best bid / offer rate, which is constructed from the plurality of bid / offer rates provided by the individual FX LPs, and will be described in more detail below, is "locked in" for a certain period of time and this rate is used in security trades for that certain period of time. At step 125, the FX Liquidity Provider 108 executes the FX transaction at the best bid / offer rate that was "locked-in" at step 110 and subsequently acknowledges the FX execution. At step 124, the broker 104

in turn notifies the investor 106 of the execution of the order. At step 126, the investor 106 acknowledges the execution of the order.

Embodiments of the present invention seek to exploit the fact that stock
5 performance in a local currency differs from its performance in a foreign currency if
the FX conversion rate is taken into consideration. Figure 1A is a MTR stock
performance chart in HK Dollars from 9 January 2009 to 6 January 2010, which is
designated generally as reference numeral 150. Figure 1B is the corresponding MTR
stock performance chart converted into Australian Dollars based on the respective
10 FX conversion rates, and is designated generally as reference numeral 160. For
example, points 152 and 154 in Figure 1A correspond to certain points in time, while
points 162 and 164 in Figure 1B correspond to the same points in time. Points 152
and 162 both correspond to a peak, but point 154 corresponds to a peak while point
164 corresponds to a trough (compared to point 162). An Australian investor who
15 bought MTR stocks at a time corresponding to point 152/162, and sold at a time
corresponding to point 154/164, would have lost more than a Hong Kong investor.

Figure 2 is a schematic diagram, designated generally as reference numeral
200, illustrating the interactions that occur between entities and application modules
20 during a foreign stock investment trade, according to an embodiment of the present
invention. The entities involved in the foreign stock investment trade comprise a
National Exchange 202, a plurality of brokers 204a/b/c, an investor 206 and a
plurality of FX banks 208a/n. The application modules (that are associated with
National Exchange 202) comprise an Order Feed Handler 210, a plurality of National
25 Exchange Order Managers 212a/b/c/d, a matching module 214, a Market Data
Service module 216 and a multi-denomination automated quotation platform 220. A
FX netting eBlotter 218 is an application module that is associated with the plurality
of FX banks 208a/n.

30 The FX netting eBlotter 218 (associated with the plurality of FX banks 208a/n)
can (i) allow the plurality of FX banks 208a/n to configure the FX netting eBlotter 218
for FX trade aggregation and notification via a graphical user interface (GUI); (ii)
allow the plurality of FX banks 208a/n to monitor trades, positions, profit/loss, etc;
and (iii) construct a unique referencing code to facilitate quick cross referencing
35 between the National Exchange 202, the plurality of FX banks' 208a/n FX rates and
the plurality of brokers 204a/b/c. The logic of the eBlotter 218 can be implemented to
comprise a plurality of databases representing "buckets", wherein each "bucket" is

associated with a different FCY (e.g.: USD, JPY, HKD) and configured to hold a certain amount of its currency for each liquidity provider. All FX transactions are filled into (or emptied from) the appropriate "bucket". In one example embodiment, individual FX "Buy" and "Sell" transactions for each "bucket" are netted against each other, advantageously reducing the number of FX transactions to be settled between the FX banks and the Exchange. For instance, a "Buy" transaction of USD1000 can be aggregated with a "Sell" transaction of USD 800, resulting in a net long position of USD200. The FX banks may independently, without regard to the prevailing FX rate, top-up or remove money from the "bucket". The aggregation process can enable the Exchange to minimize the ticketing cost for the overall FX transaction.

The multi-denomination automated quotation platform 220 comprises a FX pricing engine 220a, a Market Data Manager 220b, a FX Execution Manager 220c and an Order Manager 220d. The FX pricing engine 220a can receive streaming FX bid / offer rates from the plurality of FX banks 208a/n. The FX pricing engine 220a can then construct the best bid / offer rates in its memory and maintain a real time snapshot of the liquidity level of each of the plurality of FX banks 208a/n.

The Market Data Manager 220b can (i) subscribe to securities streaming prices published by the Exchange 202 in the local currency of the Exchange 202; (ii) convert securities prices to foreign currencies using FX rates given by the FX Pricing Engine 220a; and (iii) publish foreign currency denominated securities prices to the Exchange's market data service module 216. To achieve sub-millisecond price updates, the blending of the Exchange counter prices and FX rates runs through a price making algorithm. As mentioned above, each FX LP provides a bid / offer rate that is "locked in" for a certain period of time. For example, a FX LP provides a USD-SGD bid / offer rate of 1.395 / 1.410. A second FX LP provides a USD-SGD bid / offer rate of 1.405 / 1.415. A third FX LP provides a USD-SGD bid / offer rate of 1.390 / 1.420. A price making algorithm obtains the various bid / offer rates from the plurality of FX LPs and selects the best bid / offer rate. In the example above, the price making algorithm selects the best bid / offer rate which is 1.405 / 1.410. Whenever an updated bid / offer rate is provided, a new best bid / offer rate is determined.

The FX Execution Manager 220c implements the FX Application Programming Interfaces (APIs) of the plurality of FX banks 208a/n and can (i) receive securities Order Acknowledgements from the Order Manager 220d.

(ii) update the plurality of FX banks' 208a/n FX netting eBlotter 218 and aggregation information. Through the aggregation model described above, embodiments of the present invention reduce the number of FX orders between counterparties as smaller individual transactions are aggregated, which helps to
5 reduce cost of settlement. This is because every transaction involves a settlement cost.

The Order Manager 220d of the platform 220 can (i) accept foreign currency denominated securities orders from the plurality of brokers 204a/b/c; (ii) convert the
10 foreign currency denominated securities orders into the local currency (of the Exchange 202); (iii) route the orders to the Exchange's 202 matching queue 215a; (iv) receive Order Acknowledgements (i.e. Execution notices) in local currency from the Exchange's 202 matching module 214; (v) send Order Acknowledgements (with original FX information) or Rejections to the plurality of brokers 204a/b/c; and (vi)
15 detail the order handling process.

The flow of trading data between the investor 206, the plurality of brokers 204a/b/c, the Order Feed Handler 210, the plurality of National Exchange Order Managers 212a/b/c/d, the matching module 214 and the platform 220 is illustrated by
20 solid arrows and comprise:

- a) The investor 206 placing an order with one of the plurality of brokers 204a/b/c (illustrated in Fig. 2 as Broker 1 204a), and provides instructions such as the symbol of the security, whether to buy or sell the security and the quantity to be bought or sold. The relevant instructions are in a currency foreign to the
25 Exchange 202 (e.g. the native currency of the foreign investor 206).
- b) The broker 204a placing the order on behalf of the investor 206 with the National Exchange 202 via the Order Feed Handler 210. The order being transmitted from the Order Feed Handler 210 to the Order Manager 220d of the platform 220.
- 30 c) The Order Manager 220d of the platform 220 processing the order and transmitting the order to one of the plurality of National Exchange Order Managers 212a/b/c (illustrated in Fig. 2 as Order Manager 212a).
- d) The matching module 214 receiving the order from Order Manager 212a and queues 215a the order. If a match 215b is made, the trade is executed.
- 35 e) The matching module 214 transmitting the execution status of the trade to back the Order Manager 212a.

- f) The Order Manager 220d of the platform 220 receiving the execution status of the trade from Order Manager 212a.
- g) The broker 204a receiving the execution status of the trade from the Order Manager 220d via the Order Feed Handler 210.
- 5 h) The broker 204a notifying the investor 206 of the execution of the order.

The flow of market data between the investor 206, the plurality of brokers 204a/b/c, the Market Data Service module 216 and the Market Data Manager 220b of the platform 220 is illustrated by dashed arrows and comprise:

- 10 a) Market Data Manager 220b subscribing to market data such as current best Bid/Offer and Last Traded Price of securities from the Market Data Service module. The Market Data Manager 220b can convert securities prices (in local currencies) to foreign currencies using FX rates provided by the FX Pricing Engine 220a. The Market Data Manager 220b publishes these
- 15 converted securities prices thereby advantageously enabling the market data to be in a currency foreign to the Exchange 202 (e.g. the native currency of the foreign investor 206).
- b) The plurality of brokers 204a/b/c individually accessing the Market Data Service module 216 to obtain the market data.
- 20 c) The plurality of brokers 204a/b/c distributing the market data to the investor 206.

The interactions between the platform 220, the FX netting eBlotter 218 and the plurality of FX banks 208a/n are illustrated by dotted arrows and comprise:

- 25 a) The plurality of FX banks 208a/n streaming FX bid / offer rates to the FX pricing engine 220a of the platform 220.
- b) The FX Execution Manager 220c sending FX orders to the plurality of FX banks 208a/n and updating the FX netting eBlotter 218 and aggregation information.
- 30 c) The FX netting eBlotter 218 can allowing the plurality of FX banks 208a/n to monitor trades, positions, profit/loss, etc

Figure 3 is a schematic diagram, designated generally as reference numeral 300, illustrating the processes performed by an Order Manager 312 during a "No Fill" condition when a Market Order (MO) is placed, according to an embodiment of the present invention. During a "Create Order" process 320, a broker 304 creates a MO in the foreign currency (FCY) of an Exchange 302 and the MO is passed to the Order

Manager 312. During a "Place Order into Market" process 322, the Order Manager 312 places the order on the Exchange 302. During a "Matching" process 324, the Exchange 302 attempts to match the order. If no match can be made, the Exchange rejects the order and a "No Fill" condition arises. The Order Manager 312 is notified
5 of the "No Fill" condition. During a "Post Execution" process 326, the broker 304 is notified of the "No Fill" condition by the Order Manager 312.

Figure 4 is a schematic diagram, designated generally as reference numeral 400, illustrating the processes performed by an Order Manager 412 during a "Filled"
10 condition when a Market Order (MO) is placed, according to an embodiment of the present invention. During a "Create Order" process 420, a broker 404 creates a MO in the foreign currency (FCY) of an Exchange 402 and the MO is passed to the Order Manager 412. During a "Place Order into Market" process 422, the Order Manager 412 places the order on the Exchange 402. During a "Matching" process 424, the
15 Exchange 402 attempts to match the order. If a match can be made, the order is "Filled" in the local currency (LCY) of the Exchange 402. During a "Request Best Available FX Price" process 426, the Order Manager 412 requests the best FX price from a FX Pricing Engine 414. The FX Pricing Engine 414 can receive streaming FX bid / offer rates from a plurality of FX banks and can also construct the best bid / offer
20 rates in its memory and maintain a real time snapshot of the liquidity level of each of the plurality of FX banks. During a "Determine FX Rate" process 428, the FX Pricing Engine 414 provides the Order Manager 412 with the best available FX rate. During a "Post Execution" process 430, the Order Manager 412 notifies the broker 404 of the "Filled" condition, with information provided in the foreign currency (FCY) of the
25 Exchange 402. The Order Manager 412 also notifies a FX Execution Manager 416 of the Order Status (i.e.: a FX transaction is to be executed using the best available FX rate that was obtained).

Figure 5 is a schematic diagram, designated generally as reference numeral
30 500, illustrating the processes performed by an FX Execution Manager 516, according to an embodiment of the present invention. During process 520, an order Manager 512 can send Order details (with FX rates from a FX pricing engine) to the FX Execution Manager 516. During process 522, the FX Execution Manager 516 parses the Order message. During process 524, FX Execution Manager 516 saves
35 the Order information into a database 526. The FX Execution Manager 516 can also monitor a trading position at process 528. If the trading position is less than the threshold, the FX Execution Manager 516 continues to constantly monitor the

position. If the threshold is met, a FX bank 518 can be notified at process 530. At process 532, the trading position is initialized wherein the "buckets" in the eBlotter are reset to their original level (e.g.: a certain base level of currency). At process 534, the FX bank 518 settles and acknowledges the transaction.

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In an alternative embodiment of the present invention, a Limit Order Virtual Queue may be implemented when the investor wishes to place a limit order rather than a market order. In such an implementation, only the same local Currency Central Limit Order Book (e.g. JPY in Tokyo SE or SGD in SGX) is maintained and there can be multiple virtual queues for the foreign currency order books to constantly mark-to-market / re-price the local currency equivalents (of a foreign currency limit order). Furthermore, time priority (vis-à-vis the entire Order Book - Physical and Virtual) can be retained.

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Figure 6 is a flow chart, designated generally as reference numeral 600, illustrating the events that occur during a Limit Order foreign stock investment trade in accordance with an embodiment of the invention. At step 602, a foreign currency (FCY) limit order is placed. For instance, an investor can place a "No Worse Than - FCY Terms" Limit Order with a Broker via a FCY Stock Symbol e.g. ABC.USD. A local currency (LCY) Limit Order can be derived from the FCY Limit Order and sent to a core LCY Order Book at the Exchange. The core LCY Order Book maintains price and time priorities.

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At step 604, the relevant FCY FX rate is monitored for any changes. At step 606, if the FX rate remains unchanged, no changes are made to the limit order. At step 608, if there are changes to the FX rates, a new LCY limit price can be computed based on the changes. All the limit orders can be examined and a normal curve (with a minimum sample size of about 30) is constructed and the Confidence Interval (CI) of, for example, +/- 3 sigma can be found so as to derive a statistical confidence of 99.97%. This may advantageously reduce the number of limit orders that require re-calculation at any given point in time, thus reducing machine processor load and latency.

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At step 610, the new LCY limit price (after rounding) is checked. If there are no changes to the LCY limit price after rounding, no changes are made to the limit order (see step 606). The tick size restriction is checked to determine if it is exceeded at step 612. If the tick size restriction is not exceeded, no changes are made to the

limit order (see step 606). At step 614, if the tick size restriction is exceeded, the limit order is re-priced and replaced with the new limit price. The re-priced LCY limit price is compared to all similar price levels (in FCY) that were originally placed and the exact priority order is retained to send these better (chances of being matched) prices to the core LCY Order Book. The previous limit order is cancelled and replaced. In other words, a new LCY time priority order is given.

For example, when the investor sets a total settlement price in a foreign currency (e.g. to buy MTR stocks in HKD with USD2.55, and this translates into a derived initial order of HKD19.7625 @ 7.75). The market for MTR is now trading at HKD19.90. Should the USD-HKD rate move to 7.8039, his derived virtual price would be HKD19.8999 and can now join the main book (with the previous HKD19.7625 price cancelled). This advantageously ensures that the buyer does not pay more than USD2.55.

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After a limit order is placed (see step 602) and the limit order is subsequently modified (see step 616), the order quantity or limit price is monitored for changes at step 618. If there is no change to the order quantity or limit price, no changes are made to the limit order at step 606. If there is a change to the order quantity or limit price, a new LCY limit price can be computed (see step 608). Steps 610, 612 and 614 as described above may follow.

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After a limit order is placed (see step 602) and the limit order is subsequently cancelled (see step 620) or the order is fully filled (see step 622), the post execution stage may be entered at step 624.

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Figure 7 is a schematic diagram, designated generally as reference numeral 700, illustrating the processes performed by an Order Manager 712 during a "No Fill" condition when a Limit Order (e.g. "No Worse Than" (NWT) Order) is placed, according to an embodiment of the present invention. During a "Create Order" process 720, a broker 704 creates a NWT Order in the foreign currency (FCY) of an Exchange 702 and the NWT Order is passed to the Order Manager 712. During a "Request Best Available FX Price" process 722, the Order Manager 712 requests the best FX price from a FX Pricing Engine 714. The FX Pricing Engine 714 can receive streaming FX bid / offer rates from a plurality of FX banks and can also construct the best bid / offer rates in its memory and maintain a real time snapshot of the liquidity level of each of the plurality of FX banks. During a "Determine FX Rate" process 724,

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the FX Pricing Engine 714 provides the Order Manager 712 with the best available FX rate. During a "Calculate NWT Price and Place Order into Market" process 726, the Order Manager 712 calculates the NWT price and places the order into the market on the Exchange 702 in the local currency (LCY) of the Exchange 702.

5 During a "Matching" process 728, the Exchange 702 attempts to match the order. If no match can be made, the Exchange rejects the order and a "No Fill" condition arises. The Order Manager 712 is notified of the "No Fill" condition. During a "Post Execution" process 730, the broker 704 is notified of the "No Fill" condition by the Order Manager 712.

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Figure 8 is a schematic diagram, designated generally as reference numeral 800, illustrating the processes performed by an Order Manager 812 during a "Filled" condition when a Limit Order (e.g. "No Worse Than" (NWT) Order) is placed, according to an embodiment of the present invention. During a "Create Order"

15 process 820, a broker 804 creates a NWT Order in the foreign currency (FCY) of an Exchange 802 and the NWT Order is passed to the Order Manager 812. During a "Request Best Available FX Price" process 822, the Order Manager 812 requests the best FX price from a FX Pricing Engine 814. The FX Pricing Engine 814 can receive streaming FX bid / offer rates from a plurality of FX banks and can also construct the

20 best bid / offer rates in its memory and maintain a real time snapshot of the liquidity level of each of the plurality of FX banks. During a "Determine FX Rate" process 824, the FX Pricing Engine 814 provides the Order Manager 812 with the best available FX rate. During a "Calculate NWT Price and Place Order into Market" process 826, the Order Manager 812 calculates the NWT price and places the order into the

25 market on the Exchange 802 in the local currency (LCY) of the Exchange 802. During a "Matching" process 828, the Exchange 802 attempts to match the order. If a match can be made, the order is "Filled" in the local currency (LCY) of the Exchange 802. During a "Post Execution" process 830, the Order Manager 812 notifies the broker 804 of the "Filled" condition, with information provided in the foreign currency

30 (FCY) of the Exchange 802. The Order Manager 812 also notifies a FX Execution Manager 816 of the Order Status (i.e.: a FX transaction is to be executed using the best available FX rate that was obtained).

Advantageously, the systems and methods of embodiments of the present

35 invention do not require changes to the current method of electronic order feeding. More particularly, no additional latency is preferably introduced to the current method

when differentiating between an order in a local currency and an order in a foreign currency.

Foreign investors face considerable FX market risk between the time of placing an order for a securities trade and when the FX conversion takes place. Embodiments of the present invention advantageously reduce the uncertainty associated with the FX market risk at the time of order placing and execution on the underlying securities on the Exchange. In other words, the full profit and loss of a trade can be better known prior to the trading decision.

Currently, decisions on a securities trade is typically made with little due consideration of the underlying FX rate. With embodiments of the invention, decisions on the securities trade can now be made with full imputation of the two variables - Securities Price and FX Price. Thus the investor can properly time his entry and exit of the market.

There is a considerable cost for Listed Companies in performing multiple secondary listings in order to allow different geographical or temporal investors to trade in their securities. However, embodiments of the present invention reduce the need and cost of dual listing on different Exchanges by Listed Companies.

There is also a need to prove Best Execution by typically seeking out a minimum of X number of bid/offer prices and to ensure sufficient internal control and record keeping on this key proof of fiduciary duties which can be very resource intensive. Embodiments of the present invention provide a blended FX and Securities price provided by an Exchange, which can minimize the need to further prove Best Execution.

Retail investors currently pay on average 50-80bps on the FX conversion done by their brokers. Institutional Fund Managers usually pay 3-5bps spreads while the actual FX Interbank prices range from 1-2bps. According to embodiments of the present invention, the FX liquidity providers (LPs) can stream rates close to Interbank levels and is made possible with large aggregate flows from the Exchange, elimination of credit costs associated with brokers and fund managers as counterparties, and minimizing FX ticketing cost issues faced by the LPs. Significantly better FX rates (up to a factor of 50 times) may be obtained from the implementation of the method and system according to embodiments of the present

invention offering a single multibank FX wholesale price to all investors regardless of profile or trade size.

5 Most exchanges are predominantly reliant on domestic investors for velocity (active trading), with cross-border trades usually in the hands of institutional investors. Embodiments of the present invention may encourage a broader spectrum of international investors, which can provide diversification.

10 Currently, there is no timely and consolidated (country level) flow of funds information available. At present, large FX banks provide this information on an end of day basis to their selected clients and such information only reflects the currency flows as registered by the individual banks. Embodiments of the present invention may allow Central Banks to obtain near real-time information as the National Exchange is a good proxy of the overall cross-border activities in the country.

15 Exchanges currently face a scenario where often the only way to attract new listings is by cutting a variety of fees and having a more attractive investor base where the Price Earning (PE) Ratio can be higher than its peer Exchanges. New market access products may be needed in order to be relevant. The quoting of only
20 local currency limits the access of the Exchange to cross border investors as it is often viewed as confusing, expensive and slow. Exchanges that deploy embodiments of the present invention can make its securities be viewed as if it was listed in other geographies without physically being there and can allow investors from overseas to trade the local securities no different from that of their own home Exchanges. This
25 may also attract Global MNCs listed elsewhere to try a secondary listing in an Exchange which deploys embodiments of the present invention.

Embodiments of the present invention advantageously make global securities "local" and give investors more choices in their portfolio composition, removing the
30 mental, financial and technological barriers to cross-border securities investment. In other words, investors can make trading decisions based on both stock prices (quoted in LCY) and executable LCY-cross FX rates, which can open the gates for overseas investors who aspire to participate in overseas stock markets, both as a proxy to overseas economies as well as for investors to participate in the secondary
35 listings of foreign companies.

Figure 9 is a flow chart, designated generally as reference numeral 900, illustrating a method for trading a security in a foreign currency, according to an example embodiment of the present invention. At step 902, FX data streamed from one or more liquidity providers is maintained in a FX pricing module. At step 904, original trade data associated with the security in a trading currency of the security is received in a market manager module. At step 906, converted trade data associated with the security in the foreign currency is automatically generated in the market manager module. The market manager module automatically generates the converted trade data based on an FX rate provided by the FX pricing module.

The method and system of the example embodiment can be implemented on a computer system 1000, schematically shown in Figure 10. It may be implemented as software, such as a computer program being executed within the computer system 1000, and instructing the computer system 1000 to conduct the method of the example embodiment.

The computer system 1000 comprises a computer module 1002, input modules such as a keyboard 1004 and mouse 1006 and a plurality of output devices such as a display 1008, and printer 1010.

The computer module 1002 is connected to a computer network 1012 via a suitable transceiver device 1014, to enable access to e.g. the Internet or other network systems such as Local Area Network (LAN) or Wide Area Network (WAN).

The computer module 1002 in the example includes a processor 1018, a Random Access Memory (RAM) 1020 and a Read Only Memory (ROM) 1022. The computer module 1002 also includes a number of Input/Output (I/O) interfaces, for example I/O interface 1024 to the display 1008, and I/O interface 1026 to the keyboard 1004.

The components of the computer module 1002 typically communicate via an interconnected bus 1028 and in a manner known to the person skilled in the relevant art.

The application program is typically supplied to the user of the computer system 1000 encoded on a data storage medium such as a CD-ROM or flash

memory carrier and read utilising a corresponding data storage medium drive of a data storage device 1030. The application program is read and controlled in its execution by the processor 1018. Intermediate storage of program data maybe accomplished using RAM 1020.

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It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the embodiments without departing from a spirit or scope of the invention as broadly described. The embodiments are, therefore, to be considered in all respects to be

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illustrative and not restrictive.

CLAIMS

1. A system for trading a security in a foreign currency comprising:
an FX pricing module for maintaining FX data streamed from one or
5 more liquidity providers;
and a market manager module configured to receive original trade
data associated with the security in a trading currency of the security and to generate
converted trade data associated with the security in the foreign currency;
wherein the market manager module generates the converted trade
10 data based on an FX rate provided by the FX pricing module.
2. The system as claimed in claim 1, further comprising an order
manager module configured to execute a trade of the security in the trading currency.
- 15 3. The system as claimed in claims 1 or 2, further comprising an FX
execution manager for executing a foreign/trading currencies trade.
4. The system as claimed in any one of the preceding claims, further
comprising an order manager module for receiving an order for trading in the security
20 in the foreign currency.
5. The system as claimed in claim 4, wherein the order comprises a
market order identifying the security, an order quantity, and an order type.
- 25 6. The system as claimed in claim 5, wherein the order manager module
initiates queuing and matching of the market order in the trading currency based on a
current price, and the FX execution manager executes the foreign/trading currencies
trade based on the FX rate provided by the FX pricing module.
- 30 7. The system as claimed in claim 4, wherein the order comprises a limit
order identifying the security, an order quantity, an order type, and a set price in the
foreign currency.
8. The system as claimed in claim 7, wherein the order manager module
35 initiates queuing and matching of the limit order in the trading currency based on a
converted price from the set price in the foreign currency using the FX rate provided
by the FX pricing module.

9. The system as claimed in claim 8, wherein the order manager module is configured to adjust the converted price based on an updated FX rate from the FX pricing module, and to replace the limit order with an updated limit order for queuing and matching.

10. The system as claimed in claims 8 or 9, wherein the FX execution manager executes the foreign/trading currencies trade based on the FX rate provided by the FX pricing module upon matching of the limit order.

11. The system as claimed in any of the preceding claims, further comprising an eBlotter module configured to aggregate and net executed foreign/trading currencies trades with respective ones of the liquidity providers.

12. A method for trading a security in a foreign currency comprising:
maintaining, in a FX pricing module, FX data streamed from one or more liquidity providers; and

receiving, in a market manager module, original trade data associated with the security in a trading currency of the security and automatically generating, in the market manager module, converted trade data associated with the security in the foreign currency;

wherein the market manager module automatically generates the converted trade data based on an FX rate provided by the FX pricing module.

13. The method as claimed in claim 12, further comprising executing a trade of the security in the trading currency using an order manager module.

14. The method as claimed in claims 12 or 13, further comprising executing a foreign/trading currencies trade using an FX execution manager.

15. The method as claimed in any one of claims 12 to 14, further comprising receiving an order at an order manager module for trading in the security in the foreign currency.

16. The method as claimed in claim 15, wherein the order comprises a market order identifying the security, an order quantity, and an order type.

17. The method as claimed in claim 16, wherein the order manager module initiates queuing and matching of the market order in the trading currency based on a current price, and the FX execution manager executes the foreign/trading currencies trade based on the FX rate provided by the FX pricing module.

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18. The method as claimed in claim 15, wherein the order comprises a limit order identifying the security, an order quantity, and an order type in the foreign currency.

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19. The method as claimed in claim 18, wherein the order manager module initiates queuing and matching of the limit order in the trading currency based on a converted price from the set price in the foreign currency using the FX rate provided by the FX pricing module.

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20. The method as claimed in claim 19, wherein the order manager module adjusts the converted price based on an updated FX rate from the FX pricing module, and replaces the limit order with an updated limit order for queuing and matching.

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21. The method as claimed in claims 19 or 20, wherein the FX execution manager executes the foreign/trading currencies trade based on the FX rate provided by the FX pricing module upon matching of the limit order.

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22. The method as claimed in any of claims 12 to 21, further comprising aggregating and netting executed foreign/trading currencies trades with respective ones of the liquidity providers using an eBlotter module.

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23. A data storage medium having stored thereon computer program code means for instructing a computer system to execute a method for trading a security in a foreign currency, as claimed in any one of claims 12 to 22.