PRESENTATION TO

E-Finance Lab Conference

Trading on Markets – What do Customers Want?

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Agenda

- An introduction to algorithmic trading

- What do algorithmic traders want from markets?

- What does the future hold?

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A Brief Introduction to Citadel High Frequency

- Our style of trading is algorithmic trading, representing proprietary trading, institutional execution, and retail order flow execution

    – We trade every major electronic market

- We represent a substantial portion of global exchange-traded volume

    – Typically execute between 1 and 2 million trades per day, and can account for up to 10% of global equity volume

- We save money for other market participants

    – Volume promotes price discovery

    – We help keep bid/ask spreads tight in order to attract order flow

    – We offer price improvement to retail clients

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The Role of Algorithmic Trading in the Current Market

- Algorithmic trading "smoothes the market"

    – by alleviating market fragmentation:

        ▸ The typical algorithmic player is technologically sophisticated and connected to multiple trading venues

        ▸ As a whole, the algorithmic community provides seamless liquidity "translation" across the overall market

    – and by reducing short-term price volatility

- Algorithmic traders provide a valuable service to all investors

    – Higher turnover facilitates price discovery and both certainty and immediacy of execution

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## Principles on which Algorithmic Traders Operate

- Algorithmic traders rely on electronic data to make trading decisions. Every piece of information matters.

- Speed is very important. Most algorithms make split-second trading decisions and do not want their orders delayed.

- Anonymity is the key factor differentiating algorithmic traders from traditional floor or upstairs traders.

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Algorithmic Traders and Exchanges

- Both sides need each other to function

- Algorithmic traders bring liquidity to exchanges

- Exchanges provide algorithmic traders with the electronic tools they need in order to make markets
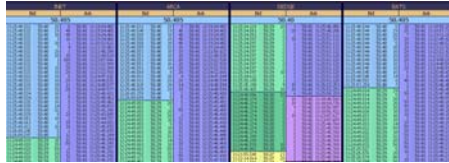

	Growth Rate
Sell Side	7%
Traditional Buy Side	28%
Hedge Funds	11%

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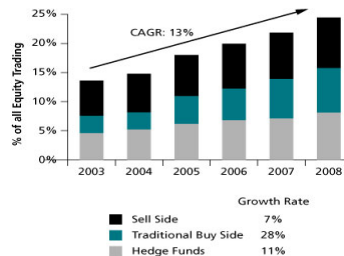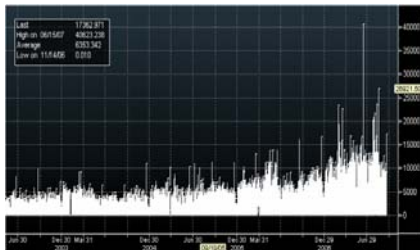
Trends in Trading on Exchanges

Past, Present, and Future

- Full and open market data dissemination

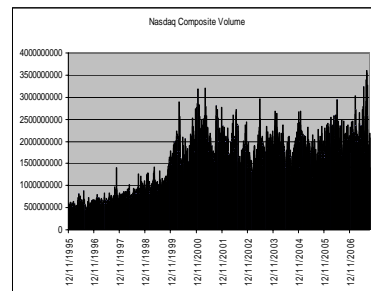- Speed, reliability, and ease of access

- Equitization

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Market Data: past versus present

- Past: floor based trading conveyed information to floor-based participants, but not uniformly

- Electronic markets add universal price discovery, and by virtue of anonymity, remove subtle human and psychological signals

- Most importantly, electronic exchanges remove barriers to access and preferential treatment: anyone with a computer and network can view prices and trade

- "Democratization" of the market has led to an explosion of volume

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Market Data: What do Customers Want?

- Information is king. The more information liquidity providers have about the current state of the market, the more liquidity they can provide.

- Types of information algorithmic traders use:
  - full depth of book
  - order based feeds
  - timely and directionally identified trades data
  - millisecond timestamp resolution

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Market Data: Open and Close Processes

- On-open and on-close: disseminating full depth of book in addition to indicated price and indicated volume improves price discovery

- Open and close prices are one of the most important sources of price information available to the public

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The Quest for Speed

- Electronic traders need accurate and timely information, and speedy electronic order and execution confirmations

- The consistency of a trader's experience is more important than cutting out a few extra microseconds of latency.

Ease of Access

- The widespread adoption of the FIX protocol has broken down most barriers to entry

- Some obstacles to free and open trading remain in place:

    – Membership requirements

    – Disincentives to post limit orders

    – Regulatory overhead

- Limit orders are the cornerstones of price discovery and promote trading

Equitization

- PHLX

  – Overall market share doubled (8.5% to 17% in two years), due almost entirely to equitization pact with Citadel Derivatives Group

  – Citadel went from trading 50,000 contracts per day on PHLX to trading over 700,000 contracts per day (500,000 per day YTD, OCC volume YTD is approximately 10.8 million contracts per day)

- BATS

  – Market share climbed from 3% to 5%

  – Very broad partnership

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Equitization

- DirectEdge

  – Partnered with Citadel and Goldman Sachs

  – Market share increased from 2% to 5%

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What Happens next?

- A more efficient current market

  - Technological and algorithmic "upgrades" in banks blends distinction between players

  - Elimination of artificial order restrictions and barriers to entry creates smoother and more liquid market with lower transaction costs

  - Reduction in costs brings non-linear increases in volume

  - Simplified regulatory environment to promote fair, efficient markets

- Broader trends

  - Fragmentation & Competition

  - Market data enrichment

  - Equitization

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Takeaways

- Algorithmic traders and electronic volume have grown tremendously and there is more volume to come

- Richer market data will improve market quality

- Reliability is crucial

- Equitization creates targeted volume growth and improves the competitive landscape

- The changes in markets are likely to accelerate

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