

**A Survey of the World's Top Stock Exchanges' Trading Mechanisms  
And Suggestions to the Shanghai Stock Exchange**

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# **A Survey of the World's Top Stock Exchanges' Trading Mechanisms And Suggestions to the Shanghai Stock Exchange**

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## **Abstract**

A variety of types of orders, market makers, dealers, and trading platforms are proven successful and necessary trading mechanisms in the world's top stock exchanges, which may provide valuable references to the Shanghai Stock Exchange where the introduction of more types of orders, market makers, dealers, block transaction mechanisms, elaborate call auctions, and trading platforms will animate trading.

## **I. Introduction**

Upon request of the Shanghai Stock Exchange (SSE) we survey the world's top stock exchanges' trading mechanisms, discuss the advantages and disadvantages of the factors of concern, particularly types of orders, market structures, dealers, market makers, and trading platforms. The purpose of this project is to further understand the world's top stock exchanges' trading mechanisms and to provide references and suggestions to the SSE, especially the successful trading mechanisms in the top exchanges that may be used at the SSE. All the top markets in the world operate with a variety of types of orders (more than 20), dealers, market

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makers, and trading platforms. Currently the SSE accepts only limit orders. There is no market maker or dealer in the stock and bond markets, and there is only one trading platform in the markets. Only one type of order may be convenient for the SSE, but more types of orders will meet the needs of various traders and generate more fees to the SSE. Dealers, market makers, well-developed institutional traders, and more trading platforms are necessary for supplying liquidity and enhancing trade at the SSE.

We interviewed executives of securities firms, traders and researchers for their needs for other types of orders, dealers, market makers, and trading platforms, discussed potential risks or problems, and possible solutions or balances. We conclude that in order to activate and enhance trading, and to strengthen the markets in China, the SSE may adopt the proven successful trading mechanisms in the most developed markets, which should help pave the way for the SSE to be an outstanding stock exchange in the world. The report is organized as follows, Section II discusses the world's top stock exchanges' trading mechanisms of interest, Section III examines suppliers of liquidity, Section IV introduces the recent developments in the most developed markets, and Section V reports our comments and suggestions.

## **II. Trading Mechanisms**

In this section we discuss the trading mechanisms, including types of orders, order precedence rules, market structures, the need for market makers, dealers, trade pricing rules and trading halt rules. We try to avoid details that are not necessary for this project<sup>2</sup>.

### **II.1. Types of Orders**

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<sup>2</sup> Readers who are interested in details of trading mechanisms may read the articles and books listed in the references.

There are over twenty types of orders in the most developed markets, of which, market and limit orders are the two standard orders, other orders are based on the two standard orders with attached contingences. We will discuss the purpose of using each type of order, its impact on market liquidity and price.

### Market orders

A *market order* is an instruction to trade at the best price currently available in the market. All exchanges in developed countries accept market orders. Market orders usually fill quickly. Impatient traders, informed or uninformed, may use market orders. Market order issuers pay the bid/ask spread for receiving liquidity or immediacy. Execution of a market order depends on its size and on available liquidity in the market. The issuers of market order face execution price uncertainty, i.e., their orders are sometimes executed at inferior or better (price improvement) prices than the prices they saw when they submitted their orders. Traders who are concerned about the execution price uncertainty may submit limit orders.

### Limit orders

A *limit order* is an instruction to trade at the specified price or better. A limit order will stand as an offer to trade until someone is willing to trade at its limit price, until it expires or is canceled. All exchanges in developed countries accept limit orders. Standing limit orders are placed in a file called a *limit order book*. Limit orders are usually far from the market when the market is volatile. Patient and absent traders prefer to use limit orders. Limit order issuers are suppliers of liquidity in the market, they receive better average price as compensation for supplying liquidity. The execution uncertainties that limit order issuers face include time and

trade uncertainties. The time when the order will be executed and whether they will trade is not known, the limit order may expire without being executed. They also face the risk of ex post regret, the market price can be much worse than the limit after the order is executed if the market moves against them in response to some significant news.

### Stop (loss) orders

A *stop (loss) order* is an instruction that stops executing the order until price reaches or passes a *stop price*. Stop orders are accepted by most exchanges or handled by brokers in developed countries. With stop instructions traders may buy only after price rises to stop price or sell only after price falls to stop price, or when prices move against them. There are two types of stop orders, stop market order--the order becomes market order once the stop price is reached, and stop limit order--the order becomes limit order once the stop price is reached. Two prices must be specified for a stop limit order, the stop price and the limit price.

A trader with a long position may use a stop sell order to close the position if the price declines significantly. A trader with a short position may use a stop buy order to cover the short position if the price increases significantly.

Stop order issuers demand liquidity when it is less available and hence accelerate price changes, or they add *momentum* to the market. Prices often change because traders on one side of the market demand more liquidity than is available. When these price changes activate stop orders, the stop orders accelerate price changes by adding buying pressure when prices are rising and selling pressure when prices are falling. *Momentum traders* buy when prices are rising and sell when prices are falling. They destabilize prices. They use stop, market and limit orders.

*Contrarian traders* buy when prices are falling and sell when prices are rising. They supply liquidity and stabilize prices. They use limit orders.

Many regulators, traders, and exchanges are concerned about the destabilizing effects that stop orders and momentum strategies have on the market, it is related to front runners, market manipulation, and extreme volatility.

#### Market-to-limit orders

A Market-to-limit order is an instruction to trade at the auction price, or the best limit price, if this limit is represented by at least one limit order and if there is no market order on the other side. Any unexecuted part of a market to limit order is entered into the order book with a limit equal to the price of the executed part.

#### Market-if-touched (MIT) orders

A *market-if-touched* order is an instruction to activate a market order when price touches (reaches) a specified *touch price*. With market-if-touched orders traders may buy when prices fall to their touch prices or sell when prices rise to their touch prices, or when prices move in their favor. Traders who want to trade when prices reach their *touch price* may use MIT orders.

MIT traders stabilize the market because they buy when the market is falling and sell when it is rising. In a broader sense, MIT traders supply liquidity because they offer liquidity to traders who push prices to their touch prices, thus decrease the price impacts of other traders. In a narrow sense, MIT orders demand liquidity because they become standard market orders that demand immediacy when they are triggered.

## Tick-sensitive orders

A tick-sensitive order is an instruction to activate a market order that is related to previous prices. Ticks include uptick, downtick, zero tick, zero down tick, and zero uptick. The orders are like limit orders that dynamically adjust limit prices. Tick-sensitive order issuers supply liquidity and have no market impact since they allow other traders to trade when they want to trade.

Strategies of using dynamic limit orders are almost impossible to implement effectively in fast markets. Traders must continuously monitor the market and immediately cancel and resubmit their limit orders whenever prices change. Most traders cannot cancel and resubmit their limit orders quickly enough therefore they use tick-sensitive orders instead for their strategies.

Tick-sensitive orders are more attractive when the minimum price increment is large. The decimalization of the U.S. stock markets in 2000 decreased the minimum price increment from one-sixteenth dollar (6.25 cents) to 1 cent. This change made tick—sensitive orders much less attractive.

## Market-not-held orders

A Market—not—held order is an instruction that brokers use their discretion when filling the orders, because brokers are often better traders than their clients. The broker then can offer or take liquidity according to current market conditions. Traders submit market-not-held orders to indicate that they will not hold their brokers accountable for failing to trade. Traders of large orders give the market-not-held orders to brokers on the floor of an exchange, recently more

traders issue their orders to brokers who operate order desks that use econometric models to formulate optimal order submission strategies.

Alternative (either or) orders are instructions to execute one but cancel the other of the two alternatives. For example, the order issuer wants to buy one of the two stocks at a limit price, or buy (sell) the same instrument at either a limit or a stop price.

Contingent orders are instructions to buy or sell an instrument only after certain action.

Switch orders are instructions to sell one instrument and buy another at a specified price difference or larger.

Spread orders are instructions to buy one instrument and simultaneously sell another. They can be market or limit orders. The two instruments usually are closely related. The trader specifies a limit for the difference between the two prices when the spread order is a limit order. The order is said to have a sell side premium if the trader wants to sell an instrument at a higher price than he or she wants to pay for the other instrument, in this case, the order can be filled only if the difference between the sales and purchase prices is greater than or equal to the limit. The order is said to have a buy side premium if the trader wants to buy an instrument at a higher price than he or she wants to sell for the other instrument, in this case, the order can be filled only if the difference between the purchase and sales prices is less than or equal to the limit.

Do not reduce (DNR) orders are instructions to keep (not reduce) the limit or stop price when limit and stop prices are automatically reduced on the ex-dividend day.

Scale orders are instructions to buy or sell certain instruments at different prices in order to achieve a better average price.

All or none (AON) orders instruct a broker to fill the order all at once, or not at all.

Minimum-or-none, Minimum Acceptable Quantity (MAQ) orders instruct a broker to arrange multiple trades to fill large orders.

Issuers of AON and MAQ orders usually do so to minimize the costs that they pay to clear and settle their trades.

IOC (immediate or cancel), Fill-or—kill (FOK), Good—on—sight orders.

IOC orders are orders that are valid only when they are presented to the market. Whatever portion of the order that cannot be filled immediately is canceled.

Issuers of IOC orders do not want to give trading options to the market.

Iceberg (undisclosed, hidden, or reserve) orders instruct brokers to show no more than some maximum quantity of the order. Traders submit iceberg orders when they fear that showing the full size would cause the market to move against them. Some electronic exchanges, such as the Euronext and Xetra permit traders to issue undisclosed limit orders. Iceberg orders in an electronic trading system offer liquidity as they allow orders on the other side to trade.

Day, GFD (good for day) orders are valid for the trading day. They expire when the market closes if they have not been filled.

Good—till—cancel (GTC) orders are valid until the trader cancels them.

Good-till-date (GTD) orders are valid until the date specified by the issuer. GTC and GTD orders usually have a 90-day maximum in the U.S. markets.

Good this week (GTW) and Good-this-month (GTM) are special cases of good-until orders.

Good—after orders are good only after some specified date.

Market—on—open, (Opening auction only) orders are market orders that a broker can fill only at the beginning of the trading session. Market—on—open orders usually guarantee the opening price, are easy to execute, and the commissions are lower.

Market-on-close, (Closing auction only) orders are market orders that a broker can fill only at the close of the trading session. They are usually executed at the closing price, particularly attractive to mutual funds because mutual funds use closing prices to calculate their net asset values.

Brokers charge higher commissions for closing price guarantee.

Accept Surplus orders can only be entered during the order book balancing phase of an auction.

It can be used to execute a remaining auction surplus. They require IOC or FOK.

Auction-only orders are valid only in scheduled auctions.

Auction-in-main-trading-phase-only orders are valid only in the auctions of main trading phase.

Main-trading-phase-only orders are valid only in the main trading phase that is from the beginning of the opening auction until the end of the closing auction.

Substitution orders instruct brokers to use their discretion to choose which securities to trade, based on their best prices. Substitution order issuers are traders who want to invest or disinvest a specified amount of money by trading any of several securities.

Orders with special settlement instructions are used by traders who want to settle on a different date. In the U.S. equity markets, regular settlement occurs three days after the trade (T+3). The most common nonstandard settlement is cash settlement on that day. The traders decide at the last moment that they want to be a shareholder of record before a vote or dividend date. Orders with special settlement instructions are difficult to find a match.

A Cancel former order is an instruction to replace an open order with a new order.

A Straight cancel order is an instruction to cancel an open order.

#### Other Order Terminologies

An *agency order* is an order that brokers represent as agents for their clients.

A *proprietary order* is an order that traders represent for their own accounts.

Agency orders have precedence over proprietary orders at the same price at most organized markets.

*Pending orders* are orders submitted to brokers, but before the brokers accept them (whether the account is authorized to trade, or securities can be borrowed for short sale).

A *working (open) order* is an order accepted by a broker, but before it is filled or canceled.

A *good order* is an order that can be executed.

Properties of major orders are listed in Table 1-1 on page 59.

## II.2. Order Precedence Rules

Markets with order—matching systems use their order precedence rules to arrange trades. They first rank orders using their primary order precedence rules, if two or more orders have the same primary precedence, the markets then apply their secondary precedence rules. Futures markets and major European equity exchanges use time precedence while U.S. stock exchanges use public order precedence as secondary precedence rules. Markets apply these rules one at a time until they rank all orders by their precedence.

Price precedence. The price precedence rule gives precedence to the orders of the best prices.

Buyers can accept only the lowest asked prices and sellers can accept only the highest bid prices.

Market orders always rank the highest because the prices at which they may trade are not limited.

All order-matching markets use price priority as their primary order precedence rule. Exchanges do not have to adopt special procedures to enforce price priority, because it is a self-enforcing rule as honest traders naturally search for the best prices. Traders acquire price priority by bidding or offering prices that improve the current best bid or offer. Any trader may improve the best prices at any time.

Markets use various secondary precedence rules to rank orders that have the same price. The most commonly used rules rank orders based on their time of submission, on their display status, and on their size. All rule-based order-matching systems must have at least one secondary precedence rule. Some use more than one. Futures markets use time precedence as the secondary precedence; U.S. stock exchanges use public order precedence as the secondary precedence and then time precedence.

Time precedence. The time precedence rule gives precedence to the traders whose bid or offer first improves the current best bid or offer. Floor time precedence rule is the same as the time precedence rule in oral auctions. Strict time precedence ranks all orders at the same price according to their submission time. Pure price—time precedence systems rank orders based only on price priority and strict time precedence.

The time precedence rule encourages price competition. It encourages traders to improve prices aggressively and rewards aggressive traders by giving them the exclusive right to trade first at the improved price. Traders who want to trade ahead of a trader who has time precedence must improve the price.

Time precedence is not a self-enforcing rule. Most traders do not care whose bid or offer they accept as long as they get the same price. Traders who have time precedence must therefore defend it when someone improperly attempts to bid or offer at the same price.

Time precedence is meaningful only when the minimum price increment is not trivially small. If it is very small, the time precedence rule gives little privilege to the traders who improve price. However, if the tick is too large, traders are reluctant to improve prices because of the increased trading cost.

Public precedence. The public precedence rule gives public orders the priority at the same prices. Exchanges use this rule to give public traders more access to their markets and to weaken the informational advantages that floor traders have. The public order precedence rule allows public traders to take precedence over a member even when the member has time precedence. This rule also increases investor confidence in the exchange by assuring them that exchange members cannot step in front of their orders. Without this rule, exchange members usually can acquire time precedence at a new price before public traders because members see prices change first and can quote faster than public traders can submit orders.

In 2001, the U.S. equity markets completed their decimalization, the minimum price increment decreased from one-sixteenth (6.25 cents) to 1 cent. This change profoundly changed the equity markets. Particularly, it significantly weakened the time and public precedence rules and reduced the value of time precedence, and thereby greatly reduced displayed order sizes. As a result, the incomes of member dealers at the NYSE rose substantially. Many analysts believe that it would have been much better had the markets adopted a 5-cent minimum price increment.

Exchanges and regulators pay close attention to the minimum price increment because it significantly affects market quality.

Display precedence gives displayed orders precedence over undisclosed orders at the same price. Markets give precedence to displayed orders in order to encourage traders to expose their orders. If an order is partly displayed and partly undisclosed, the market usually treats the two parts separately.

Size precedence varies by market. In some markets, large orders have precedence over small orders, while in other markets the opposite holds. When two or more orders are at parity, and they cannot all be fully filled, some markets allocate available size on a pro rata basis. In a pro rata allocation, orders fill in proportion to their size.

Most exchanges allow traders to issue orders with size restrictions. Traders may specify that their entire order must be filled all at once, or they may specify a minimum size for a partial execution. Orders with size restrictions usually have lower precedence than unrestricted orders because they are harder to fill. Large traders use these restrictions to avoid paying fixed costs for settling numerous small trades. These costs include exchange fees, settlement fees, and the costs of accounting for each trade.

### II.3. Market Structures

Markets are classified by their procedures for matching buyers to sellers or execution systems. The three main types of markets are order-driven markets, quote-driven markets, and

brokered markets. Hybrid markets use some combination of these three systems. Now most of the equity markets in the world are hybrid markets.

### II.3.1. Order-driven markets

Order-driven markets are quite common. All markets that conduct open-outcry auctions or electronic auctions are order-driven markets. These include all major futures exchanges, most stock and options exchanges, such as the New York Stock Exchange, American Stock Exchange (merged with Nasdaq in 1998), Chicago Board of Trade, Chicago Board Options Exchange, and Tokyo Stock Exchange, and many trading systems created by brokerages and ECNs (Electronic Communications Networks) to organize trading in stocks, bonds, swaps, currencies, and pollution rights. Governments commonly issue their new debt securities in order-driven market calls.

In pure order-driven markets, buyers and sellers regularly trade with each other (through brokers) without the intermediation of dealers. These markets have trading rules that specify how they arrange their trades. Their order precedence rules determine which buyers trade with which sellers, and their trade pricing rules determine the trade prices.

Most order-driven markets are auction markets where buyers seek the lowest available prices and sellers seek the highest available prices. This process is called the price discovery process because it reveals the prices that best match buyers to sellers.

Order-driven markets vary considerably in the implement of trading rules. In markets that conduct oral or open-outcry auctions, traders negotiate their trades face-to-face or “cry out” their bids and offers on an exchange floor. The trading rules in these markets determine who can negotiate and when they can negotiate. Markets with rule-based order-matching systems use

rules to match orders. Most order-matching markets use electronic systems to match orders automatically. Some order-matching markets still use manual operations, where their clerks match buy and sell orders.

Despite the great variation in how order-driven markets operate, their trading rules are quite similar. All order-driven markets use order precedence rules to match buyers to sellers and trade pricing rules to price the resulting trades.

Traders cannot choose with whom they trade in order-driven markets since the markets use order precedence rules to arrange trades. They therefore often trade with traders with whom they have no credit relationships. To prevent settlement failures, order-driven markets have elaborate mechanisms to ensure that all their traders are trustworthy and creditworthy.

There are dealers trading in order-driven markets. In pure order-driven markets, they trade on an equal basis with all other traders. Dealers provide most of the liquidity in some order-driven markets although these markets are still known as order-driven because the dealers cannot choose their clients. The exchange rules require that they trade with anyone who accepts their offers.

There are different structures of order-driven markets. Some markets conduct single—price auctions in which they arrange all trades at the same price following a market call. Other markets conduct continuous two-sided auctions where buyers and sellers continuously attempt to arrange their trades at prices that vary through time. Still others conduct crossing networks in which they match orders at prices derived from major markets.

In call markets, all traders trade at the same time when the market is called. The market may call all securities simultaneously, or it may call the securities one at a time in a rotation.

Markets that call in rotation may complete only one rotation per trading session or as many rotations as their trading requires.

Most continuous order-driven stock markets and most electronic futures markets open their trading sessions with a single price call market auction. These markets also use single price auctions to restart trading following a halt. The NYSE, NASDQ market, and the European markets open and close trading with a call auction. The Deutsche Borse and Euronext Paris Bourse use calls to trade their least active securities.

Call markets usually arrange their trades using order-driven execution systems. Most of them use batch execution systems in which all trades are arranged at the same time by matching orders with order precedence rules. But a few call markets allow bilateral trading where traders arrange their trades among themselves.

Continuous trading markets are very common. Almost all major stock, bond, futures, options, and foreign exchange markets have continuous trading sessions.

The main advantage of call markets is that all traders interested in an instrument meet at the same place and at the same time so that buyers and sellers find each other easily. When traders can easily find each other, the total trader surplus should be high. For a given order flow, no other method of arranging trades can produce a higher total trader surplus than that produced in a single price auction. Other advantages of call markets include fairness as all traders have the same price; higher information efficiency as all traders have the same access to market information; low costs since there is no bid/ask spread, and anonymity.

However, the single price call auction does not provide transactional immediacy. Also, for a given order flow, the single price auction will trade a lower volume than the continuous auction while it requires sufficient volume for efficient operation.

The main advantage of continuous trading is that it allows traders to arrange their trades whenever they want. This flexibility can be very important to impatient traders who do not want to wait for the next market call. The main disadvantage of continuous trading is higher costs because of the bid/ask spreads. Economically, continuous auction produces a smaller trader surplus than single price auction when processing the same order flow.

Recent developments in the equity markets around the world suggest that traders prefer continuous markets with opening calls to exclusive call markets. Many national equity exchanges have switched from call market rotations to continuous trading with opening calls, but none has changed from continuous trading to exclusive call markets.

Order-driven market has excellent properties, particularly for liquid stocks, retail order flow, and markets that are not under stress. But illiquidity is a serious problem for pure order driven markets, particularly for the mid- and small-cap issues. There are often many orders that are too big to be easily digested in the market, primarily those generated by institutional customers, and stress may occur on all markets everyday. There are often insufficient limit orders or inadequate liquidity for low-cap and mid-cap stocks in order driven markets, which may disrupt price discovery and trading when there are large orders. The difficulty of price formation is accentuated after major news hit the market. Hence, order-driven markets need market makers to reduce the stress.

### II.3.2. Market makers/dealers, and specialists

Dealers serve as market makers, they provide liquidity or immediacy as they are continuously present, buying and selling when public selling and buying orders arrive. Dealers demand liquidity when they need to balance (reliquify) their inventory.

Dealers offer liquidity and are rewarded with profit from the bid/ask spreads. Their bid/ask spread includes two components: transaction cost that compensates dealers for their normal costs of doing business, and the adverse selection spread component that compensates dealers for the losses they suffer when trading with well-informed traders. Dealers bid/ask spreads are limited by competition from public limit orders and from dealers at other exchanges that trade the same securities. Dealers may also try to profit by predicting the direction of price movements, or positioning.

Many dealers specialize in serving clients such as small retail traders or large institutional traders. A dealer may refuse to trade with customers who are not among its preferred clientele. Dealers have an advantage as order-anticipating speculators because they generally see more order flow than other traders. Most dealers try to avoid trading with customers they believe are well informed about future prices, because they often lose to well-informed traders. They trade most effectively when they can identify whether they are trading with well-informed traders.

Dealers need capital to finance their inventories and are heavily levered. The capital available to them thus limits their ability to offer liquidity. Market makers often cannot easily raise capital by borrowing or by issuing equity because market making is very risky and hence investors generally do not like to invest in market-making operations. Also, investors are more concerned about trader incentives because most of inventory risk is diversifiable. Since market making requires continuous attention in order to avoid significant losses, incentives are especially important.

Market-making firms typically have excellent risk-management systems that prevent their dealers from generating large losses. These systems tightly limit the capital that each dealer can commit. These firms also ensure that their traders' compensation contracts reward them for

making profits and penalize them for generating losses. These contracts make traders like equity-holders and thereby align their interests with those of the firm's shareholders and bondholders.

Many exchanges and dealer networks require that their dealers meet minimum capital standards in an effort to make their markets more liquid. However, capital adequacy regulations only ensure that dealers can offer liquidity if they desire to do so. Dealers who have more capital can offer more liquidity, but only adequate capital will not make them willing to supply liquidity if they face too much adverse selection from informed traders, they provide liquidity only to the extent that they feel comfortable.

Many order-driven exchanges have specialist-trading systems where specialists act as market makers. These exchanges assign special responsibilities to members who are specialists, and the major responsibility is to provide liquidity and to facilitate price discovery. The New York Stock Exchange, for example, has specialists to serve as dealer/market makers since 1875, now they serve as dealers, brokers, and exchange officials. Similar market professionals are called *animateurs* (liquidity providers) in French markets and *betreuers* (designated sponsors) in German markets.

The specialists are required to continuously quote two-sided markets as market makers if no one else will do so and to make a "fair, smooth, and orderly market" for the stocks assigned to them. They must intervene in trading and provide supplemental liquidity to keep price changes small. They must assume a passive position; they post their quotes and wait for other traders to respond. Specialists with limit order book also trades as a principal for their own accounts.

### II.3.3. Quote-driven markets

The term, quote-driven market, is created because prices are set only by dealer quotes in the market. The markets are also known as dealer markets and market maker markets because dealers make market and supply all the liquidity. In pure quote—driven systems, dealers arrange every trade when they trade with their customers and among themselves, they often broker trades among public traders.

In some dealer markets, interdealer brokers help dealers arrange trades among themselves as many dealers do not like their rivals to know about their trades. By allowing dealers to trade with each other anonymously, interdealer brokers protect dealers and their clients from predatory actions by rivals.

The Nasdaq Stock Market, the London Stock Exchange, the eSpeed government bond trading system, and the Reuters 3000 foreign exchange trading system are well-known quote-driven markets. However, most dealer markets are informal networks of dealers who communicate with their clients and among themselves by telephone.

A comparison between a traditionally quote-driven (Nasdaq) market and a traditionally order-driven (the NYSE) market is shown in Table 1-3.

Here we discuss three major differences between the two markets, one is essentially quote-driven, while the other is essentially order-driven.

**Competition:** The Nasdaq market traditionally depended on interdealer competition to keep markets fair, orderly, and liquid. Market makers on the Nasdaq market compete with each other, they have been reluctant to accept additional competition from the public order flow. By contrast, there is just one market maker (the specialist) per issue on the NYSE, the big board depends on

competition from public limit orders, floor traders, specialists on other exchanges, and its own surveillance system to keep markets fair, orderly, and liquid.

TABLE 1-3. Nasdaq (traditionally quote-driven) Market versus NYSE (traditionally order-driven)

	<b>Nasdaq</b>	<b>NYSE</b>
<b>Trade initiation</b>	Dealer market Quote-driven Active interaction with the order flow	Agency/auction market Order-driven Passive interaction with the order flow
<b>Competition</b>	Multiple dealers	Single dealer and public order flow
<b>Flexibility</b>	Freedom to select stocks Primary and secondary market operations	Stocks are assigned Secondary market operations only
<b>Information flows</b>	Deal directly with customers Close contact with firms	Consolidated order flow and floor information
<b>Price discovery</b>	No formal procedure Competitive quotations centrally displayed	Market opening procedure Consolidation of the order flow
<b>Regulation</b>	SRO for member firms Obligation to continuously quote firm two-sided market Rely on competition to limit abuses	SRO for member firms Affirmative obligation  Specialist trading restrictions

Source: Schwartz and Francioni, 2004

Flexibility: Market makers on the Nasdaq market are free to select the stocks in which they make markets or offer liquidity. Broker-dealer firms are free to participate in the new-issues market, although they must temporarily give up market making for an issue in the secondary market when they underwrite for the same company in the primary market. On the other hand,

specialists on the NYSE can only operate in the secondary market. A specialist firm must apply for being the market maker for a newly listed issue. An issue is rarely given up by a specialist firm and is almost never taken away once assigned by the exchange's stock allocation committee.

Information Flows: Specialists on the NYSE see a larger fraction of the order flow because order flow is more consolidated in exchange trading. Specialists on the NYSE are prohibited from dealing directly with institutions. By contrast, market makers on the Nasdaq market can receive orders directly from institutional customers. In addition, some market makers, dealers and brokers maintain close contact with the listed firms and commonly act in an advisory capacity for these firms. This direct contact gives OTC (over-the-counter) dealers an information advantage as they can better sense the motive behind an order, i.e., whether an order is issued by an informed trader or an uninformed trader (e.g., from an index fund).

#### II.3.4. Brokered markets

In brokered trading systems, brokers actively search to match buyers and sellers, and arrange trades. Brokers usually start searches when their clients ask them to fill their orders, they also initiate searches when they suggest trades to their clients.

The broker's role in finding liquidity is the distinguishing characteristic of a brokered market. In markets where dealers will not normally trade and where traders usually do not make public offers to trade, the markets are typically illiquid, traders need brokers to search for traders on the other side.

Concealed traders and latent traders are liquidity suppliers in brokered markets. Concealed traders want to trade but do not want to expose orders to the public. They offer

liquidity when brokers present them with trading opportunities they like. Latent traders want to trade only when brokers present them with attractive trading opportunities. A good broker can find concealed traders and latent traders.

A summary of the market structures is provided in Table 1-2 on page 60.

### II.3.5. Hybrid markets

Hybrid markets mix the characteristics of order-driven, quote-driven, and brokered markets. In fact, most exchanges/markets have long had hybrid structures as hybrid markets give customers the flexibility to choose between either supply liquidity or receive liquidity.

For example, although the New York Stock Exchange is essentially an order-driven market, it requires its specialists to offer liquidity as dealers if no one else will do so. There are dealers acting as market makers at the Big Board, providing liquidity and dealer capital for floor trading and upstairs block transactions, participating in price discovery, facilitating market timing, and animating trading. The New York Stock Exchange therefore has elements of a quote-driven market. Block brokers arrange upstairs negotiations for large trades for NYSE issues and bring to the trading floor for execution. The Nasdaq Stock Market is also a hybrid. Although essentially a quote-driven market, it requires its dealers to display, and in many circumstances to execute, public limit orders. The Nasdaq therefore has elements of an order-driven market. The London Stock Exchange (LSE) used to be competitive market-maker markets, but have altered their systems to include the public display of customer limit orders, particularly with the introduction of SETs (stock exchange electronic trading service) system in 1997. Both the Nasdaq market and the London Stock Exchange now open and close market with a call auction. Since brokers sometimes arrange large block trade in both of these markets, they also have some

characteristics of brokered markets. The Paris Bourse, Deutsche Börse, and other European continental exchanges run open, close, and intraday call auctions. The continuous order-driven electronic trading platforms in Europe include market makers on both contractual and voluntary bases. Almost all European markets open and close trading with a call auction. The Tokyo and other Far East exchanges have been continuous order-driven environments that include call auctions at market openings and closings.

A hybrid structure can sharpen price discovery, provide enhanced liquidity, and help to stabilize a market under stress. Market makers play a vital role in the hybrid structure, and call auction and continuous trading together in a hybrid structure strengthens an order-driven market.

Different types of traders in the markets have different trading needs depending on their size, motive, and the characteristics of the stocks; these needs have been driving the advance toward hybrid structure around the world. Since late 1990s, major markets around the world have been explicitly designed as hybrids. Limit order books displaying public limit orders were introduced in the Nasdaq market. For this purpose, the Nasdaq market started its Montage system in 1997, and its SuperMontage system in October 2002, which can handle both dealer and public orders. Similarly, the London market introduced SETs. Market makers are included in order-driven platforms throughout Europe, and virtually all markets globally now conduct call auctions.

### II.3.6. Block Trading Mechanisms

A block transaction is defined as 10,000 shares or more on the NYSE although transactions of 10,000 shares are commonplace in the U.S. now, 50 to 75 times the standard size on the LSE, over 50,000 to over 500,000 Euros on Euronext depending on the liquidity of the stock. According to the New York Stock Exchange Fact Book, the proportion of block

transactions to reported volume on the NYSE increased from 3.1 percent in 1965 to over 57 percent in 1995, but has been declining since then to around 30 percent in the first half of 2005. The average number of block transactions per day increased from 9 in 1965 to 25,300 in 2002, but then declined to 19,000 in the first half of 2005.

Block dealers and block brokers are key players in the block market. Block dealers offer liquidity when they buy or sell when their customers sell or buy. Block brokers find liquidity for customers. Traders sometimes call block brokers and dealers facilitators because they facilitate their customers' trading. The trades may involve large blocks of a single security or contract, or portfolios of many instruments. The dealers and brokers usually negotiate and arrange large block trades by telephone in the upstairs block market at the NYSE, and then bring the trade to the floor for execution.

Block dealers take large positions as they supply liquidity to their clients in the form of depth. However, they carefully consider with whom they trade in order to avoid trading with well-informed traders. They generally do not want to offer immediacy because impatient traders are often well informed.

Large transactions require significant amount of capital and involve big risk. Block dealer firms must have strong risk-management systems to ensure that their traders do not take foolish positions. These systems tend to slow their trading. To diversify away their risk, block dealers like to work for large firms that can spread their inventory risks over many positions.

Block traders face several problems. Latent demand problem refers to the situation that block liquidity suppliers are unwilling to expose their interest, they might trade if being asked. Block initiators need to find these potential traders on the other side. Order exposure problem refers to the situation that traders who know about impending blocks may change prices or wait,

to the disadvantage of the block initiator. Price discrimination problem refers to the situation that block liquidity suppliers do not want to be the first to offer liquidity to a large initiator, only to see prices move against them when the large initiator continues to trade. Information asymmetry problem refers to the situation that block liquidity suppliers suspect that block initiators are well informed hence don't want to take the risk to trade.

Exchanges or regulation usually allow the execution of large block trade be displayed at least 30 minutes later because of their significant impact on prices. This is a typical situation where high level of transparency may have an adverse effect on the market. Call auctions are needed to reduce the possible price impact on major market. In the U.S. markets, companies have developed several electronic systems that combined the mechanisms:

OptiMark started operation in 1999 as a facility of the Pacific Exchange for the NYSE-listed stocks and as a facility of the Nasdaq Stock Market for Nasdaq-listed stocks. It uses call auction to match block trades. However, it has been inactive since 2000.

Burlington Capital Markets' Burlington Large Order Cross (BLOX) is attractive to institutions. LiquidNet started operation in 2001, it enables institutional traders to meet anonymously, negotiate prices and trade in large sizes (the average size is 50,000 shares). Traders negotiate (electronically) prices based on prevailing quotes in the major markets, and hence do not have to participate in significant price discovery. In fact, over 90 percent of LiquidNet's executions are within the spread in the major markets.

Harborside+ started operation in 2002 for institutions. Customers send indication of interest (IOIs), after Harborside+ electronic system finds potential matches, a person contacts the counterparties, and facilitate negotiation while keeping identities confidential. It offers the flexibility beyond electronic systems.

Liquidity Tracker of the NASDAQ started operation in December 2002. The anonymous order delivery service was intended to complement the transparency and automatic executions of SuperMontage. Liquidity Tracker is not a trading system. It acts as an inter-dealer broker between buyers and sellers, it analyzes Nasdaq's trade data, brings together trading counterparties for anonymous negotiations of large trades through instant messaging, and uses SuperMontage's directed order functionality. Its service is like what a NYSE specialist sometimes does for large traders. When it finds a buyer or seller, it then forwards the order to the dealer or dealers. The first dealer to respond wins the trade. Neither the order recipient nor the order sender knows the other's identity until the transaction is complete. Liquidity Tracker is not very successful because of the competition from Harborside+ and LiquidNet, and its Nasdaq market makers only service. Recently, the NASDAQ connected Liquidity Tracker to Harborside+, extended its coverage to smallcap securities, and reduced the fee from \$0.006 to \$0.004, (\$0.003 for over 5 million Shares per month) per executed share for members.

### II.3.7. Bond Trading Mechanisms

Bonds are traded by direct search, on brokered markets, organized order-driven exchanges, and the over-the-counter (OTC) dealer quote-driven markets. Some markets conduct electronic or open-outcry auctions in continuous environment, the best known electronic government bond trading system is the eSpeed in the U.S. Bonds are traded essentially on the OTC markets in the most developed countries. For example, there are 30 major dealers and over 1,500 other dealers trading and making market in the U.S. Treasury securities market. Treasury

bonds and some major companies' bonds are traded on the NYSE but the trading volume is small and the small-volume transaction may not represent large volume prices.

Players in the bond market are issuers, investors, intermediaries and central banks. Bond issuers are referred to as deficit units, including central and municipal governments, government agencies, banks and corporations, and foreign institutions. Investors are referred to as surplus units, including banks, foreign institutions, governments, households, insurance companies, mutual funds, and pension funds. Intermediaries include brokers, dealers (e.g., Goldman Sachs, Salomon Smith Barney are the largest for Treasury securities), and interdealer brokers. Central banks trade Treasury bonds for their open market operations.

In the primary market, governments commonly issue their new debt securities in order-driven call market auctions. Table 1-4 shows government bonds issuing procedures and market organizations in the most developed countries.

Corporations commonly issue their debts through syndicated underwriting. Investment bankers are the key players in the market, they match the surplus and deficit units, reduce the search and information costs to both the issuers and the investors. They may sell the bond with their best effort for a commission that is a percentage of the total issue's value, or underwrite the bonds, i.e., buy the bonds from the issuer and then sell them at a hopefully higher price. They usually form an underwriting syndicate whereby a group of investment bankers buys and sells the issue. Some corporate borrowers may issue their bonds through private placement or negotiated market where the bond is issued to one or a few institutions under a private contract, others may issue the debt instrument through open market transaction where the bond issue is sold to the public at large.

TABLE 1-4. Government Bonds Issuing Procedures and Market Organizations

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Canada: Subscription offerings and yield auction. OTC dealer network

France: Dutch auctions. Listed on Paris Stock Exchange, OTC dealer market very active

Japan: A part is underwritten by a syndicate of banks, insurance companies, and security firms.  
Remaining is by auctions. In Tokyo Stock Exchange and OTC dealer markets.

Germany: Dutch auction and fixed allocation to a pool of institutions. Stock exchanges and OTC dealer markets.

U.K.: Single or multiple price auctions. OTC dealer market very active,

U.S.: Yield auctions. OTC dealer markets and the NYSE.

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Source: Sundaresan, 2002.

In the secondary market, brokers try to match buyers and sellers for a fee, dealers make markets and offer liquidities. Dealers maintain inventories and risk their own funds, hope to make the bid-asked spread on average. Dealers are highly levered and face bankruptcy risk. Some dealers' losses have exceeded their equity; several dealers have gone bankrupt in recent years. A small proportion of dealer debt financing is from bank loans. The majority of dealer debt financing is in the form of repurchase agreements (repos). A repurchase agreement involves the sale of U.S. Treasury securities with an agreement to repurchase the same security the next day at the sale price plus overnight interest. Repos for longer than overnight are called term repos.

As in the stock markets, dealers must register with the Securities and Exchange Commission (SEC) to trade. The National Association of Security Dealers (NASD) licenses dealers and brokers and regulates OTC trading. Regulation of government bond dealers has been minimal. Entry into the dealer market has been free, with minimal official restrictions on dealer behavior. Current legislation requires the U.S. Treasury to regulate dealers.

Not many individual investors trade bonds directly although about 30 million households trade stocks in the U.S., because of the relatively large face value (\$1000) and small price fluctuations of bonds. Organized exchanges for bonds would be more important if individual investors actively trade bonds, although the OTC markets are convenient for institutional traders. The NYSE operates the largest centralized bond market of any exchange. It offers investors a broad selection of bonds issued by U.S. and foreign corporations, the U.S. government, foreign governments, municipalities and international banks.

The NYSE's fixed income market is centered on its Automated Bond System (ABS). This is a fully automated trading and information system that allows subscribing firms to enter directly and execute bond orders through terminals in their offices. ABS displays current market data, provides subscribers with immediate execution reports and locked-in trade comparisons.

All NYSE bonds trade through ABS. Exchange bond volume during 2004 was \$1.3 billion, down from \$2.5 billion<sup>3</sup> in 2003. About 94% of NYSE bond volume is in straight, or non-convertible debt, and 6% of NYSE bond volume is in convertible bonds. At year-end 2004, the ABS had a subscriber base of thirty-eight member firms with an installed terminal base of 119. Table 1-5 provides the information about NYSE's listed bonds as of year-end 2004.

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<sup>3</sup> NYSE Fact Book.

**Table 1--5. NYSE listed bonds at year end, 2004**

<b><u>Major group</u></b>	<b><u>Number of issuers</u></b>	<b><u>Number of issues</u></b>	<b><u>Par value (mils.)</u></b>
<b>U.S. Companies</b>	171	424	\$178,664
<b>Foreign Companies</b>	41	80	\$33,739
<b>U.S. Government</b>	1	294	\$817,064
<b>International Banks</b>	5	100	\$40,619
<b>Foreign Governments</b>	4	5	\$790
<b>Municipals</b>	6	156	\$8,655
<b>Total</b>	<b>228</b>	<b>1,059</b>	<b>\$1,079,531</b>

Source: NYSE Fact Book

#### II.4. Market information and order execution systems

Exchanges and dealers have developed various market information and order execution systems. Information systems collect and distribute information, present it, and store it. In the U.S., almost all equity markets, dealers and trading systems must report their trades and quotes to a securities information processor (SIP). The Securities Industry Automation Corporation (SIAC) is the SIP for exchange-listed stocks, and the NASD (National Association of Securities Dealers) is the SIP for Nasdaq and OTC stocks. Market data systems report trades and quotes to the public. Order—routing systems send orders from customers to brokers, dealers, and to exchanges. These systems also send reports of filled orders back to customers. Order presentation systems reveal orders and quotes to traders so that they can act upon them. The systems may use screen-based, open-outcry, or hand-signaling technologies, messaging systems (allow private messages), bulletin boards on which traders post IOI. Brokers, dealers, and exchanges use order books to hold open limit orders.

Transparency represents the ability of market participants to observe information about the trading process. Transparency is important for investors' confidence in the markets. However, greater transparency does not necessarily lead to better market quality because large orders may impact prices, and large traders do not want to show their identity. A floor trader on the NYSE may reveal only parts of a large order, which the trader slices and dices and trade over an extended period of time. On major European markets, such as the Euronext Paris (Paris Bourse) and Frankfurt Stock Exchange, a large order can be entered as an iceberg order in the electronic trading platform where only a part of the order is revealed.

Below is a list of major systems or trading platforms<sup>4</sup>

U.S., inside the exchanges: SuperDOT, OpenBook, Direct+®, Xpress, eBroker, SuperMontage, CTCI, SOES<sup>SM</sup>

U.S., outside the exchanges: Island, Instinet, Archipelago, REDIBBOOK, Bloomberg Tradebook, BRUT, and POSIT (ITG-POSIT, TST-POSIT), BLOX, INET, LiquidNet, Harborside+, Optimark.

West Europe: SEAQ, SEATS+ (Stock Exchange Alternative Trading System+) SETS, Xetra, CAC (Cotation Assistee en Continu), NSC (Nouveau System de Cotation), SAXESS

Recently developed market data and order routing systems: FIX (Financial Information eXchange for institutional traders), OFE (Open Financial Exchange for internet-based retail traders).

## II.5. Trade pricing rules

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<sup>4</sup> We discuss some representative systems in Section IV "Recent Developments."

The trade pricing rules depend on the type of market. Single price auctions use the uniform pricing rule, i.e., all trades take place at the same market clearing price, or the last match that leads to a feasible trade determines the clearing price.

Continuous two-sided auctions and a few call markets use the discriminatory pricing rule. Under the discriminatory pricing rule, the limit price of the standing order determines the price for each trade. This rule requires that every trade takes place at the price proposed by the trader whose bid or offer is accepted. If the market matches a large incoming order with several standing limit orders placed at different prices, trades will take place at the various limit order prices. It derives its name from a strategy that large, aggressive traders use to lower their trading costs. Large traders often break their orders into several smaller parts and trade one at a time. The first part trades at the best price initially available in the market. The remaining parts trade at progressively inferior prices as the traders exhaust the available liquidity and as the market finds the true order sizes. Large traders thus discriminate among the traders who are most willing to trade and those who are willing to trade only at inferior prices. They obtain their best prices from the first and their worst prices from the last. This strategy lowers their trading costs because the traders most willing to trade would not offer such good prices if they knew the full order sizes.

Crossing networks use the derivative pricing rule. Crossing networks are the only order-driven markets that are not auction markets. They obtain or derive their crossing prices that are determined at main markets that trade the same instruments. The U.S. equity crossing networks are all call markets.

Large impatient traders prefer the discriminatory pricing rule to the uniform pricing rule for a given set of orders because the discriminatory pricing rule allows them to trade the first parts of their orders at better prices than the last parts. Under the uniform pricing rule, their entire

orders would trade at the same price, which would be the worst price they would receive under the discriminatory rule.

Limit order traders prefer the uniform pricing rule for a given set of orders. They do not want large traders to discriminate among them. They would rather that all traders receive the same price when filling a large order.

Since markets want to encourage traders to bid and offer aggressively, continuous trading markets might consider adopting the uniform pricing rule instead of the discriminatory pricing rule. Continuous markets cannot enforce uniform pricing, however. Large traders who want to price-discriminate can circumvent the uniform rule by breaking up their orders and submitting them as a sequence of smaller orders. Under the discriminatory pricing rule, the market splits large orders. Under the uniform pricing rule, traders would split their orders before submitting them.

To effectively switch to a uniform pricing rule, continuous trading markets must stop trading. Some continuous markets have trading halt rules to achieve this purpose. These markets halt trading if a large order imbalance would cause the price to move too far or too quickly. They resume trading after some time with a single price auction. The trading halt therefore represents a transition from the discriminatory pricing rule to the uniform pricing rule. Large traders can still break up their orders, but doing so delays the execution of their trades. If the delays are sufficiently long, they may discourage large traders from splitting their orders.

## II.6. Trading halt rules

A trading halt is a pause in the trading of a particular security on one or more exchanges, usually in anticipation of a news announcement or to correct an order imbalance. A trading halt may also be imposed for purely regulatory reasons. The stock exchange can halt a stock at anytime if they feel suspicious things are occurring in regards to the stock price. The stock typically doesn't start trading until the company releases information on their stock. During a trading halt, open orders may be cancelled and options may be exercised. A trading halt gives all investors equal opportunity to evaluate news and make buy, sell, or hold decisions on that basis. Trading halts may also decrease volatility by alerting traders to unusual demands for liquidity. If traders step in to supply liquidity, prices may not change as much as they would have changed if the market immediately processed the orders that caused the imbalance.

After the October 19, 1987 stock market crash, stock and futures exchanges in the U.S. adopted a set of market trading halt rules. For example, the National Association of Securities Dealers, Inc. (NASD ) has agreed, upon the request of the Securities and Exchange Commission, to halt domestic trading in all NASDAQ<sup>®</sup> securities and all equity and equity-related OTC securities should the NYSE declare a market-wide trading halt, pursuant to their rules. These coordinated trading halt rules have halted trading only once. On October 27, 1997, the DJIA dropped 350 points or 4.5 percent, by 2:35 p.m. the trading was halted for 30 minutes according to the then current version of the rules. After trading resumed the DJIA dropped 200 more points by 3:30 p.m., which halted trading for the rest of the day. Many people believed that these halts occurred too quickly. The exchanges therefore amended their halt rules in early 1998 to provide three levels of circuit breakers. The New York Stock Exchange version of this rule is called Rule 80B. The thresholds are effective for a quarter, or three months, they are revised for the first day of every January, April, July, and October. The current version of the rules calls for a Level 1

Halt if the Dow Jones Industrial Average declines by more than approximately 10 percent below its previous day's closing value. The halt will last for an hour if it occurs before 2:00 p.m., and for 30 minutes if it occurred between 2:00 and 2:30 p.m., if the event occurs after 2:30 p.m., trading will continue for the rest of the day unless a Level 2 Halt goes into effect. A Level 2 Halt will occur if the DJIA drops by more than 20 percent below its previous closing value. A halt will last for two hours if it begins before 1 p.m., and for one hour if it occurs between 1 p.m. and 2:00 p.m., and close the market for the rest of the day if the 20 percent decline occurs after 2 p.m. For a Level 3 Halt the DJIA must drop by more than 30 percent below its previous closing value, a Level 3 Halt occurs at any time will last for the rest of the day. When a halt ends, trading resumes with a call. Chart 1-1 displays the NYSE's circuit breaker levels and trade halt durations for third quarter 2005, Chart 1-2 displays the Nasdaq Market's circuit breaker trigger points and trade halt durations for fourth quarter, 2004.

## II.7. A summary of the world's top stock exchanges' trading mechanisms

This section summarizes the world's top stock exchanges' trading mechanisms. The top exchanges include the New York Stock Exchange, the Nasdaq market, London Stock Exchange, Euronext, Frankfurt Stock Exchange, and Tokyo Stock Exchange. There are over 50 major stock exchanges in the world. As discussed above, all the top exchanges are continuous environments with call auctions. All of the exchange systems in Europe are hybrid structures that encompass order-driven with market making and continuous trading with call auctions at opening, closing and intra-day. They follow price-time priority, and handle most types of orders. Customized orders may be handled by broker/dealers in the most developed markets.

### **Chart 1-1. CIRCUIT-BREAKER LEVELS**

**FOR THIRD-QUARTER 2005**

In the event of a **1,050-POINT** decline in the DJIA (10 percent):



Before 2 p.m.  
**1-HOUR HALT**



2-2:30 p.m.  
**30-MIN. HALT**



After 2:30 p.m.  
**NO HALT**

In the event of a **2,100-POINT** decline in the DJIA (20 percent):



Before 1 p.m.  
**2-HOUR HALT**



1-2 p.m.  
**1-HOUR HALT**



After 2 p.m.  
**MARKET CLOSES**

In the event of a **3,150-POINT** decline in the DJIA (30 percent), regardless of the time, **MARKET CLOSES** for the day.

Source: the NYSE

**Chart 1-2. Circuit Breaker Trigger Points and Trade Halt Durations for Fourth Quarter, 2004 (Nasdaq Market)**

	Before 1:00 p.m.	1:00 p.m. - 1:59 p.m.	2:00 p.m. - 2:30 p.m.	After 2:30 p.m.
<b>1,050-point Decline in the Dow</b>	1 Hour Halt	1 Hour Halt	0.5 Hour Halt	No Effect
<b>2,150-point Decline in the Dow</b>	2 Hour Halt	1 Hour Halt	Close For Day	Close For Day
<b>3,200-point Decline in the Dow</b>	Close For Day	Close For Day	Close For Day	Close For Day

Source: NASDAQ

The New York Stock Exchange

The NYSE is a hybrid although essentially an order-driven market. Floor trading and specialist systems are the key characteristics of the big board. It has the most advanced technologies and electronic systems supporting the floor trading. Market makers on the exchange include specialists, upstairs block dealer/brokers, and dealers on the trading floor. The exchange enforces price-public priority, uses open and close call auctions, accepts market, limit, stop, open, close, IOC, AON orders.

#### The Nasdaq Market

The Nasdaq market is also a hybrid although essentially a quote-driven dealer market. It uses automatic trading systems; public limit orders are displayed and executed with SuperMontage (limit order book, started in 2002). It enforces price-public priority, adopted open and close call auctions recently, accepts standard orders.

#### The London Stock Exchange

The London Stock Exchange is traditionally a quote-driven dealer market, now a hybrid with electronic trading systems. Its SETs (Stock Exchange Electronic Trading Service, started in 1997) can handle public limit orders. The exchange uses open and close call auctions, accepts market, limit, stop, FOK, IOC, orders.

#### Euronext (France, Amsterdam, Brussels)

It is a hybrid with electronic trading systems, it uses call auctions, accepts market, limit, open, close, AON orders.

## Frankfurt Stock Exchange

It is a hybrid with electronic trading systems, it uses open, close and intra-day call auctions, accepts all types of orders.

## Tokyo Stock Exchange

The Tokyo Stock Exchange is a typical order-driven market with market maker elements. Dealers may trade directly with important customers and offer improved prices. It uses automatic trading systems, open and close call auctions, accepts standard orders.

### **III. Suppliers of Liquidity**

A market is *liquid* when trades can be done without significant adverse effect on price.

There are four dimensions of liquidity:

Immediacy refers to how quickly market orders of a given size can be executed at a given cost.

Depth is measured by units available at a given price of liquidity. A market is said to have depth if there are many market orders and limit orders at prices around the last trade.

Breadth or width refers to the cost per unit of liquidity. Small traders usually measure breadth by the bid/ask spread. A market is said to have breadth if the spread is small.

Resiliency refers to how quickly prices restore to reasonable levels after they temporarily change due to large order flow imbalances initiated by uninformed traders. Trading by uninformed traders has little effect on prices in a resilient market.

The origins or suppliers of liquidity include dealer/market makers, block dealers, value traders, arbitrageurs, and a trader who will trade only if asked by a broker. Liquidity suppliers hope to profit from selling at high prices and buying at low prices. Brokers are also important for

effective creation of liquidity. Natural buyers and natural sellers are the ultimate source of liquidity to public sellers and buyers.

Dealers or market makers are liquidity suppliers as they bring capital to the market by posting quotes (making market) that enables public clients to trade with immediacy or by filling marketable orders. However, market makers are not the fundamental source of liquidity. They are liquidity demanders when they rebalance their position by selling (buying) the shares after buying (selling) shares to accommodate a seller (buyer). The rebalance of a position after buying from or selling to customers is part of a dealer's inventory control.

Block dealers offer liquidity to clients who want to trade large positions in the form of depth. They may offer to trade very large size to clients whom they know well.

Dealers supply liquidity only when they feel confident that they will make profit, i.e., they can recover from uninformed traders what they may lose to informed traders. They naturally try to avoid informed traders although they don't know who are informed. Dealers usually quote narrow spreads for small size, but quote wide spreads for large size to protect themselves from losses to well-informed traders. They are passive traders as they generally wait until their customers ask to trade with them.

Market makers' motive of offering liquidity is profit. Their quotes (bid and ask prices) represent the terms at which they will trade, and impatient customers who are liquidity takers accept those terms. Dealers trade very frequently; often try to discover the prices that produce balanced two-sided order flows. They avoid large inventory positions because large inventory positions expose them to losses if the market moves against them.

Value traders are informed traders; they collect information about fundamental values and trade when prices differ substantially from their estimates of value. Fundamental values

change when events occur that change valuations. Prices change to reflect changes in fundamental value when traders receive and digest news about events that change valuations. Fundamental values may differ from prices when fundamental values have changed but prices have not yet adjusted, or when prices change but fundamental values have not. Value traders therefore are liquidity suppliers as they exploit these opportunities when they buy underpriced instruments or sell overpriced instruments. When making these trades, value traders trade in response to the demands that other traders make for liquidity

Value traders are the ultimate suppliers of liquidity. When nobody else will trade, value traders will trade if the price is right. They supply liquidity in the form of depth because they are able to solve the adverse selection problem and are willing to keep buying (selling) when prices are significantly below (above) fundamental value. They generally do not care with whom they trade as long as they are confident that they have all available fundamental information. Value traders are passive liquidity suppliers because they generally will not trade unless impatient traders demand liquidity.

Value traders are usually slow traders. They must be very confident that they know everything relevant to estimating values. They therefore tend to trade after uninformed demands for liquidity have caused prices to change. Value traders often compete with each other to supply liquidity. Frequently some event may cause many value traders to try to trade at the same time. In that case, the quickest value traders will be the most profitable because they will incur the lowest transaction costs.

Value traders make markets resilient as they cause prices to return to fundamental values after uninformed liquidity takers cause them to diverge. They are able to make markets resilient when they are well capitalized, well informed, and are willing to trade.

Value traders hope to profit from speculating successfully on their information about fundamental values. The prices at which value traders will buy and sell constitute the outside spread. Outside spreads tend to be much wider than dealer spreads because value traders generally trade much larger sizes and because they must fund their research costs.

Patient traders offer liquidity only to lower the cost of trades that they intent to make but no hurry to complete. They may want to speculate, invest, hedge, exchange assets, or gamble. These traders are precommitted liquidity suppliers because they may eventually demand liquidity if their limit orders do not fill when they want the trade. Precommitted traders are often the most aggressive suppliers of liquidity, they place their orders close to the market. Therefore, bid/ask spreads are small in public auction markets where there are many precommitted traders.

Precommitted limit order traders supply liquidity in the form of immediacy since they are very aggressive. They typically do not offer significant depth because large traders are reluctant to display their standing limit orders.

Precommitted traders can drive dealers out of a market because they can price their orders more aggressively than dealers place their quotes and because they do not face the costs that dealers have to spend for doing business. However, dealers have an advantage over precommitted traders. They generally can adjust their quotes faster than precommitted traders can adjust their limit orders. If they have limit order books, they also can decide whether they want to fill an incoming marketable order or allow it to fill with orders on their limit order books. Dealers naturally will make these decisions to their advantage.

Arbitrageurs use information about relative values and trade on price discrepancies between two or more markets. Since arbitrage is a low-risk strategy, arbitrageurs can move substantial liquidity from one market to another. The effect of their trading is to connect

demands for liquidity in one market with supplies of liquidity in another market. Arbitrageurs are therefore porters of liquidity. They demand liquidity in the market where it is most available and supply that liquidity in the market where traders demand it. By bringing in more liquidity from other markets when traders demand it, arbitrageurs increase the depth in the market

Traders who will trade only if asked by a broker also offer liquidity. These traders allow other people to trade if they like the offer that is brought to them by the broker.

Liquidity is related to types of orders. Limit orders supply liquidity as they set the values at which market orders can trade. Market orders take liquidity because they demand immediacy of trade. Liquidity builds as limit orders are entered in the limit order book and is drawn down as market orders eliminate limit orders from the book. As discussed in Section I, Market-if-touched and tick sensitive orders supply liquidity, undisplayed (iceberg) orders that are held by a broker or in an electronic trading system offer liquidity as they allow orders on the other side to trade.

With continuing innovation in market structure, people's attention is shifting from building better generics to building more effective hybrids. Combining alternative systems is a complex task, but only when this is effectively accomplished will market participants receive the liquidity that they expect.

#### **IV. Recent Developments**

Innovation and improvements have been continuing in the most developed equity markets. With the advances in computer and communication technologies, ECNs (electronic communication networks) and ATSS (alternative trading systems) have been brought to the market and become more popular.

An ECN is an electronic system that attempts to facilitate (for market makers) or eliminate (for individual investors) third party orders entered by a client's brokerage to be executed in whole or in part. The advantage of an ECN is that it displays orders in real time, whereas on the NYSE, most investors can only view the best bid and ask prices. Through ECNs major brokerages and traders can trade between themselves without having to go through a middleman.

Cost of trading through ECNs is about 28 percent of the cost on the NYSE and 33 percent of the cost on Nasdaq market (Domowitz and Steil, 2001). The use of ECNs is low for NYSE-listed stocks; the NYSE receives about 80 percent of the order flow of its issues. By contrast, the use of ECNs is high for Nasdaq-listed stocks; Nasdaq receives less than 20 percent of the order flow of its issues (Schwartz and Francioni, 2004).

There are several variations of ECNs in the market, each differing slightly. Below we introduce some of the most popular ECNs and their basic characteristics:

Instinet (Institutional Network) was the first ECN in the world, started operation in 1969. It was originally designed for brokerages to display bid and ask prices for every stock in North America and abroad and was first used by institutions to trade with each other. Instinet was acquired by Reuters in 1987. The systems incorporated anonymity since June 1989 and since then order flow increased sharply. With its order-driven electronic platform and limit order display for customers Instinet looks very much like an exchange. It became an interdealer broker (IDB) for the Nasdaq market makers. The system is used to execute a large proportion of orders on Nasdaq and is primarily entered by market makers. Because of this exclusive access many of the large block orders on Nasdaq stocks are traded through Instinet. More recently Instinet has

tried to level the playing field by lowering access fees and allowing individual investors and small firms to access its orders. Now it includes a select group of smaller brokerages. Its IPO on May 18, 2001 was a big success.

Island serves retail order flow, is popular among smaller traders because everyone placing an order in the system is on equal ground. The system puts all active orders in the "Island Order Book," which lists all the bid and ask orders for each individual stock. It is considered very easy to use and relatively inexpensive compared to other ECNs. In short, Island allows anybody to access the Nasdaq in a way that was not possible in the past without becoming a member firm. Instinet acquired Island in September 2002, the consolidated operations is a single electronic marketplace called INET.

SelectNet is primarily used for trading between Market Makers. It is known as a negotiable system, market makers may or may not execute your order immediately as on other ECNs, although they are required to execute immediately if the order is at the advertised price and appears on the market maker's screen. SelectNet is popular among traders because orders can be preferenced, which allows a trader to isolate a particular market maker to trade with. This is advantageous because traders can target market makers who are active in the stock they want to trade. This way the trader will get immediate attention, which usually results in a faster execution.

Capital Markets' Burlington Large Order Cross (BLOX), OptiMark, LiquidNet, and Harborside+ are private systems for block trading. As discussed early in block trading markets, Optimark has been inactive since 2000 while the other three are very popular.

Archipelago started operation in January 1997; it serves both institutional and retail order flows. It may merge with the NYSE.

Companies also developed smart order routers, among which Lava is a popular one. Smart order routers consolidate information from various markets for most favorable execution.

Since 1990s, more entrepreneurs have created for-profit companies that offer rule-based order-matching systems. These electronic communications networks operate like brokers and look like exchanges. Many of these firms also develop software and provide network communications. Meanwhile, many brokerage firms have created similar rule-based order-matching systems to provide low-cost service to their clients. These brokerage firms therefore are like many exchanges, they grant their customers trading privileges instead of memberships. These developments represent growing competition with organized exchanges from dealer/broker trading systems. The Nasdaq market has been losing market share to ECNs because of their similarity, as mentioned above, Nasdaq receives less than 20 percent of the order flow of its issues. The NYSE, however, because of its unique strengths in floor trading and self-regulation, have not lost market share to ECNs.

Meanwhile, organized exchanges have been combining alternative trading mechanisms to build more effective hybrids. Many exchanges have rule-based electronic order-matching

systems that arrange trades between buyers and sellers. They are now more than just a place to trade they essentially became brokerages.

As discussed earlier, the NYSE has introduced the most advanced technologies for its electronic systems supporting its floor trading. The Nasdaq market and London Stock Exchange incorporated systems that handle both dealer and public limit orders, the Nasdaq market just introduced call auctions for opening and closing the market. The integration has evolved naturally on the NYSE where a floor based market including a public limit order book, a designated market maker (specialist), and additional broker-dealer floor traders and upstairs market makers/brokers. It is more difficult to integrate public limit orders into predominantly quote-driven market. The integration is particularly difficult and complex in a computerized environment such as that of the Nasdaq market. Details of order handling and trade execution must be spelled out clearly and precisely, and with strict reference to a clock that measures time in nanoseconds. It took the Nasdaq five years to design its SuperMontage and to go through the regulatory approval process.

SuperMontage is Nasdaq's electronic order display and execution system, it started trading in October 2002, added new SuperMontage limit order book in May 2003, and completed with an Alternative Display Facility (ADF) that is operated by the NASD. The system allows market participants to enter quotes and orders at multiple prices and displays aggregated interest at five different prices on both sides of the market (ranging down from the bid quote and up from the ask quote). The system offers full anonymity, follows price-time priority, allows market makers to internalize orders, including preferenced orders, and allows market makers and ECNs to specify a reserve size (i.e., market participants have an option not to display their full order). Nasdaq market added several functionalities to the SuperMontage in May 2003.

### Reserve to Follow Quote Update

Firms have the option to have the remaining reserve follow the quote to a new price level, whether the update is an uptick or downtick (from the previous quote). The options are indicated on the SuperMontage firm profile data with a “Carry Quote Reserve to a New Price” flag. This flag is applicable to all positions for that firm. If the flag is set to Yes, existing reserve will follow the quote update to a new price level (will not be reduced to zero). If the flag is set to No, the existing reserve will not follow the update (will be reduced to zero). Firms may make changes to their profiles. Previously, when a firm updates its quote price, any reserve associated with the quote was reduced to zero.

### CTCI (computer-to-computer interface) Liquidity Provider/Taker Indicator

Four-character field in the CTCI execution reports that indicates whether the firm is the liquidity provider or the liquidity taker on the trade. This information allows firms to better manage their firm’s position and billing processes.

### Closed Quote Indicator

Firms have an additional value in their quote update message that indicates if the market participant’s quote is Open or Closed to allow for functionality similar to Legacy (Small Order Execution System<sup>SM</sup> [SOES<sup>SM</sup>]) messaging. For example, the system will indicate a C (closed) when the market participant’s quote update closes the position or when the market participant’s position is in a non-trading state.

## Cancel All

Per the request of many subscribers, NASDAQ Trading Operations are able to cancel all market participant's SuperMontage orders without specifying their unique order IDs.

## Short Sale Validation and exchange traded funds (ETFs)

SuperMontage does not provide validation for short sale orders for ETFs and firms are not required to mark ETFs trades as short sale exempt. Previously, although short sale rules do not apply to ETFs, the SuperMontage system checked for the direction of the tick before executing a short sale order for an ETF. In order to work around this system issue, firms were required to enter all orders for ETFs as short sale exempt.

## New Firm Profile Fields

Two fields were added to the Firm Profile providing firms new options for managing quotes and summary quotes during the overnight file maintenance process. The options for both quotes and summary quotes allow users to indicate, on a firm-wide basis, if they would like to:

1. Carry over the end-of-day quote as is (both display and reserve);
2. Carry over display only (set reserve to zero); or
3. Do not carry over and cancel quote (both display and reserve).

Previously, firms' quotes were carried over from one business day to another only.

The advent of SuperMontage has gone a long way toward completing Nasdaq's transformation from a quote-driven market to a hybrid market that contains both quote-driven and order-driven mechanisms. As mentioned above, Nasdaq stock market is currently adding a

third component to the hybrid—a call auction to open and close the market. It is too early to judge the ultimate success of SuperMontage, but without question the system is key to Nasdaq's prospects going forward.

To compete with for-profit organizations and their ECNs, exchanges are converting from membership mutual organizations to for-profit companies. They want the flexibility to streamline control structures. The Stockholm Stock Exchange was the first to incorporate as a for-profit company in 1993. Following Stockholm's successful change of its governance structure, the Australian Stock Exchange, Euronext, the London Stock Exchange, the Nasdaq, the Toronto Stock Exchange, Deutsche Borse, and the International Securities Exchange<sup>5</sup> all became equity-based. The Chicago Board of Trade, Chicago Board Options Exchange, the Tokyo Stock Exchange, and the Swiss Exchange are moving toward demutualization. Price of the stocks of the Chicago Board of Trade has increased three hundred percent since 2002; the Nasdaq Stock Market Inc. went public in July 2002 and is listed on Nasdaq with the symbol NDAQ. Nasdaq wants to be an exchange and has applied for exchange registration. Companies adopt different forms after their demutualization, some have become public companies and are listed on their own markets, such as Deutsche Borse, Euronext, the London Stock Exchange, the Nasdaq Inc., and Stockholm, others remain private firms with their previous members as owners, and some retained their legal form of an association.

In the spring of 2005 a series of events in the U.S. equity markets well reflect this trend. On March 8, 2005, the NYSE CEO announced considering adopting electronic trading, thirteen days later, on April 21, the Big Board announced that it is going to merge with Archipelago. On the next day, April 22, Nasdaq announced that it is buying Instinet Network. Three days later, on

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<sup>5</sup> Formed in 1997, started trading U.S. equity options in 2000, is the only option exchange with completely automated trading system in the country.

April 25, Langone announced that he and his partners will buy the Big Board. People generally believe that Langone's bid for the Big Board will lead to the close of floor trading at the NYSE and will turn members into shareholders.

With the computer and communication technologies and automatic trading systems, 24 hour global trading is highly possible in the near future. The NYSE, Nasdaq market, and West European exchanges have been trading stocks of different countries. Major obstacles for international trading are administrative issues and exchange rate anomalies.

Dual listing has emerged and may become popular in the U.S. markets in the future. On January 12, 2004, Nasdaq announced a dual-listing initiative, six NYSE firms including Hewlett-Packard, Charles Schwab, and Walgreens were to list on Nasdaq as well as on the NYSE. Many listed stocks have already been trading on several platforms (ECNs), American on Line Time Warner, for example, is listed on the NYSE and traded on all U.S. regional exchanges, most ECNs and alternative trading systems, and some large foreign stock exchanges.

## **V. Comments and Suggestions**

This section provides comments and suggestions, which is the main purpose of this project. The comments and suggestions are based on the survey, the current condition of the Chinese stock market, and opinions of professionals.

The Shanghai Stock Exchange has the ambition and the potential to be an outstanding global exchange. In order to animate trading and improve services to meet traders' needs, the SSE needs to adopt certain trading mechanisms that have proven successful in the most developed markets.

Offer more types of orders. In the stock market, traders with different purposes need different types of orders. For example, informed traders are usually impatient and want to trade

immediately hence prefer market orders. In the world, all the top exchanges and most markets accept market orders. As a preparation for accepting market orders, the SSE and securities firms may need to educate individual stock investors about the price uncertainty of market orders, and establish operators to explain to traders why they did not get the price they saw when they submitted their orders. The need for this operation may be large at the beginning and then decline as more investors understand the uncertainty. Brokers may handle certain orders. A highly efficient NGTS (New Generation Trading System) combined with securities firms' systems may serve to provide more types of orders.

Introduce dealer/market makers. Market maker system is a key component of trading mechanisms in developed markets, dealers quote both sides and offer to buy and sell at their quotes for the public to sell and buy. They make market, increase liquidity and sharpen price discovery both inside and outside the exchange. Dealers' trading activities can also reduce information asymmetry because they have to research the companies and spread the information they obtain through their trading activities. These market maker functions are particularly important to an exchange where there is only one trading platform and during the time when trading is inactive. On the SSE trading has been relatively inactive for years, the introduction of dealers/market makers will animate both institutional and individual trades.

There is an argument that the Chinese stock market is among the most liquid and dealer/market maker is not necessary (孙培源等, 2002). However, even though higher liquidity is not of concern, dealer/market maker system is very helpful to animate institutional trade, block trade, and very helpful to financial institutions for product and service creation.

A potential problem, particularly at the early stage of dealer system is that some dealers may take too much advantage of, or cheat individual investors. The regulation should prevent

trade-through and front running by enforcing price-public priority<sup>6</sup>. A trade through occurs when a trade is made at a price that is higher than the best ask or lower than the best bid, and orders at these best prices are not included in the transaction. Front running means a broker improperly trade one order ahead of another. Regulators need to carefully monitor dealers' quotes, exact time of order submission and execution, and trade price. Market makers must report every trade to the SSE within a limited time (30 to 60 seconds) and confirm to the client the price, number of shares, and time of execution. Dealers should establish special individual accounts for each type of trade. Violators must be penalized revoking license, a multiple of the illegal income, in jail or both.

Another problem is that dealers may not be able to raise inventory capital. As discussed earlier, a dealer needs sufficient inventory of stocks for market making, and inventory capital is risky. The regulation needs to enforce dealers to disclose the purpose and incentives to investors when they raise inventory capital, and record market making trades in a special account.

There can be other problems and difficulties with the development of dealer market in China. The dealer market making system may be established in three steps:

1. Allow security firms to act as dealers and to make market on the Treasury-bond market first because the T-bond market is less volatile, the Treasury is the most trust-worthy borrower, and there is the least information asymmetry problem in the T-band market<sup>i</sup>. Both dealers and regulators will gain experiences in market making and regulation during the pilot period.

2. Start with specialists on the stock market. The NYSE has a stock allocation committee that assigns newly listed stocks to specialists, the SSE may consider establishing a committee for this purpose. There should be several specialists for each stock to ensure that no specialist firm

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<sup>6</sup> An electronic system needs to distinguish public (agency) orders from member (proprietary) orders.

will gain any monopolistic power in market making. Hence, a specialist will compete with other specialists and with public limit order submitters. The competition will press the specialists to reduce spreads and to improve services.

3. Grant all qualified security firms the right to make market in the stock market at the time when regulators feel confident.

Regulators may allow private dealers, which may improve efficiency and quality of services in the industry through competition with state dealers, and prepare for privatization of the industry.

Dealers should be allowed to trade directly with investors, not only through the exchange. In addition, securities firms should be encouraged to create more quality products for investors, which will lead to more funds flow into stock markets.

The SSE needs to prepare for allowing dealers to quote both sides on its trading platform, the system needs to distinguish public (agency) orders from member/dealer (proprietary) orders and follow price-public priority.

The SSE may extend services to local markets. There are informal, private direct and OTC markets in different areas of China for unlisted and delisted companies. The SSE may provide investors with information about the stock's prices and trading volumes, the companies' decisions on dividend, split, and repurchase, management change, merger and bankruptcy. These services would be helpful to individual investors, raise their confidence, enhance trading of the stocks, and increase the value of the shares. The information may be published in a system that is independent from the main system in order to avoid confusion and improper speculation. Once dealer market opens, the SSE need to cooperate, as well as to compete with OTC market or dealer market.

Allowing more institutional traders may also be helpful, such as allowing qualified commercial banks to participate in the stock market. The U.S. separated commercial banking and investment banking during the great depression, but recently allowed them to combine, e.g., Citibank and Smith Barney, JP Morgan and Chase Manhattan.

The regulation may allow dealers to open margin account with commercial banks. The central bank determines the initial margin at around 50 percent; the commercial bank determines the maintenance margin at a lower percentage, based on market conditions. Dealer's, not clients' stocks should be used as collateral, the bank keeps the collateral of stocks and monitor the dealer's account. This operation will channel bank funds into stock market, which will benefit both banking and securities industries.

Improve block transaction mechanisms. The SSE started block trade in 2003 but the trading has been inactive. The lack of block trading mechanisms, i.e., there is no block broker/dealer in the market, no liquidity tracker, and no anonymity, has stunted the growth of block trade. The long bear market and the high liquidity of the market also contribute to the inactivity.

With the existing simple block trading mechanism, large traders usually choose to submit their orders in small pieces in the major market in order to avoid the adverse price impact and possible front run against them at the cost of longer waiting time for execution. To attract block traders and activate block trade, the new system must be able to reduce trading cost and increase trading speed for customers.

In addition to the existing functions of the system, the SSE may build a hybrid system that combines the successful mechanisms in the most developed block markets in the world.

Such a hybrid system should include:

1. Upstairs block trade negotiation facilities and staffs who act as block brokers like the specialists on the NYSE for large traders. The staff assists the counterparties to negotiate anonymously by telephone, arranges the trade and then brings the trade to the “floor” for execution.
2. In addition to the current electronic system, incorporate a system that resembles the Harborside+ through which traders send indication of interest (IOIs), after the electronic system finds potential matches, a staff contacts the counterparties, and facilitate negotiation while keeping identities confidential.
3. Establish a block trade information system like the Liquidity Tracker<sup>ii</sup> of the NASDAQ. The electronic system and the up stairs staffs for block trade should have the ability to find liquidity or potential matches for customers, which requires the system to gather data of potential block traders and know who specializes in trading what stocks and their stock holding positions. The system should work as follows:
  - 1) The system records data of large transaction in a data system, including the stocks, sizes, identities and contact information of the traders.
  - 2) When a block initiation is received the system analyzes the data and finds the potential matches who may be willing to trade the block. A large trader who’s position of the stock is significantly above or below its average level at the time may well be a trader of the other side.

- 3) The system or staff contacts the first, then second...potential match, once a willing trader is found the staff assists the counterparties negotiate anonymously.
4. The existing system should incorporate anonymity (like the Harborside+ and LiquidNet) and iceberg order (as the Xetra) since anonymity is an important condition for block trade. Without anonymity traders would be reluctant to initiate block trade because of the concern over adverse price movement and front run against them. The experience of Instinet has evidenced traders' preference for anonymity, the system's order flow increased sharply since it incorporated anonymity in June 1989.
5. Accept all-or-none and minimum amount order contingencies.
6. Extend block trading hour from the current 15:00 – 15:30 to an hour in the morning and an hour in the afternoon during the regular trading sessions because informed traders may need to make a large transaction anytime in the day.
7. The price negotiation should be based on the existing price on the major market. The liquidity level on the SSE market is similar to that of the major U.S. markets (孙培源等, 2002). As discussed earlier, the average size of block trade on the LiquidNet is 50,000 shares and over 90 percent of it's executions are within the spread in the major markets. The SSE may introduce call auction for large block orders to reduce the possible price impact on the major market.
8. Execution of the arranged trade should include public orders of the same and better prices following price-time precedence. After the opening of block dealer and block broker market, the execution of outside block transactions may also include public orders of the same and better prices in the SSE's order book. The inclusion would benefit public traders, enhance equality and efficiency, reduce price volatility, and discourage price manipulation.

However, including public orders may lengthen the time for block execution by certain seconds.

The SSE or regulation should allow the execution of large block trade be displayed at least 30 minutes later to reduce price impact on the market. This is a typical situation where high level of transparency may have an adverse effect on the market. After the opening of block dealer and block broker market, block transactions outside the SSE should be reported to the SSE within a minute.

The current 500,000-share threshold for block trade is too high compared to the thresholds in the most developed block market in the world. As shown above, a block transaction is defined as 10,000 shares or more on the NYSE although transactions of 10,000 shares are commonplace in the U.S., and the average size of block trade on the LiquidNet is 50,000 shares. On the LSE, it is defined as 50 to 75 times the standard size, on Euronext, it is over 50,000 to over 500,000 Euros depending on the liquidity of the stock. Block transaction may be defined depending on the price impact of the order size and liquidity of the stocks. For the SSE, based on the liquidity estimate by 刘逖 (2002) and 孙培源等 (2002), a reasonable level now may be ranged from 50,000 to 100,000 shares.

Block broker and the upstairs staff must not front run customer's order, or pass the information about the block initiation to potential front-runners. Regulators should establish rules or codes to prohibit such actions and penalize violators.

The control of price manipulation and price change limits. It is possible that some traders manipulate price through block transaction. Currently, the SSE uses the trading day's price range as the upper and lower limits for block trade price, which may still leave room for price manipulation. In order to control price manipulation, the SSE needs to establish reasonable

deviation range from the existing price on the major market, which should be based on the estimate of price impact of block sizes within different size ranges. The estimation should be conducted on each individual stock because firms have different numbers of shares in circulation and the stocks are not the same liquid. If a negotiated block trade price deviates beyond the reasonable range, the trade must be submitted for approval and must be filed before execution. The SSE may build estimation models and set up computer programs to facilitate decision making on approving or disapproving the transaction in very short time. A 10 percent limit can be the maximum upper and lower limits, which is consistent with the 10 percent up or down trading price limit for individual stocks on the SSE. When the 10 percent up or down trading price limit is relaxed to some wider range, the upper and lower price change limits for block trade may be adjusted accordingly.

The inclusion of public orders of the same and better price, as discussed above, would discourage price manipulation because the manipulators would not rip all the benefit from their manipulation. In order to include public orders, negotiated block trades after the major market's close should be postponed to the next trading day before the opening of after-hour session.

Regulators should consider allowing block dealers, block brokers, and encourage the development of block dealer/broker market for large transactions. Block dealers and block brokers are key players in the block market because they facilitate their customers' trading. Block dealers offer liquidity when they buy or sell when their customers want to sell or buy. They demand liquidity when they rebalance their inventory, as they need to keep a balanced inventory. They can quickly make large transactions with customers at a single price, and then profit from trading the block at better average prices in the market. The trades may involve large blocks of a single security or contract, or portfolios of many instruments.

Block brokers find liquidity for customers. They do not keep inventory. They gather information about who likes to trade what stocks and the holding positions of the stocks, hence are able to find matches quickly for customers, reduce customers' trading costs, search time and execution time. Traders sometimes call block dealers and block brokers facilitators. Actually, informal block brokers already exist in China.

As discussed earlier, block traders face several problems. Latent demand problem refers to the situation that block liquidity suppliers are unwilling to expose their interest, they might trade if being asked. Block initiators need to find these potential traders on the other side. Order exposure problem refers to the situation that traders who know about impending blocks may change prices or wait, to the disadvantage of the block initiator. Price discrimination problem refers to the situation that block liquidity suppliers do not want to be the first to offer liquidity to a large initiator, only to see prices move against them when the large initiator continues to trade. Information asymmetry problem refers to the situation that block liquidity suppliers suspect that block initiators are well informed hence don't want to take the risk to trade. Well developed block dealer and block broker systems, up stairs facilities, specialists, and advanced electronic systems (and anonymity) in the most developed markets have proven successful mechanisms for mitigating or solving these problems, a hybrid of these mechanisms (with anonymous negotiation) at the SSE would help animate block trade in the Chinese stock market.

Allow short sales. Short sales can help reduce volatility, offer liquidity and continuity, and are necessary for risk management. The operation of short sales is not difficult. At the beginning, the SSE may allow only sophisticated investors selling short while educating general investors about the risk of selling short. To prevent manipulation, the SSE may limit the size of each account's short position during the experimental period. The SSE should also allow traders

to buy and sell the same stock in the same day because these trading activities tend to reduce volatility.

Design elaborate open and close call auctions to prevent manipulation by large traders, and adopt intra-day call auctions for illiquid and halted stocks. The problem of information asymmetry is more serious for illiquid and small stocks; call auctions can reduce information asymmetry by providing higher information efficiency as all traders have the same access to market information.

Establish trading halt rules for the market to mitigate market crash after some significant event; and for individual stocks to stabilize prices until sometime after major news about the company is released.

The minimum price increment may be reduced to 0.001 yuan for low-price stocks because the 0.01 yuan minimum price increment represents big spread hence high trading costs for low-price stocks. On the U.S. equity markets, the spread with 1-cent tick is 0.05 percent of the average stock price that is around \$20, moreover, the limit bid ask prices often differ by 0.1 cent on the Nasdaq market.

Establish more trading platforms. Exchanges in the most developed markets have been building more trading platforms in order to serve the needs of different traders and to compete with ECNs and ATNs of for-profit companies, and to reduce risks. By contrast, there is only one trading platform at the SSE, it can be very risky when unusual event occurs. In addition, securities firms in China have the capacity to (buy) build ECNs and ATN once they are allowed to, they will compete with the SSE by providing a variety of services to meet the needs of different traders through their systems. The SSE will take a strong position in the emerging

competition by providing more and convenient trading platforms that meet the needs of various traders, and reduce risk.

The SSE should be ready for potential competition from dealer/brokers' and their electronic systems. As discussed earlier, dealer/brokers' systems become more like exchanges while the exchanges are more like brokers in the most developed markets. In China, dealer/brokers' will eventually develop their trading platforms that can be similar to that of the SSE and compete with the SSE.

Financial futures and options are effective risk management instruments; they generally help to reduce price volatility of the underlying asset. Futures and options on indices and T-bonds should be introduced soon. Stock options may be introduced a couple of years later when participants and regulators feel confident about the markets. The SSE may train arbitrageurs whose activities can bring prices of the derivatives and of the underlying assets in line. However, because futures and options are the most risky instruments, trading futures and options should be limited only to institutional and sophisticated investors.

A sign of the SSE will help promote publicity of the SSE in China and in the world. The NYSE has its artistic building; the NASDAQ Stock Market built its huge screen several years ago.

We find the differences, reduce the differences as an emerging market, keep certain differences and create some differences as an innovator.

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TABLE 1-1. Order Properties

ORDER TYPE	USAGE	EFFECT ON LIQUIDITY	PRICE CONTINGENCIES	ADVANTAGES	DISADVANTAGES
Market order	Common	Demands immediacy	None	Fast execution	Uncertain price impact
Standing limit order	Common	Supplies liquidity	Trade price must be at or better than the limit price	Limited price with no price impact	May never execute
Marketable limit order	Common	Demands immediacy	Trade price must be at or better than the limit price	Limited price impact	Some price impact possible
Tick sensitive order	Occasional	Supplies liquidity	Must sell on an uptick or buy on a downtick	No price impact; adjusts with the market	Uncertain execution price
Stop market order	Occasional	Demands liquidity when it is least available	Triggered when price touches or moves through the stop price	Often used to stop losses when the trader is not present	Price impact can be large
Stop limit order	Rare	Triggered when liquidity is least available; offers liquidity on the side not needed	Triggered when price touches or moves through the stop price; trade price must be at or better than the limit price	Limits price impact	May not execute
Market-if- touched order	Very rare	Demands immediacy and supplies resiliency	Triggered when price touches or moves through the touch price	Fast execution following trigger	Uncertain price impact
Market-not- held order	Common among institutions	Broker decides whether to offer or take liquidity	Whatever the broker decides	Expert brokers may make better trading decisions with better information	Trader loses control over the broker

Source: Larry Harris, 2003.

TABLE 1-2. Market System Summary

MARKET TYPE	CLASSIFICATION	LIQUIDITY SUPPLIERS	TRADE ARRANGERS	BUYER & SELLER MATCHERS	COMMON EXAMPLES
Dealer	Quote-driven	Dealers	Dealers	Clients (or their brokers) choose dealers	OTC markets in currencies, bonds, and stocks
Oral auctions	Order-driven	Dealers and public limit order traders	Traders	Trading rules regulate negotiations	Floor-based stock, futures, and options auctions
Order-matching systems	Order-driven	Traders who issue limit orders	Brokerages or exchanges	Trading rules match orders	Electronic exchanges and automated brokerage systems
Brokered markets	Brokered	Public traders	Brokers	Brokers match traders	Block trading

Source: Larry Harris, 2003.

<sup>i</sup> T-bond dealers' main sources of income are price spreads of retail and block trades, they buy (sell) blocks and then sell (buy) the block at better average prices. Some dealers may also speculate, they buy and sell securities based on their expectation of the direction of price movement, make profit if their expectation is correct. As mentioned earlier, there are over 1,500 Treasury bond dealers/market makers in the U.S., which indicates that the T-bond market is very lucrative in the country. During my interviews with the executives of securities firms they all indicate that they are willing to be T-bond dealers/market makers.

The regulation should prohibit securities dealers from using clients' fund or securities for their own (priority) accounts. Once short and margin account is allowed, the clearinghouse should ensure that borrowed funds and securities are credited into the right borrower's accounts.

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<sup>ii</sup> Liquidity Tracker of the NASDAQ started operation in December 2002. The anonymous order delivery service was intended to complement the transparency and automatic executions of SuperMontage. Liquidity Tracker is not a trading system. It acts as an inter-dealer broker between buyers and sellers, it analyzes Nasdaq's trade data, brings together trading counterparties for anonymous negotiations of large trades through instant messaging, and uses SuperMontage's directed order functionality. Its service is like what a NYSE specialist sometimes does for large traders. When it finds a buyer or seller, it then forwards the order to the dealer or dealers. The first dealer to respond wins the trade. Neither the order recipient nor the order sender knows the other's identity until the transaction is complete.

Liquidity Tracker is not very successful because of the competition from Harborside+ and LiquidNet, and its narrow Nasdaq market makers only focus. Recently, the NASDAQ connected Liquidity Tracker to Harborside+, extended its coverage to smallcap securities, and reduced the fee from \$0.006 to \$0.004, (\$0.003 for over 5 million Shares per month) per executed share for members.