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The Stock Exchanges and Automated Trading Centers

... listing and trading conduits

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The 2005 Game-Changer Mandate: The SEC Regulation National Market System (Reg NMS)

This massive mandate, created in 2005 and now being implemented, was intended to create a competitive, self-regulating, and largely automated **national market system** for securities.

Among its features:

1. “Consolidated tape” for all exchanges.
2. Rule 611 – orders trade at the **best possible price** (NBBO).
3. **Standardized trading rules** to be followed.
4. Rule 610 - Equal access to all markets by all players.

Electronic Communications Networks (ECNs) now being called Automated Trading Centers (ATC)

- Fully electronic trading and clearing networks
- Most were originally independent, and designed to compete with NASDAQ and NYSE, but many were absorbed (Instinet, Archipelago, the Island) and others have become exchanges.
- Oldest was Instinet (1960), specializing in institutional trades, purchased by NASDAQ.
- Some specialize in **after-hours** trades (normal trading hours are 9:30 to 4:00 EST).
- They introduced low-latency full automated (computerized) trading.

So what, precisely, is a stock exchange?

A stock exchange is any ATC or physical exchange that legally adopts rules for itself and its members that comply with the requirements of Reg NMS, subject to approval of the SEC. The *technology* used by the exchange, for example for order routing, must be capable of insuring this compliance. There are currently four trade groups that meet this criteria:

1. NYSE Euronext
2. NASDAQ OMX
3. BATS Exchange
4. Direct Edge



All of these have global components. They are competitive.



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Major Exchanges – NYSE Euronext

- Retains physical exchange - 1 Wall St. NYC
- Oldest and most traditional of US exchanges 1792
- Still relies in part upon **open outcry** system, but rapidly converting to hybrid pure electronic.
- Merged with EuroNext in 2007.
 - which was formed by merging Amsterdam, Brussels, and Paris exchanges (2000), then acquired London derivatives market (LIFFE) and Portuguese exchange, making it the largest cross-border market in the world.
 - Euronext stocks are not (yet) traded directly in the US *but* they do have a **Universal Trading Platform** now, for large clients only?
- 8,500 listed companies, many European
- Listing standards higher than NASDAQ and companies tend to be larger, more mature, but many exceptions.

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NYSE – 4 US dedicated exchanges

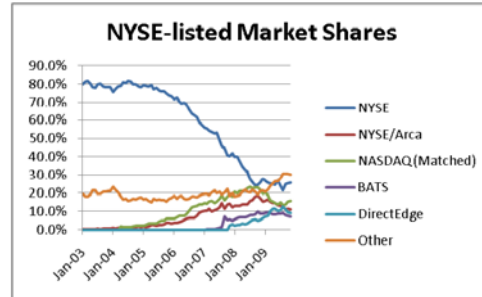
1. **NYSE** – the traditional open-outcry physical exchange located at 1 Wall Street.*
2. **NYSE Arca** – the fully electronic exchange
 - Purchased Archipelago, an ECN, in 2005.
3. **NYSE Amex** – old Amex business dedicated to lost and trading small-caps and mid-caps
 - Purchased AMEX, a failing competitor, in 2008
4. **Arca Edge** – fully electronic version of Arca dedicated to trading OTC stocks (smaller US stocks not listed on NYSE or NASDAQ)

*I no longer describe the workings of the physical exchange in these lectures.



Observations about NYSE

- Your order, if routed to **NYSE**, would go to **NYSE Arca**.
- **NYSE** tried for too long to fight automated exchanges because (IMHO) it was a profitable good 'ol boy system, then the conversion came a little too late.
- ... consequently NYSE continues to loose market share.



Source: Barclays Capital Equity Research

Note: These are NYSE-listed only.

Source: James J. Angel, Lawrence E. Harris, Chester S. Spatt, *Equity Trading in the 21st Century*, February 23, 2010

NASDAQ, BATS, & Direct Edge The fully automated markets



NASDAQ OMX Group

- National Association of Securities Dealers Active Quotation system - no longer associated w/ NASD
- Decentralized electronic exchange since 1971
- 3,600 companies listed on **NASDAQ OMX** in 50 countries.
- **INET** global high-speed trading platform (former ECN acquired in 2007)
- NASDAQ listing and trading are separate functions
- Still the biggest player, but fighting off the competition.



The newest – BATS Exchange and Direct Edge (the pure technology plays)

- Both started as ECNs (ATCs)
- Both aspired to **SEC Reg NMS** compliance
- Both are global
- Both sell mostly **speed** and **low cost** (and NMS compliance)
 - The secret on speed is **order routing** that is **NMS Rule 611 compliant**.
- Both are active in options trade (Tape B trade)
- Between them they seem to have at least 20% market share.
- BATS scans against **dark pools** (explained later).
- Direct Edge is directly marketing speed, cost, and compliance.
- Both appear to be aggressive at attracting algos and market makers.

Over-the-Counter Bulletin Board (OTCBB) stocks

- 30,000 stocks listed on the "Pink Sheets"
- Go to www.otcmarkets.com, find **WAMUQ** (Washington Mutual)
- Many delisted companies these days
- Largely illiquid and extremely speculative
- FAX and chatroom stocks
- Odd hi-priced stocks (see HSNTF; on Jan 23 09 stock went from \$1.62 to \$143.32 exactly 100K share, because of Obama wind/solar speech? – now 84 cents)
- Minimal listing requirements
- A good way to enable shareholders of privately-held company to find venue for selling shares

Market Makers

- Market Makers are large trading firms who are committed to provide market liquidity through active bidding, buying and selling in designated stocks.
- For NASDAQ, market makers have a Market Participant ID (MPID) ... these you see as 4-letter symbols on NASDAQ TotalView (Level II).
- Many of these market makers also accept order routing from trading sites (like NITE).
- Underwriters for an IPO are required to be market makers for the new stock.
- For trading, market makers have additional privileges on order type (see material on open/close NASDAQ OMX) and trade with proprietary software, NASDAQ Workstation, or through firms like Neovest (see neovest.com as an example).



Example: Market Makers / MPID who provided liquidity for INTC in Nov 2008.

Monthly Share Volume Report

INTC - Intel Corporation

November 2008

Rank	MPID	MP Name	Volume
1	WEDB	Wedbush Morgan Securities Inc.	177,963,457
2	GSCO	Goldman, Sachs & Co.	122,443,203
3	CDRG	Citadel Derivatives Group LLC	119,856,460
4	MSCO	Morgan Stanley & Co., Incorporated	82,741,074
5	SBSH	Citigroup Global Markets Inc.	81,920,023
6	FBCO	Credit Suisse Securities (USA) LLC	69,122,841
7	UBSS	UBS Securities LLC	66,325,830
8	JPMS	J.P. Morgan Securities Inc.	48,562,010
9	NITE	Knight Equity Markets, L.P.	39,680,819
10	MLCO	Merrill Lynch, Pierce, Fenner	39,308,747

Source: <http://www.nasdaqtrader.com>

Does Reg NMS really address this problem?:

Large institutional traders like mutual funds and hedge funds often want to trade huge blocks of the same stock (e.g. 100,000 shares) over a short period of time. But they want to do it anonymously, because if the market knew their intentions, other traders could game the transaction.

So the market must provide liquidity to these traders (have enough stock out there being sold and bought on spec and arbitrage to offer sufficient volume for these large block trades.

Traditionally these large block trades were broken up and handled anonymously in pieces, and they still are to some extent, but now they are more likely to be handled by **dark pools** and **intermarket sweep orders (ISOs)**.

The answer to our question seems to be yes, but we did have a **flash crash!**

Dark Markets and Dark Pools

- Dark markets do not publicly post their transactions
 - you won't see large block transactions on NASDAQ TotalView, although you will see pieces of them if and when they are broken into smaller trades
- Dark pools are ECNs that trade dark market transactions
- The SEC allows them to facilitate secret large block trades
 - because an informed market would go against the trades
 - What if someone knew you were trying to sell 300,000 shares of F?
- Dark pools must report trades monthly on Reg NMS Rule 605.
- Dark pools seem to account for between 15% and 20% of total market volume.

Dark Market ECNs

Many dark pools trade in sizes comparable with displayed markets; Only a handful are truly block venues

VENUE	AVG TRADE SIZE IN JULY (# Shares)	JULY ADV (Adjusted, millions of shares)
LIQUIDNET	59,139	41.4
PIPELINE TRADING	48,132	14.6
ITG POSIT	~6,000	~28.0
GOLDMAN SACHS SIGMA X	600	142.0
BNY CONVERGEX VORTEX	525	4.4
BIDS TRADING	449	12.4
LEVEL ATS	418	44.1
CITI MATCH	409	50.5
LEHMAN LX	400	51.0
NYFIX MILLENIUM	360	27.7
KNIGHT LINK	333	103.0
GETCO EXECUTION SERVICES	323	47.1
INSTINET CBX	299 ^a	21.9
DIRECT EDGE ECN	293 ^b	52.7
MORGAN STANLEY MS POOL	275	22.5
ISE MIDPOINT MATCH	257	29.0
CREDIT SUISSE CROSSFINDER	213	71.0

**BATS
Dark Scan**

Source: Rosenblatt Securities Inc., Trading Talk, August 26, 2008.

Comment on volume

Intermarket Sweep Orders (ISO)

Level II bids XYZZX	
BID	Vol (100s)
15.98	134
15.97	147
15.96	65
15.95	231
15.93	45
15.92	101
15.90	85
15.88	87

Suppose a large-block trader wants to quietly buy 50,000 shares of **XYZZX**. That would effectively take him down to 15.95 if he tried to access only “protected quotes” (the term used by Reg NMS to refer to the public quotes that show up in Level II – he also has the option of using a dark pool).

This trader can send out this entire order or part of this order as an ISO, a series of linked limit orders, market orders, or limitable market orders, simultaneously or in rapid order to multiple ATCs using a protocol designed to get the best prices for this stack.



GETCO

Who are the algo traders?

short pipes!!

Algo(rhythm) traders, also called hi-frequency traders and hi-speed traders, use completely or partly computer programs to generate many low-latency bids and asks, and by so doing, provide liquidity to the markets.

XYZZX	
BID	ASK
15.98	15.99

Most market makers are now also algo traders but not all algo traders are market makers. Market makers are *required* to make a market in their designated stocks, but algo traders in general are not (you can be an algo trader).

Some market makers pay for market order routing to come to them. Suppose the MM pays for **XYZZX** market orders. Suppose the Level 1 Bid and Ask above is represented by the MM. Then if MM gets a market order to buy and another to sell they execute at these prices and the MM makes a penny.

It looks to me like algo traders now have sophisticated strategies for trying to get the most out of ISOs and large block trades – they put in bids and asks all the way down the queue, then often withdraw them quickly – like some sort of bid/ask chess.

Hmmm ... maybe a few bugs?

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The flash crash of May 6, 2010



At 10:42 AM PDT I and millions of others watched the DJIA fall about 700 points in 15 minutes in an otherwise quiet day. Then it recovered nearly as fast. PG, a DJIA component, is shown here. Accenture and a handful of other stocks fell to one cent, and thousands of share were traded at the price.

What happened? Nobody is yet quite sure to this day. It appears that (and when I saw it happen I judged it to be this) that a large series of computer generated ISOs wiped off the top of a couple of key queues (like Dow component PG) which sent indexes tumbling, which triggered circuit-breaker shutdowns of algo trades, which removed liquidity and depleted the ask stacks and remaining algo traders and probably ISOs took them down to nothing. (I have seen an entire ask stack disappear from time to time).

Blue type denotes "typically"

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Order Management Systems

A broker (including online), market maker, and ECN will have an Order Management System consisting of:

- A [java interface](#) for clients to enter orders and send instructions (ETrade) or an API to allow users to design their own interface (MBTrading)
- A computing link to a [proprietary routing network](#) or a [FIX hub and spoke network](#) (see later slide)
- A [FIX 4.x standardized software](#) installation for routing (or accepting) trading orders, execution, and reporting.
- An accounting system to maintain records for clients and other transaction parties.

The FIX (Financial Information Exchange) Protocol

- See <http://www.fixprotocol.org>
- Software **standardizing** protocol used for routing trading orders (market and limit), execution, and reporting.
- Globally an estimated 80% to 90% of global equity trades transacted through FIX protocols.
- Now rapidly expanding into yield-bearing, derivatives and FOREX.
- Began in 1994 as a proprietary experiment between Fidelity and Salomon Brothers.
- Programmers first learn FIX protocol specs (from website above) then design their FIX engine, buy a canned one, or tweak an open-source engine like QuickFix(3).
- I notice that neither BATS nor Direct Edge use it.

A Fix 4.2 example

```

BeginString(8)=FIX.4.2
BodyLength(9)=190
MsgType(35)=E
SenderCompID(49)=INST
TargetCompID(56)=BROK
SendingTime(52)=20050908-15:51:22
MsgSeqNum(34)=200
ListID(66)=14 BidType(394)=1
TotNoOrders(68)=1
NoOrders(73)=1
ClOrdID(11)=order-1
ListSeqNo(67)=1
Symbol(55)=IBM
Side(54)=2
OrderQty(38)=2000
OrdType(40)=1

```

Sample take from a forum on fixprotocol.org provided by Rajarao Bandu, posted on Sep. 28, 2005. Evans changed the commands some (to shorten).

Actual script is typically not written with field descriptors.