

## 10. NASDAQ

### 10.1 Overview

Historically, Nasdaq was the US “over-the-counter” (OTC) market.

The over-the-counter market was a loose network of dealers that traded stocks that were not listed on an exchange.

Stocks that traded over the counter were sometimes said to be “unlisted”. Over time, though, Nasdaq became a listing venue in its own right, with its own listing requirements and procedures. Still, stocks listed on Nasdaq are sometimes said to be “unlisted”.

The trading mechanisms in this market were once starkly different than those used on the NYSE. Over time, the market has become more regulated and better integrated. The similarities between the present-day Nasdaq and NYSE are more striking than their differences.

### 10.2 Capsule History

By the 1930’s, the OTC brokerage firms comprised:

- ̄ Retailers (agents for public investors)
- ̄ Wholesalers (made markets in stocks for the retail firms)
- ̄ Integrated firms (did both)

A typical trade involved a customer buying from a retail firm at a price that was marked up over the wholesale price.

Retailers and wholesalers frequently established relationships: a retailer would typically rely primarily on one *preferred* wholesaler.

Until 1938 (in the US), this market was largely exempt from regulation.

National Association of Securities Dealers (NASD) incorporated in 1939 to regulate and oversee members’ conduct.

The SEC also encouraged it to become involved in quote dissemination (in the wholesale market). This

encouragement culminated in a 1961 study that recommended automation.

In 1971, the National Association of Securities Dealers Automated Quotation (NASDAQ) system went online.

“Nasdaq” is now the name of the corporate entity that runs the market.

### **10.3 Organizational structure**

NASD/Nasdaq was historically a member-owned (“mutual”) cooperative.

It is currently in the midst of a protracted demutualization that will result in a for-profit publicly-traded corporation.

It is also undergoing a divorce.

Almost from the beginning, NASD has had a dual role

Regulation (of US securities professionals)

Market operation

In the 1990’s, it became apparent that these roles were incompatible and the organization was split.

NASD regulates

Nasdaq operates markets

The divorce is being spread out over many years. At present, NASD holds a substantial equity position in Nasdaq. NASD also provides regulatory services to Nasdaq.

#### **NASD (from its website)**

“[T]he world's leading private-sector provider of financial regulatory services...”

Under federal law, virtually every securities firm doing business with the US public is a member of this private, not-for-profit organization. Roughly 5,500 brokerage firms, over 92,000 branch offices and more than 670,000 registered securities representatives come under our jurisdiction.

NASD registers member firms, writes rules to govern their behavior, examines them for

compliance and disciplines those that fail to comply. We provide education to industry professionals and investors. We also operate the largest securities dispute resolution forum – with arbitration and mediation programs – in the world.”

### **Terminology**

Currently, the terms “Nasdaq”, “unlisted” and “OTC” are often used interchangeably.

The equivalence is loose: Nasdaq stocks are listed (with Nasdaq); NYSE-listed issues (like IBM) trade on Nasdaq.

Some OTC stocks don’t trade on Nasdaq.

### **Nasdaq’s markets**

Nasdaq owns and operates under the Nasdaq name:

- yi Nasdaq National Market (approx 3,200 issues)
- yi Nasdaq Small Cap Market (approx 800 issues)

Nasd/Nasdaq also owns

- yi The OTC Bulletin Board system (OTCBB).  
Nasdaq had intended to phase this out in 2003, replacing it with a new system, the Bulletin Board Exchange (BBX). These plans have been shelved.
- yi The American Stock Exchange  
This will probably be spun off.

Our discussion will focus on the Nasdaq National Market (NNM) and the Small Cap Market.

Although the two are distinctly different listing venues, they share the same trading systems and procedures.

#### **10.4 The Nasdaq listed companies**

Nasdaq was traditionally the first step in a successful company’s listing trajectory.

Companies that reached a certain size tended to move to the American or New York exchanges.

Beginning in the 1980's, many companies that could have moved ended up staying

Nasdaq was/is associated with high-tech.

This brand identity enabled it to grab a large share of new offerings in the 1990's, but the close identification with high-tech caused Nasdaq to suffer when high-tech collapsed in the spring of 2000.

NAS/NMS COMPOSITE (NASDAQ Stock Exchange)  
as of 18-Oct-2002



### 10.5 Market participants

“Market participants” on Nasdaq are designated firms or individuals that have varying degrees of access to Nasdaq information and trading capabilities.

A *query-only service participant* can directly access market information, but can't send in orders or trade.

The requirements to be a query-only service provider are minimal. NASD membership is not required.

An *order-entry participant* can send in executable orders to Nasdaq systems and report executed trades to Nasdaq.

An order-entry participant must be a NASD member, satisfy capital requirements, etc.

Order-entry participants are the descendants of the original OTC “retail firms”

A *market-maker participant* can act as a dealer, posting bids and offers on Nasdaq systems.

Market-makers are subject to the most regulation.

Market-makers are descendants of the original OTC “wholesalers”.

The trading structure of Nasdaq centers on the market-makers.

### 10.6 The market-makers

The MM’s are major US investment banks and non-bank securities firms.

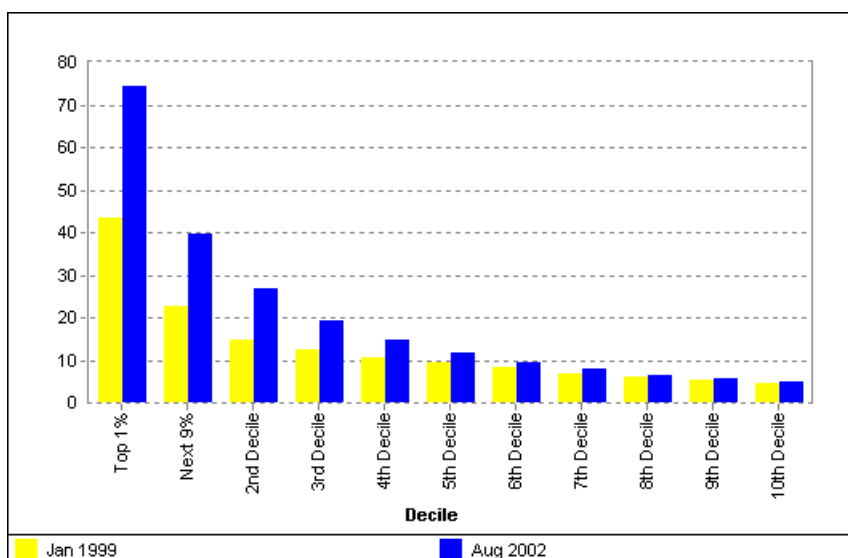
The larger Nasdaq-listed companies have an active MM presence.

In September 2002, MSFT had roughly 250 dealers including

Goldman Sachs (traded about 49 million shares)

Paragon Capital Markets (about 24 thousand shares)

#### Average number of market makers by dollar volume decile:



(Source: [www.nasdaq.com](http://www.nasdaq.com) → Inside Nasdaq → Market data → Monthly market data)

**MSFT activity by market participant:****TOTAL VOLUME****MSFT Microsoft Corporation**

Common Stock, NASDAQ National Market

Legend: M - Market Maker, NR - Non-Market Maker Reporting Member, C - ECN

TSO: 10,794,392,603 (as of January 31, 2004)

[VIEW GRAPH](#)Page  of 2 [Go](#)

Total # of MPs:		February 2004		January 2004			Year to Date	
<b>181</b>		Volume	Rank %	Volume	Rank %	Volume	Rank %	
MP Type	Volume	Rank %	Volume	Rank %	Volume	Rank %	Volume	
<b>Totals</b>	439,886,292		598,604,572				1,038,490,864	
<a href="#">GSCO</a>								
GOLDMAN, SACHS & CO.	M	54,098,915	1 12	58,348,876	1 10		112,447,791	1 11
<a href="#">SBSH</a>								
Citigroup Global Markets Inc.	M	42,810,551	2 10	52,643,563	2 9		95,454,114	2 9
<a href="#">JPMS</a>								
J.P. Morgan Securities Inc.	M	42,532,816	3 10	45,377,007	3 8		87,909,823	3 8
<a href="#">SCHB</a>								
SCHWAB CAPITAL MARKETS L.P.	M	28,890,714	4 7	43,396,153	4 7		72,286,867	4 7
<a href="#">PXCA</a>								
Pax Clearing Corporation	NR	22,488,996	5 5	7,947,973	23 1		30,436,969	9 3
<a href="#">MSCO</a>								
MORGAN STANLEY & CO., INCORPORATED	M	21,615,399	6 5	25,933,944	7 4		47,549,343	5 5
<a href="#">BRUT</a>								
Brut, LLC	C	18,294,263	7 4	19,261,435	8 3		37,555,698	7 4
<a href="#">LEHM</a>								
LEHMAN BROTHERS INC.	M	18,152,738	8 4	26,436,352	5 4		44,589,090	6 4

(source: [www.nasdaqtrader.com](http://www.nasdaqtrader.com) → trading data → monthly share volume)

Where are the ECN trades?

The two largest ECNs (Archipelago and Inet) don't report trades in Nasdaq-listed securities to Nasdaq. Archipelago reports as "P" (Pacific); Inet reports to the Cincinnati Stock Exchange.

**Nasdaq as a dealer market**

As a dealer market, Nasdaq has similarities to the FX and bond markets

There is no physical trading floor

Most customer trades are with a dealer.

Dealers can trade among themselves in an interdealer market.

However:

Regulation is much stronger than in the bond and FX markets.

Bond and FX markets are mostly institutional. Equity markets have numerous retail investors.

Transparency is better. It's easier for non-dealers to see what's going on.

Customers have stronger rights relative to dealers.

## 10.7 Typical trades

### Retail market order

E-trade (an order-entry firm) receives a retail order to buy 100 MSFT at the market.

By prearrangement, E-trade routes the order to Knight Securities (a market-maker)

Knight executes the trade.

Knight is the counterparty. If the customer is buying, Knight sells at the National Best Offer; if the customer is selling Knight buys at the National Best Bid.

Knight may offer "price improvement" on the trade.

### Retail limit order I

E-trade receives order to buy 100 MSFT limit \$40.

By prearrangement, E-trade routes the order to Knight.

Knight puts the order on its own internal book.

Display of the order (to the rest of the market) is required, but only in some circumstances.

Display procedures are stated in the SEC's Order Handling Rules (see below).

Execution of the order will occur when Knight sells to the customer (acting as a dealer counterparty).

This execution will generally be triggered when Knight *buys* for its own account at or below \$40.

Execution procedures in this instance are governed by the “Manning” rules (see below).

### **Retail limit order II**

TradeScape is a direct-access brokerage.

It is a front-end for sophisticated retail customers.

Customers can direct where their order will be sent.

A TradeScape customer sends an order to buy 100 MSFT limit 40 to Island.

The order is handled according to Island’s protocols.

### **10.8 Nasdaq’s market systems**

More than most markets, Nasdaq is defined by its computer systems.

These systems exist to:

- ̄ link the market participants
- ̄ partially consolidate trading
- ̄ give Nasdaq a unified collective identity for purposes of regulation and marketing (“brand awareness”)

These systems provide the following functions:

- ̄ Information collection and dissemination (bid, ask quotes, last trade prices)
- ̄ Order routing (transmitting orders between participants)
- ̄ Order execution

The most important system is SuperMontage.

### **SuperMontage**

Historically, the Nasdaq screen that displayed the consolidated dealer quotes was called the quote montage, or simply, the montage.

SuperMontage is the current incarnation of this system.

SuperMontage performs collection and dissemination of bids and asks, order-routing and execution functions.

It has subsumed the functionality of earlier systems:

SelectNet: an interdealer order routing system.

SOES and SuperSOES (Small Order Execution System).

In providing a “unified point of entry” for orders, SuperMontage is similar to the NYSE’s Common Message Switch (CMS).

### **Other systems**

- y Primex: auction system for small orders.
- y ACT: Automated Confirmation Transaction system (trade reporting)

## **10.9 SuperMontage**

(See Nasdaq’s SuperMontage Function Summary.)

SuperMontage went live on October 14, 2002.

Basically an electronic limit order book, but...

It’s not open to customers (only Nasdaq order-entry and market-maker participants and ECNs)

OE and MM participants may enter market orders.

Only MMs can post bids and offers.

SuperMontage comes closest to being an electronic limit order book for the interdealer market (like EBS in the FX market).

Many firms interact with SuperMontage via the application program interface (API) and custom systems.

Nasdaq also supplies a “standard” workstation (Nasdaq Workstation II).

Here is the “dynamic quote window”:

Sec: <b>YAHB</b>	<b>Detail</b>	<b>Nasdaq</b>	Vol: <b>18500</b>	PCL: <b>17.42</b>	<b>OP</b>	
Last: <b>17.66</b>	<b>C +0.24</b>	<b>03:52</b>	Hi: <b>18.47</b>	Lo: <b>17.55</b>		
NBBO: <b>17.44</b>	<b>Q 17.67</b>	<b>Q</b>	<b>2 - 9</b>	<b>YARDVILLE NATL BNC##</b>	<b>NNM</b>	
Nasdaq:			<b>D</b>			
Display Quote:						
Proprietary Quote:						
<input checked="" type="radio"/> Both <input type="radio"/> Bid <input type="radio"/> Ask           MPV: <b>0.01</b>						
up <input type="text"/>		NSDQ - Order <input type="text"/>		Send Clear		
Away	17.28 1	17.33 1	Join	Join	17.90 1	
	17.35 1	17.43 2	17.44 2	17.67 9	17.75 25	
	17.85 16					
BRUT#	d	2	[2]	17.44	17.67 [9] 9 p NITE	
MONT	p	1	[3]	17.43	17.75 [33] 24 p ADVS	
LEGG	p	1	[4]	17.43	17.75 [34] 1 p PERT	
ADFN	ADFN	p	3	[7]	17.41	17.85 [50] 16 d ARCA#
GSCO	p	1	[8]	17.35	17.90 [51] 1 p MSCO	
KBWI	p	1	[9]	17.33	17.94 [52] 1 p GSCO	
MSCO	p	1	[10]	17.28	18.00 [54] 2 p CIBC	
UBSW	p	1	[11]	17.20	18.25 [55] 1 p FJMC	
SDLR	p	1	[12]	17.20	18.30 [60] 5 p CINN- CINN	
MLCO	p	1	[13]	17.04	18.50 [61] 1 p SUSQ	
CINN	CINN	p	5	[18]	18.50 [62] 1 p SDLR	
SCHB	p	1	[19]	17.00	18.52 [63] 1 p KBWI	
MCBD	p	1	[20]	17.00	18.55 [64] 1 p LEGG	
HITE	p	1	[21]	17.00	18.57 [65] 1 p UBSW	
CIBC	p	1	[22]	16.90	18.65 [66] 1 p MLCO	
RYAN	p	1	[23]	16.80	18.70 [67] 1 p RYAN	
MCBT	p	4	[27]	16.75	18.93 [68] 1 p MONT	
<input type="button" value="1_NasDOE"/> <input type="button" value="2_QteMgmt"/> <input type="button" value="3_NasDOEScn"/> <input type="button" value="4_MPODF"/> <input type="button" value="5_SumScn"/> <input type="button" value="6_Settings"/> <input type="button" value="7_Trdrpt"/> <input type="button" value="8_Dial"/>						

Market Participant ID (MPID)

MSCO=Morgan Stanley, etc.

A “#” designates an ECN; BRUT# = MarketXT

“ADFN” is the Nasdaq Alternative Display Facility.

Although it is not shown on the screen above, there is an MPID code “SIZE”, which contains bids and offers submitted by market-makers who don’t want attribution by name.

**Entry of bids and asks**

“Bid 100 for 1,000 shares” is both a limit order and a “quote”.

In SuperMontage, only MM’s can directly enter a quote.

Customer limit orders are indirectly displayed.

If a customer limit order is sent to a MM, the MM must “reflect” the order in his quote.

A customer limit order can be sent to an ECN. The best bid and offer at the ECN will be displayed on SuperMontage.

MM's can enter only one bid and one offer.

When the system began operation, MM's could enter quotes at multiple prices.

MMs can designate quantities as "attributable" or "non-attributable"

Attributable quantities are displayed on the screen with the MPID.

Non-attributable quantities are aggregated in the "SIZE" MPID

MMs can designate all or part of the quantity as "reserve" (hidden)

A MM can have a visible quantity at a price and a reserve quantity.

At the MM's option, the system will "refresh" the visible quantity out of the reserve quantity.

### **10.10 Accessing ("executing against") the SuperMontage quotes**

In an electronic limit order book (like Island/Instinet or Euronext), orders execute against the book in price/time priority.

SuperMontage does not follow strict price/time priority. This flexibility accommodates the vestiges of the retailer/wholesaler relationships.

Executable orders are either

- non-directed
- preferenced
- directed

Non-directed orders execute against the book in price/time priority.

Preferenced and directed orders are addressed to a particular MM, who will generally execute the order.

#### **Preferenced orders**

If that MM is not at the inside quote, the order is returned unexecuted.

Example:

MSCO is bidding 100.00

PRUS is bidding 99.90

A market order to sell, preferenced to PRUS will be returned.

### **Directed orders**

The MM may accept directed orders on a negotiated basis (“non-liability”)

Example:

A market order to sell, directed to PRUS

PRUS has the *option* of executing the order (buying).

It will generally do this when it has a relationship with the entering firm.

Example:

eTrade may direct all market orders to Knight.

Knight pays eTrade for this relationship.

Directed orders are generally executed at the NBBO (regardless of where the MM’s bid and offer are).

In the first example, PRUS would generally buy at 100.00 (the best bid).

## **11. NASDAQ: THE TRANSITION TO THE PRESENT**

### **11.1 Outline**

In the 1990's Nasdaq was transformed by technological forces, regulatory changes, and the misbehavior of its dealers.

The main topics are:

- Collusion by dealers
- SEC response
- Manning rules
- order handling rules ("OHR")

### **Themes**

- y The rights of public traders. In a dealer market, a dealer is often
  - acting as an agent for the customer
  - trading against the customer
- Market integration
  - The perennial Nasdaq issue: How will multiple dealers be linked?
    - Who can we trade with?
    - Who must we trade with? (Who gets priority in trading?)

### **Nasdaq "problem areas" in the early 1990's**

Customer limit orders

Selective quoting

A dealer would have one set of quotes (bid and ask) for customers, and another for trading with other dealers.

(Some) Nasdaq dealers colluded in setting quotes.

In all of these areas, Nasdaq faced legal, regulatory, and customer pressure.

### **11.2 Handling of customer limit orders**

A limit order competes with a dealer.

Strong incentives for dealers to keep customer limit orders to themselves (not display them or allow them to interact with other orders)

Example

Suppose the best bid (among all the dealers in the market) is 100 and the best offer is 102.

A dealer receives a customer limit order to buy at 101.

Why would the dealer want to display this bid?

Why would the dealer willingly let a seller hit this bid (instead of hitting the dealer's own, lower, bid).

Customer limit orders are not handled well in most dealer markets, so they are rarely used.

### **Nasdaq limit orders pre-1990's**

Note: current order handling rules and procedures are vastly different. But pre-1990's . . .

The market is 100 bid, 102 offered, a customer sends a dealer a limit order to buy at 101.

The dealer could:

Hold the limit order order without displaying it.

Bid 101 and buy at 101 ahead of the customer

Buy at 99 (if there's a willing seller) through the customer

Turn around and immediately sell the stock to customer at 100.

The customer was only entitled to an execution when the insider market offer reached 101 (if ever).

Nasdaq dealers had an effective lock on the display of bids and asks.

Compare: on the exchanges (NYSE, etc.), limit orders had price protection and customer priority.

The differences lead to great frictions between brokers and customers.

Many retail customers sought satisfaction in arbitration. Their complaints were invariably overruled.

Some institutional customers complained, but others simply went to . . .

### **Instinet**

In some respects the first modern electronic communications network (ECN)

Founded in 1969; acquired by Reuters in 1987.

Started an electronic limit order for institutional customers, primarily in Nasdaq stocks.

Instinet did modest volume through the 1970's.

Major development: in 1980, Instinet let Nasdaq market makers onto the system.

Without Nasdaq dealer interest, trading activity was small.

The consequences of this entry explain why the current SEC is so preoccupied with market fragmentation.

### **11.3 Selective quoting**

Are the limit orders posted on an electronic limit order book like Instinet "quotes".

Functionally: YES

An Instinet participant (institution or market maker) could hit a bid or offer and get an automatic fill.

This was easier than hitting a dealer's quote, which entailed a phone call.

Legally: NO (prior to ca. 1995).

Instinet bids and offers were not included in the montage, and so were not visible to nonparticipating customers (mostly retail).

As a result, two markets developed

- ⌘ The retail market which relied on the quotes posted by market makers and provided no possibility for the display of limit orders.

- yi An “inner” market comprised of institutions and Nasdaq dealers who traded with each other on Instinet.

(SelectNet was also available for interdealer trade at non-public quotes, but for various reasons (inferior technology, lack of anonymity) was not widely used.)

It was common for a market maker to quote wide in the montage, but narrow on Instinet and/or SelectNet

Strategy question: Why didn't Instinet open its system to retail traders?

### **Summary of Nasdaq's market ca. 1993**

Divergence of retail and institutional order flow.

On the retail side:

Customers limit orders were not well-handled.

Customers who submitted market orders paid a wide bid-ask spread.

### **11.4 Collusion Charges in May, 1994**

William Christie and Paul Schultz (Professors at Vanderbilt and Ohio State, respectively) found “clustering” of Nasdaq quotes.

#### **Clustering**

Clustering is the tendency of the last digit (or tick) of prices to group on “natural multiples” of the tick.

In actual auctions (and in our auction games), bids tended to cluster on \$5 and \$10 multiples.

On the NYSE, when the tick size was  $1/8$ ,

We'd see more trades than we'd expect “at the figure” (whole number prices) and halves.

We see fewer than we'd expect on “odd eights”, e.g.  $7/8$ .

On the NYSE, this regularity was statistically significant, but modest.

Christie & Schultz noted that in Nasdaq quotes, clustering (on 1/4's) was extremely pronounced.

How to interpret this? Suppose we find that MSFT tends to have an average spread of 1/2.

Nasdaq dealers:

The spread simply reflects the costs of making this market.

C & S:

Fine. We'd still expect to see a fair number of bids on the odd eighths (e.g., 90 1/8, 90 3/8; with corresponding offers at 90 5/8 and 90 7/8).

In fact, we virtually never see odd-eighth quotes.

Charge: dealers have colluded to keep spreads wide by agreeing (perhaps implicitly) to never quote on odd eighths.

C&S study submitted to Journal of Finance for peer review. Accepted for eventual publication.

### **May 24, 1994.**

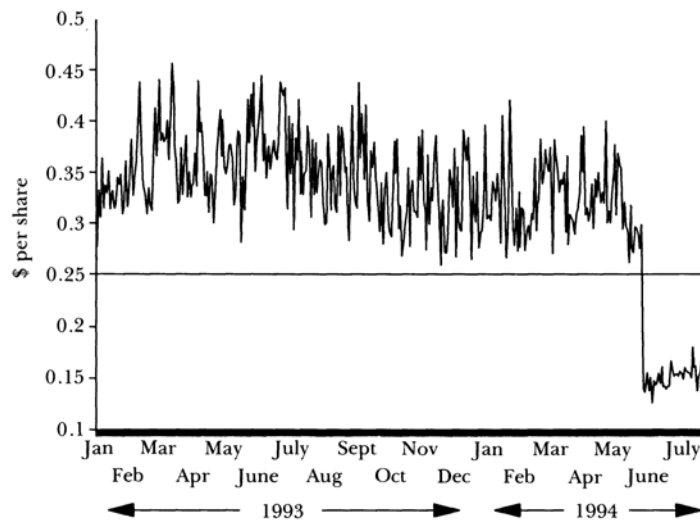
Vanderbilt issues a press release.

Security Traders' Association (STA) immediately convenes at Bear Sterns. Meeting attended by senior Nasd officers, senior STA officers, over 100 Nasdaq market makers.

Spreads in key Nasdaq issues immediately fall.

Figure 1

The Time Series of Daily Average Inside Spreads for Microsoft Between January 1, 1993, and July 29, 1994



SEC launches investigation. Department of Justice follows.

### SEC findings

The investigation might have gone nowhere, but it turned out that firms were taping their traders' conversations.

*Excerpts from the SEC "21a" report:*

A tape obtained in the investigation contains a conversation by a market maker who refuses to put an odd-eighth quote on Nasdaq when requested to do so by a retail broker, but indicates he will put an order on Instinet containing the odd-eighth quote.

He explains to the broker that displaying an odd-eighth quote in the stock on Nasdaq would make a "Chinese market," which is considered unprofessional and which other market makers do not like.

Trader: "I really can't do that 'cause it creates what they call a Chinese market, stock trades in 1/4 point. I'm on Instinet. If somebody wants to whack me at 7/8ths, that's where they're going to whack me."

The Commission recognizes the potentially pejorative connotation of the term "Chinese

market," and by repeating it herein does not condone its use by any Nasdaq market makers.

...

At times, a degree of imagination was applied to the harassing telephone calls. When one market maker narrowed the spread on certain occasions from 1/4 to 1/8, it received anonymous telephone calls in which the caller, in a phony Chinese accent, ordered chop suey, moo goo gai pan or other Chinese food, in an apparent allusion to the understanding among market makers not to make "Chinese markets."

### **The reforms resulting from the Nasdaq investigations**

SEC's primary goal was market reform (rather than punishment)

Major rule changes effectively strengthened the position of public limit orders (at the expense of dealer interest)

The rules were intended to advance a consistent regulatory policy across equity markets.

Applicable to the NYSE as well as Nasdaq.

Applicable in principle to other markets for which the SEC has jurisdiction (like the bond markets).

### **11.5 "Manning" rules**

(For a recent summary and interpretation, see NASD Notice to Members 03-74, NASD (2004))

"Manning" was the customer in an arbitration case involving E.F. Hutton

E.F. Hutton was later acquired by Shearson Lehman; Shearson Lehman was acquired by American Express, and then spun off under the Lehman name.

Adoption of rules was in process well before the "collusion" scandal broke

*Manning I* (Approved by SEC on June 29, 1994)

Dealers can't trade ahead of their customer limit orders.

Ex. Holding a customer order to buy at 100, the dealer can't buy at 100 (or a lower price), but can buy at a higher price.

*Manning II* (Approved by SEC on May 19, 1995)

Extends protection to limit orders placed by NASD members.

Why Manning II?

In many security markets, customer orders are passed on (to other brokers) by initial broker.

The initial broker may be too busy to give the order proper attention.

An NYSE floor broker working for Merrill, might have used an independent ("Two-dollar") broker to represent a customer order.

The hand-off may afford the initial broker greater flexibility in the handling of the order.

Converting a "dealer" to a "public customer"

Resolving a "dual trading" conflict

## 11.6 The "Order Handling Rules"

(See the [summary of the order handling rules](#).)

These rules marked the first official use of the term ECN ("electronic communications network")

Major components

- Limit order display rule
- Quote display rule
- Market order handling rule (proposed, not adopted)

### Limit order display rule

(See NASD Notice to members 99-99, NASD (1999))

A dealer who receives a customer limit order that betters the existing quote must execute it immediately or display it.

*Example*

Dealer bid 100 for 2,000 shares (shown on montage).

Customer limit order bids 101 for 200 shares.

Dealer must either

- ☐ execute the trade  
(sell to customer at 101)  
or
- ☐ change his bid in the montage to 101.

If the limit order is at the dealer's bid or offer, the dealer must revise his size to reflect the customer's order.

*Example*

Dealer bid 100 for 2,000 shares.

Customer limit order bids 100 for 200 shares.

Dealer must either

- ☐ execute the trade  
(sell to customer at 100)  
or
- ☐ change his size in the montage to 2200 shares.

**“The ECN Alternative”**

When a customer limit order arrives, as an alternative to changing his quote on the montage, a dealer may pass the order along to an ECN if the ECN is linked to the public display.

**Limit order display: the NYSE experience**

The NYSE did not always display customer limit orders.

*Example*

ABC is 100 bid; 101 offered; 50 x 50  
 (“100 bid for 5,000; 5,000 offered at 101”)

Customer enters limit order bidding 100.25 for 200 sh.

We'd expect see quotes revised: 100.25 bid; 101 offered; 2 x 50.

In actuality, often the new quote was never displayed.

NYSE specialist: trading public cares about prices at which there is significant depth. 200 shares too small to warrant showing.

Madoff et al.: the NYSE is keeping the “true” inside market to itself. This disadvantages customers.

Ca. 1993, NYSE called for display of all orders that could not be immediately executed.

This was positioned as an interpretation of an existing rule.

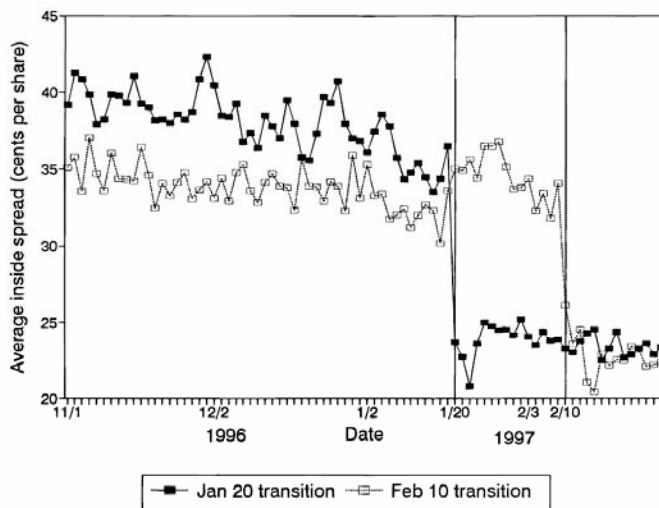
### Quote Display Rule

Amendments to pre-existing rules that require all bids and offers to be publicly displayed

A market maker must make publicly available any superior prices he/she is quoting on an ECN.

MM can't bid or offer more aggressively on Instinet or than he is quoting on SuperMontage.

### 11.7 The impacts of the rule changes. (Barclay et al., 1999)



**Figure 1. The time-series of time-weighted average dollar inside spreads for stocks phased in under the new SEC order handling rules.** The first fifty stocks are phased in on January 20, 1997, and the second fifty stocks are phased in on February 10, 1997. Average inside spreads are computed by weighting each spread by the fraction of the trading day that particular spread was in effect. The averages are computed daily for each stock, then averaged across all stocks in the particular sample.

### **11.8 Electronic communications networks (ECNs)**

ECNs defined in the SEC's order handling rules (op. cit.) as a medium for electronic dissemination of bids and offers

Not necessary to have execution facility (but many do).

Most are constituted as electronic limit order books.

Most ECN's started by trading Nasdaq stocks

Issue: should the best ECN bids and offers be incorporated into Nasdaq's montage (of dealer quotes)?

Recall that dealers have market presence and capital requirements. Limit orders don't have these responsibilities.

SEC: montage (later/currently SuperMontage) must incorporate ECN bids and offers.

#### **The Principal ECNs**

- y Instinet/Island (Reuters)
- yi Archipelago (joint venture of Goldman, eTrade, etc.)
- yi Brut (Sungard; NYSE: SDS)
- yi BTrade (Bloomberg)
- yi Attain (Domestic Securities, Inc.)
- yi Track (subsidiary of Track Data Securities Corp; Nasdaq NMS: TRAC)
- yi NexTrade (privately held)
- yi REDIBook (joint venture of Spear, Leeds & Kellogg, Charles Schwab, etc., merged into Archipelago in 2002)

## 12. OTHER EXCHANGES

### 12.1 Introduction

For US equities, we've covered the key markets: NYSE, Nasdaq and the ECN's.

To fill in more of the picture:

- Amex (American Stock Exchange)
- The regional exchanges
- Alternative trading systems (Section 13)

### 12.2 The American Stock Exchange

Started up in the 19th century as the “curb” market.

Became the middle tier listing venue for companies that had “outgrown” Nasdaq and “weren't ready” for an NYSE listing.

This role has largely vanished.

Amex has a prominent role in equity derivatives.

Although both NYSE and Amex started option floors, only Amex's became successful.

Amex “introduced” long term index options and exchange-traded funds.

### 12.3 The regional exchanges

At one point in the 19th century, the US had over 100 stock exchanges.

They specialized in listing and trading of local and regional companies.

By the 1920s there had been extensive consolidation, and only a few regional exchanges remained.

The trading structures on most of these followed the NYSE pattern: floor trading with a specialist.

By the end of the 20th century, the business models were starting to diverge.

The surviving regionals are: Boston, Philadelphia, Pacific, Chicago, Cincinnati.

**Boston (Exchange ticker symbol “B”)**

Extensively electronic and modernized.

Remains a floor-based market with specialists.

Lists regional companies, but also trades NYSE issues.

**Philadelphia (Exchange symbol “X”)**

Highly electronic, but still has a trading floor.

Trades equities, but most growth has been in derivatives (FX options, etc.)

Introduced a “remote competing specialist system”

Multiple specialists + remote access = electronic dealer market.

From their web site: “On the equity floor, PHLX's PACE (Philadelphia Automated Communication and Execution) system was one of the first automated equity trading systems on any exchange.”

**Pacific (Exchange ticker “P”)**

Formed from a merger of the LA and San Francisco exchanges.

After the merger, had two trading floors, then one.

In 2000, the Exchange entered into an agreement with Archipelago (and ECN). As a result:

Pacific Stock Exchange became the regulator of Archipelago (instead of NASD)

Pacific now has no equity trading floors.

All equity trading is done on the Archipelago Exchange.

When you see a quote associated with “P”, it is the top of the Archipelago book.

Exchange retains an options trading floor in San Francisco

From the Pacific web site: “[The Pacific] was the first exchange in the world to build and operate an electronic trading system.”

**Chicago (Exchange symbol “M”)**

Formerly the Midwest exchange

Highly automated, retains a floor.

Niche: Trading Nasdaq issues under exchange trading rules.

This is distinctive: most of the regionals went after trades in (NYSE-) listed companies.

From their web site: “1982 CHX launches the MAX system, becoming one of the first stock exchanges to provide fully automated order execution.”

**Cincinnati (Exchange symbol “C”)**

Started as a floor-based market in Cincinnati (Ohio).

Presently has no floor; located in Chicago.

Recent history closely intertwined with that of Madoff Securities (a major broker and market-maker)

From the 1980’s through the present, Madoff has been a strong competitor to the NYSE in the execution of retail orders in listed stock.

The Cincinnati exchange was (among other things) the regulatory storefront for this activity.

From their web site: “We created the first all-electronic stock exchange in the United States.”

### 13. ALTERNATIVE TRADING SYSTEMS

#### 13.1 Introduction

The term “alternative trading system” encompasses four general sorts of mechanisms.

- Derivative markets
- Crossing markets
- Continuous ATSS

The legal framework for these markets is contained in:

#### 13.2 SEC “Reg ATS”

Formal title: Regulation of Exchanges and Alternative Trading Systems

Enacted (after much debate) in December, 1998

Prior to the rule, anyone who wanted to set up a securities market either

- had to become an exchange (extremely difficult), or
- get the SEC to issue a “No action” letter  
A guarantee that the SEC would not prosecute the operators of the new market

Effectively, market structure decisions were being made case-by-case

Reg ATS established

- A broad regulatory framework.
- Conditions under which a new market could start up with minimal regulation.

#### Definition of an ATS (from the rule)

Alternative trading system means any organization, association, person, group of persons, or system:

That constitutes, maintains, or provides a market place or facilities for bringing together purchasers and sellers of securities or for otherwise performing with respect to securities the functions commonly performed by a stock exchange ...;

This part is extremely broad: “bringing together” covers many diverse aspects of the brokerage business. Other provisions and interpretations impose or imply restrictions in the scope of the rule.

[An ATS] does not:

Set rules governing the conduct of subscribers other than the conduct of such subscribers' trading on such organization, association, person, group of persons, or system; or

Set rules governing the conduct of subscribers other than the conduct of such subscribers' trading on such organization, association, person, group of persons, or system; or

Discipline subscribers other than by exclusion from trading.

These provisions exclude the NYSE, Nasdaq, etc.

The most important provision is:

A new market can register as

- ⌘ an exchange (heavy regulatory burden); or
- ⌘ a broker-dealer

If the new market registers as a broker-dealer ...

... a system with less than five percent of the trading volume in all securities it trades is required only to: (1) file with the Commission a notice of operation and quarterly reports; (2) maintain records, including an audit trail of transactions; and (3) refrain from using the words "exchange," "stock market," or similar terms in its name.

This last provision led to the introduction of many new trading systems.

### **Who/what are the ATs?**

All of the ECNs are ATs

But there are many non-ECN ATs

Non-ECN ATs are generally electronic, institutional markets. They include:

- ⌘ NYSE crossing sessions

- ̄ Instinet (besides its ECN) also runs Global and VWAP crossing markets.
- ̄ Posit (ITG, Inc.)
- ̄ LiquidNet
- ̄ Tri-Act (ITG, Inc.)
- ̄ NYFIX Millennium

Not all of the newly-introduced ATSS were successful. Defunct venues include the Arizona Stock Exchange and Optimark.

It is worth emphasizing that both of these ventures were well-capitalized efforts organized by seasoned brokers and traders.

### **Digression: Derivative pricing and derivative markets**

With derivative pricing, the price at which trades take place is determined by the price in some other market (the primary market).

A derivative market is one that relies almost exclusively on derivative pricing.

All markets take into account to some extent the prices at other markets.

In many systems, the midpoint of the NBBO prevailing at the time of the trade sets the price.

Derivative markets depend crucially on the integrity (reliability, absence of manipulation) of the price in the primary market.

Note: A derivative security (option, futures contract, etc.) is priced off of the underlying security. Sometimes the term “derivative market” refers to a market for derivative securities.

### **13.3 The NYSE Crossing sessions**

#### **Crossing markets/networks**

Traders submit directions (buy or sell) and quantities, but no prices.

There orders are submitted electronically and are not externally visible.

Prices are determined by taking another market price as a reference.

Sometimes this price is determined prior to the match; sometimes after.

Crossing markets are sometimes called “zero impact” trades.

There is symmetry between the buyer and seller.

Nobody hits/lifts someone else’s bid/ask.

### **NYSE Crossing Session I**

Crossing Session I operates between 4:15 and 5:00 p.m. (EST).

It enables members to enter one-sided, two-sided, or good-til-executed orders for a particular stock into the SuperDot system for execution at 5:00 p.m.

Matched orders are executed at the NYSE closing price determined during the Exchange's 9:30 a.m. to 4:00 p.m. trading session and are printed on the consolidated tape.

Average 2001 volume: approx 3 MM sh/day (fact book)

Avg total NYSE volume: 1,240 MM sh/day.

### **Crossing Session II**

Crossing Session II operates between 4:00 p.m. and 5:15 p.m. (EST).

This session is designed to facilitate trading of baskets of at least 15 NYSE securities valued at \$1 million or more.

Members that have either facilitated a basket trade, or have paired two customers' baskets, submit aggregate information to the Exchange for execution.

At 5:15 p.m., the NYSE prints the aggregate information of all baskets executed in this session to the consolidated tape. On the third day after trade date (T+3), the individual component stocks executed as part of a basket trade are printed in aggregate form in the NYSE Daily Sales Report.

Avg 2001 volume: 21 MM sh/day

**Order strategy in crossing markets using previously determined prices**

NYSE Crossing Session I: Orders accepted at 4:15. Cross operates between 4:15 and 5pm.

Suppose the trading desk for ABC mutual fund follows the strategy of sweeping all unfilled orders into the session at 4:15, and checking at 5pm to see if anything was done.

Example: the closing price of KO was 56. ABC puts in an order to sell KO. If there's a match, ABC sells KO at 56.

Danger: KO makes a significant positive after-hours news announcement. It is clear that KO will open tomorrow substantially above 56. A smarter trading desk puts in an order (to the crossing session) to buy KO. ABC gets a (bad) fill.

If there's no announcement (or a negative one), ABC finds that it usually doesn't get a fill.

ABC tends to get filled when the market has moved against it.

(The winner's curse.)

There are relatively few one-sided orders in the cross.

**13.4 Instinet Global Crossings**

Comprises three separate crosses: End-of-day, VWAP and Japan

Readings: Global crossing fact sheet; News policy

**End-of-day cross**

3:30 P.M.–6:30 P.M. EST, Instinet Global Crossing accepts and accumulates buy and sell orders for US equities from its clients worldwide.

6:30 P.M.–9:00 P.M.: The "matching" process begins by

- uploading closing price data,
- checking corporate actions,
- verifying order entry accuracy, and
- enforcing Instinet's News Policy (!)

At approximately 9:00 P.M.,

Instinet Global Crossing executes one massive cross between all clients' orders.

In the Cross, all trades are executed at the last sale for NYSE-listed equities and at the mid-point of the closing Nasdaq market on a next-day trade date basis.

Where an order does not find a match in the Cross, it is returned "unexecuted" to the client.

Instinet's regulation

From the Global Crossing Fact Sheet:

Instinet ... monitors late-breaking news and client activity to provide a fair and level trading environment for all clients.

Excerpts from "Instinet Global Crossing News Policy"

Instinet requests that its clients refrain from entering orders in the affected securities into Instinet Global Crossing.

Instinet reserves the right not to trade any specific security at any time.

If Instinet determines that a client's trading style is reactive or event-driven, i.e., the client places an order to purchase or sell securities that may be impacted by, or in response to, information disseminated immediately before or after the close of the market, that client will be categorized as an "Event-Driven Client."

An "Event-Driven Client" will be able to trade only with other Event-Driven Clients and with those Passive Clients who choose to expose their orders to them.

Instinet reserves the right to suspend or terminate service to any client that Instinet, in its sole discretion, reasonably believes to be acting in a manner inconsistent with the Policy.

Instinet VWAP cross

VWAP is value-weighted average price [per share]

$\$ \text{ Volume} / \text{Share Volume}$  for the day.

Example: 1,000 shares @ 50; 2,000 @ 55; 1,000 @ 58.

$$\text{VWAP} = (50,000 + 110,000 + 58,000)/4,000 = 54.50$$

Institutions often use it as a benchmark to evaluate their trading desks and brokers.

In the VWAP cross, buyers and sellers are matched before the start of the day's trading.

Japan crosses

VWAP cross (as in US)

Morning close cross

The Tokyo Stock exchange operates morning and afternoon sessions.

Planned crosses:

Morning intra-session

Afternoon intra-session

ITG's Posit

Buy and sell orders, including both individual stocks and portfolios, are entered into the system from many sources.

Eight times daily — 9:40, 10:00, 10:30, and hourly from 11:00 to 3:00 Eastern Time — the main POSIT computer processes and compares all orders confidentially.

POSIT matches take place within a five minute window after the match times indicated above. You don't know exactly when the match will occur. This discourages manipulation.

POSIT trades are priced from the stock's primary market [not the NBBO] at the moment the match is run. Trades are matched at the midpoint of the bid/offer spread (the difference between the best seller's asking price and the best buyer's bid).

Those orders which match are automatically executed. Immediately after each match, clients receive electronic reports showing match results for their orders. Clients then decide whether to keep unmatched orders in the system for future matches or to execute them by other means.

### 13.5 ATs with continuous trading:

#### General design

Buy and sell quantities are entered into the system anonymously.

If there is a match with a quantity already in the system, then

- The buyer and seller are brought together in a chat room to negotiate price (LiquidNet), or
- There is an execution according to a rigid protocol. (Tri-Act and Millenium)

#### Negotiation on LiquidNet

Buyer and seller are brought together anonymously.

Typically, agreement is quickly reached at the midpoint of the NBBO (Rubenstein Theorem from bargaining)

There is some quantity negotiation.

Each side sees a scorecard for the counterparty that summarizes how often the counterparty has successfully concluded negotiations.

This is to prevent someone from putting in an “order” that they have no intention of trading, just to see if there is interest on the other side.

#### TriAct and NYFIX Millenium

Relatively new class of market mechanism.

Most traditional markets are “sticky”.

When an NYSE specialist receives an order, he will go to great lengths to avoid sending that order elsewhere.

TriAct, Millenium (and a few other markets) don't position themselves as final destinations.

To institutions sending in market orders, they say, in effect, “Sending an order to the NYSE? Why not stop at our place first. You might get a better price.”

If we don't have an immediate match for your order, we'll forward it to the NYSE with no delay (or as close to "no delay" as systems allow).

NYFIX calls these "pass-through" orders

To institutions sending in limit orders, they say, "Why not post in our system. It's invisible and anonymous. And, if you trade in our market, you'll only be trading against our select clientele."

### **13.6 Tri-Act (ITG)**

Players (all institutions)

Liquidity demanders ("market order traders")

Liquidity suppliers ("limit order traders")

Crossing clients

Mechanisms

Continuous blind limit order market

Ongoing crossing sessions (two per minute)

Regular Posit matches (eight per day)

"Path 1" A blind ECN

Using the ITG Platform, a liquidity supplier submits an order to sell 5,000 shares of XYZ. A market order to buy 2,000 shares of XYZ enters TriAct. Instantly, the liquidity supplier order is partially filled and the market order is fully executed.

The 2,000 share transaction is automatically priced based on the best current bid, 20.4, and the best current offer, 20.8. Because the liquidity supplier gets 75% of the spread and the trader submitting the market order gets 25%, the 2,000 shares are transacted at 20.7 and both parties benefit from price improvement.

The liquidity supplier's remaining 3,000 shares stay in TriAct where they are continuously exposed to all three kinds of execution opportunities.

Path 2: Frequent crosses

Trade over time against other liquidity suppliers

The liquidity supplier who originally entered an order to sell 5,000 shares of XYZ completed a transaction for 2,000 of those shares, so a sell order for 3,000 shares of XYZ remains in the TriAct pool.

Another liquidity supplier submits a midpoint-eligible order to buy 4,500 shares of XYZ. Within seconds, the 3,000 share sell order is fully executed. As the best bid is now 20.2 and the best offer 20.6, the 3,000 shares are executed at the midpoint, 20.4. Since both parties are liquidity suppliers, they share equally in price improvement.

#### Path 3: POSIT

After a partial fill against a liquidity supplier, an order to buy 1,500 shares of XYZ is still in the TriAct pool and a POSIT match is coming up. The order is swept to POSIT, where it crosses with an order to sell 1,000 shares. Like all POSIT executions, this transaction is priced at the midpoint, which remains at 20.4.

The remaining order to buy 500 shares of XYZ is swept back to TriAct for potential execution against market orders, other liquidity supplier orders, or in the next POSIT match.

### 13.7 NYFIX Millennium

NYFIX, Inc. supplies trading software.

The “FIX” part of the name refers to the Financial Information Exchange protocol, a data transmission standard for communications between customers, brokers and markets.

NYFIX Millennium is an ATS operated as joint venture of NYFIX and leading sell-side firms.

Among other things, the system accepts

- Pass-through orders

If an incoming order can't be executed immediately, it will (at the users option) be forwarded on to its next destination at no charge ("pass- through orders").

yi Conditional orders

Essentially hidden limit orders in the system. They will be matched anonymously against incoming orders.

They are called conditional in that they can be activated/deactivated/modified by a wide range of decision rules.

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