Fragmented Markets and Maker-Taker Pricing

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Outline

- Current (U.S. or European) equities and options markets are different now in fundamental ways
  - High Frequency Trading and Algorithmic Trading
  - Markets are fragmented
- Markets are competitive: Investors have more options or access than ever before
  - Brokers compete for customer order flow through aggressive pricing
  - Exchanges and trading venues compete for order flow by reducing execution fees
- Fierce competition has fostered new innovation

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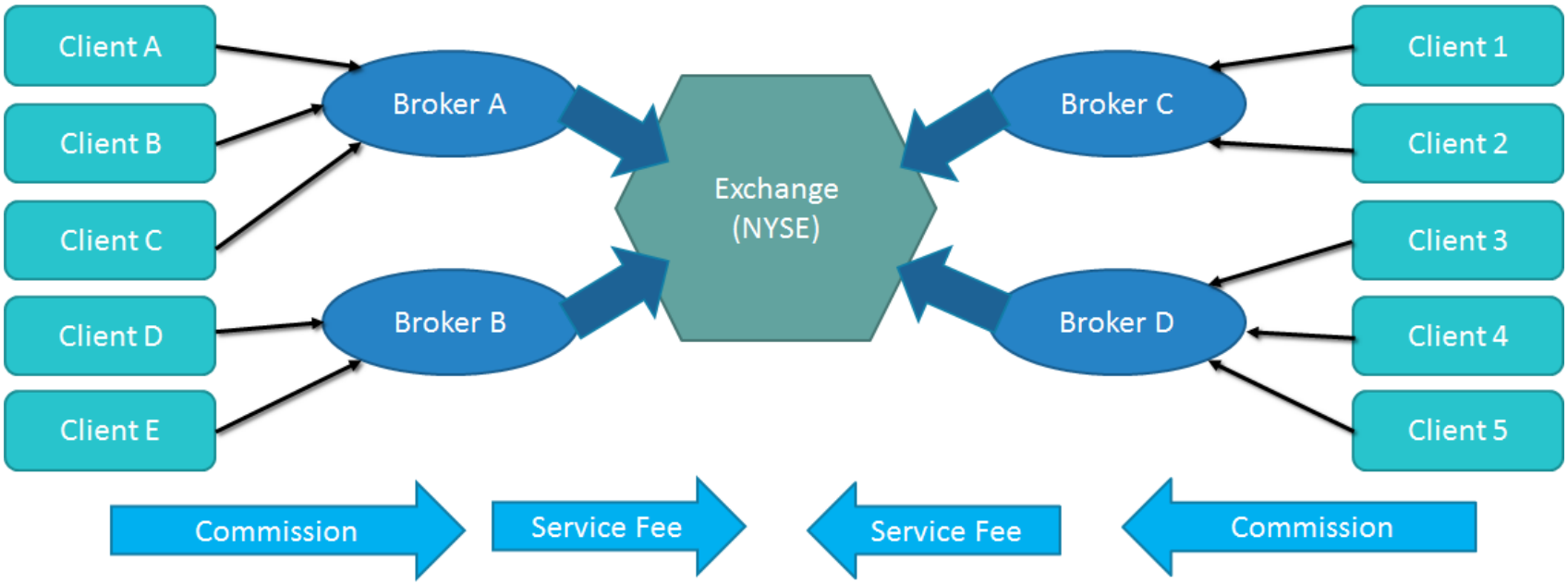
Scottrade takes great pride in seeking best execution for its clients' equity and option orders, and we recognize the importance of delivering quick and efficient executions. That's why we thoroughly review key execution metrics including price improvement percentage, execution price and execution speed on a daily basis.

The traditional arrangement

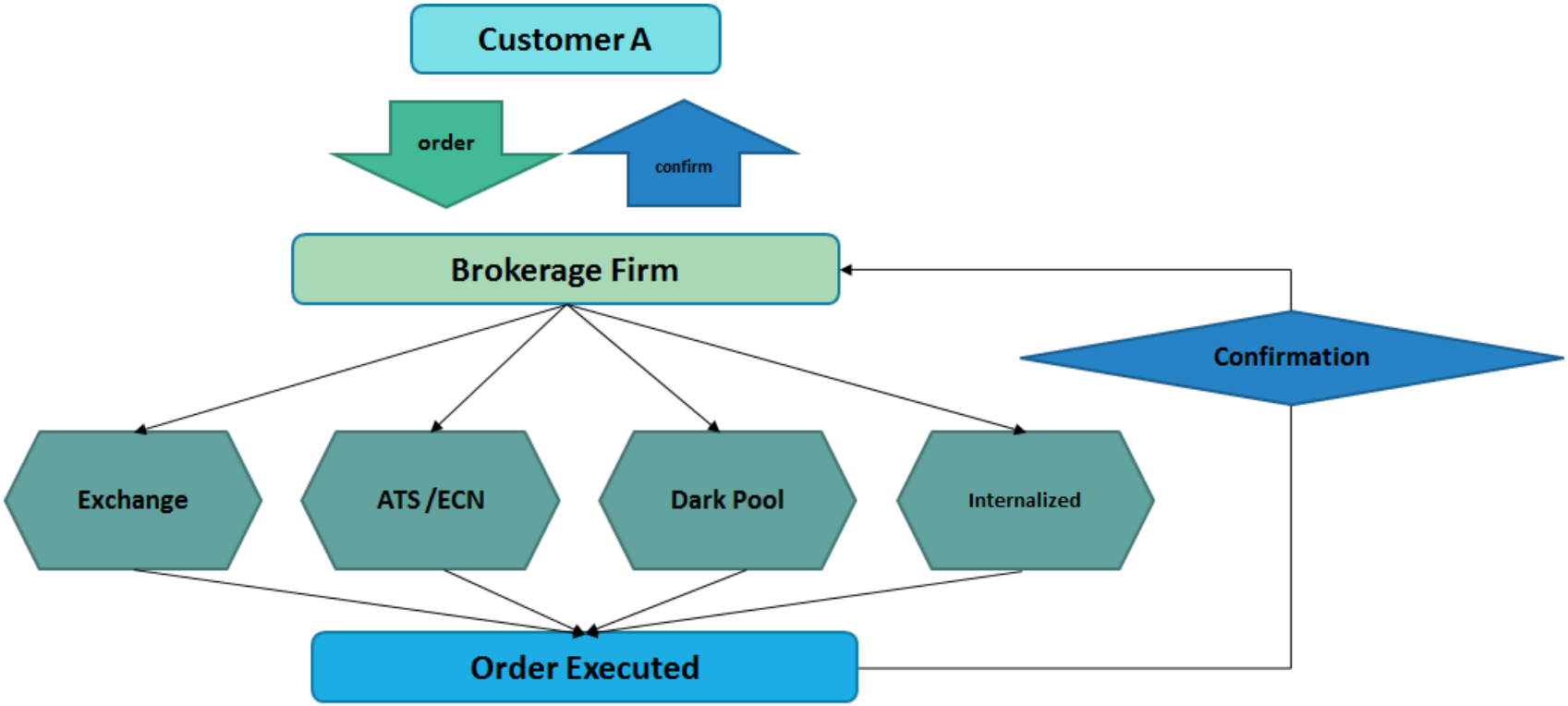


- The customer paid a **standard** commission, which covered exchange fees
- The exchange service fee was usually based on executed shares, **no matter how** the execution was accomplished

The forces of technology, speed, and computer-based trading...

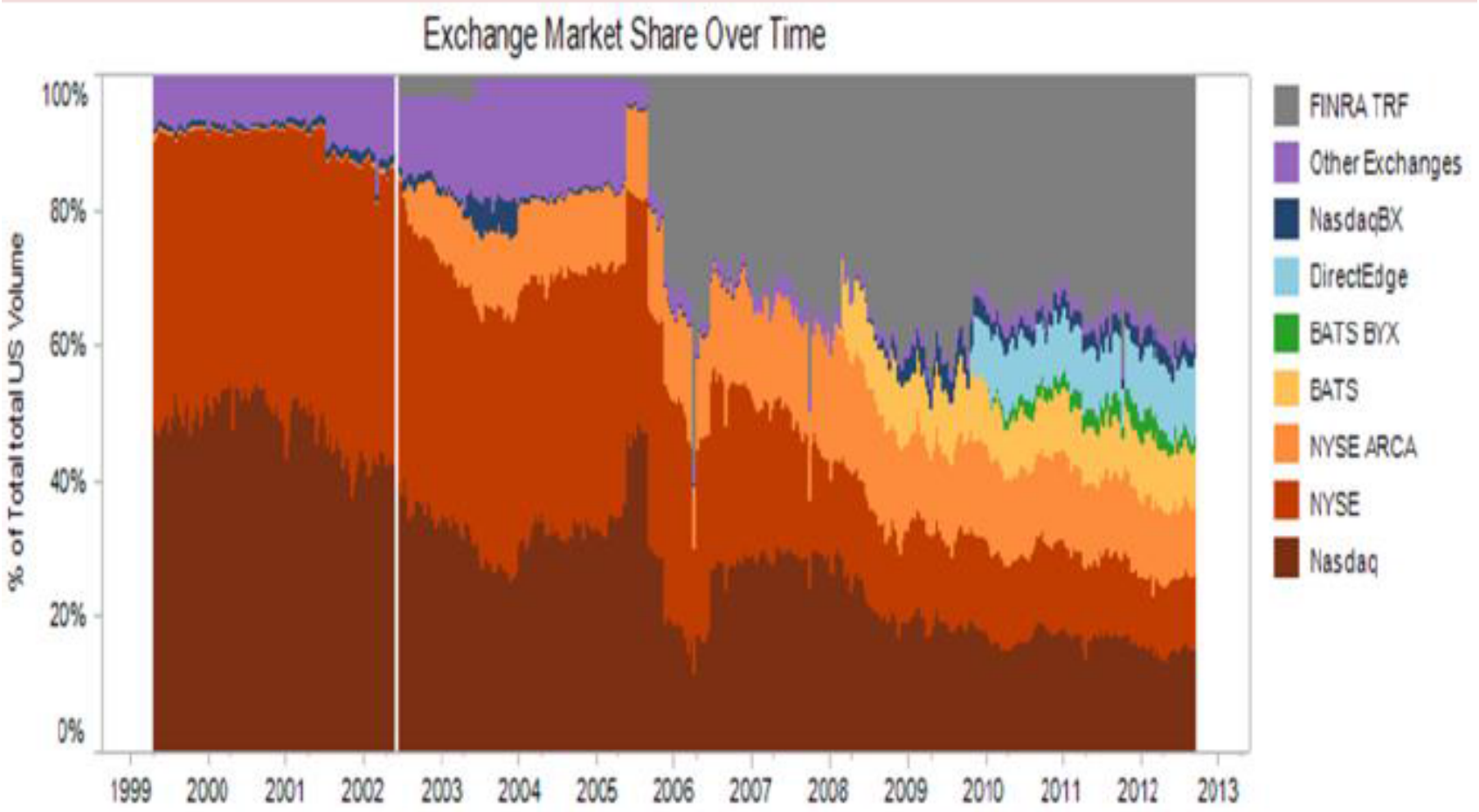
- Have increasingly shaped the structure and behavior of markets
- The evolution of the market
  - From human involvement to computer control
  - From operating in time frames of minutes to time scales of milliseconds or microseconds
  - From exchanges to multiple trading venues (ATS, ECN, and Dark Pools)

Ordering and Routing in Fragmented Markets



- Your broker has options for executing your trade (Routing)
- Your broker has a duty of "Best Execution"
  - Must evaluate the orders receiving from *all* customers and periodically assess which venues offer the most favorable terms of execution

Exchange Market Share over Time in the U.S.



Source: CS Trading Strategy

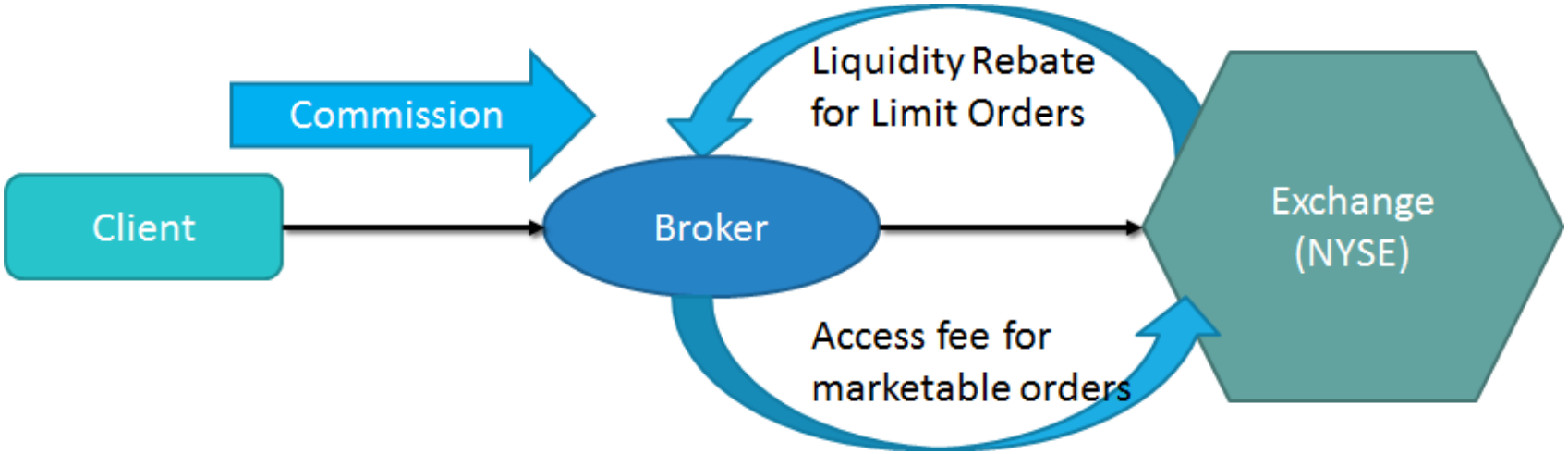
Consequences of fragmented markets

- Increase the price competition
  - Suppose you want to sell SPY stock: You want to receive better price!!
    - BATS X : The highest bid price is $100.05 with 400 shares
    - BATS Y : The highest bid price is $100.04 with 1,000 shares
  - What if your broker sends your orders to BATS Y?
  - What if your order sizes are greater than 400 shares?
- Trading venues act strategically
  - Choosing new pricing models
  - Choosing market designs to attract particular volume to their trading venues
  - Choosing various types of orders

Associated fees charged by trading venues

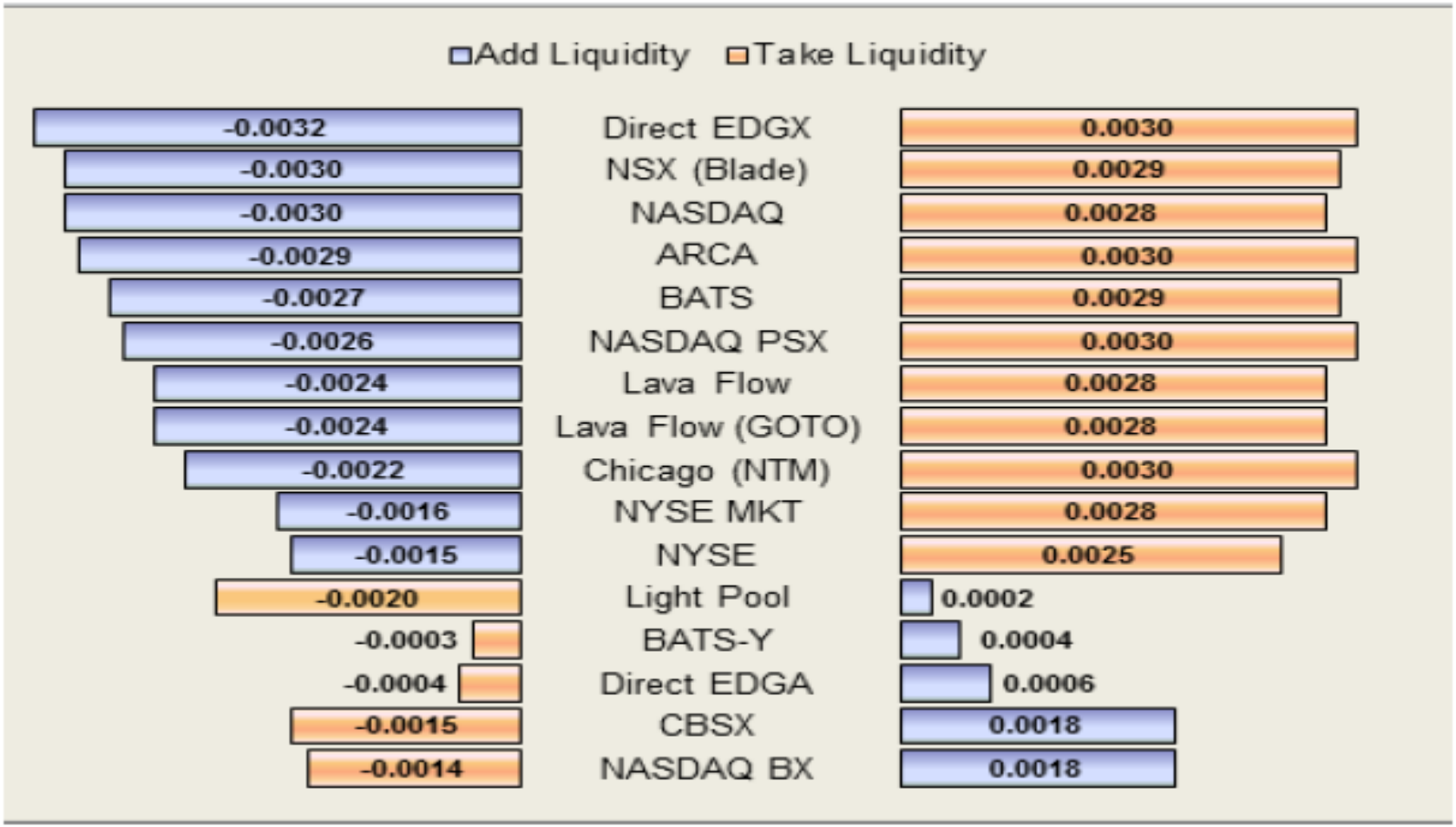
- Make/Take Pricing
- Inverted Pricing (Take/Maker Pricing)
- Payment for Order Flow (PFOF)
- Routing Charges

Maker/Taker Pricing



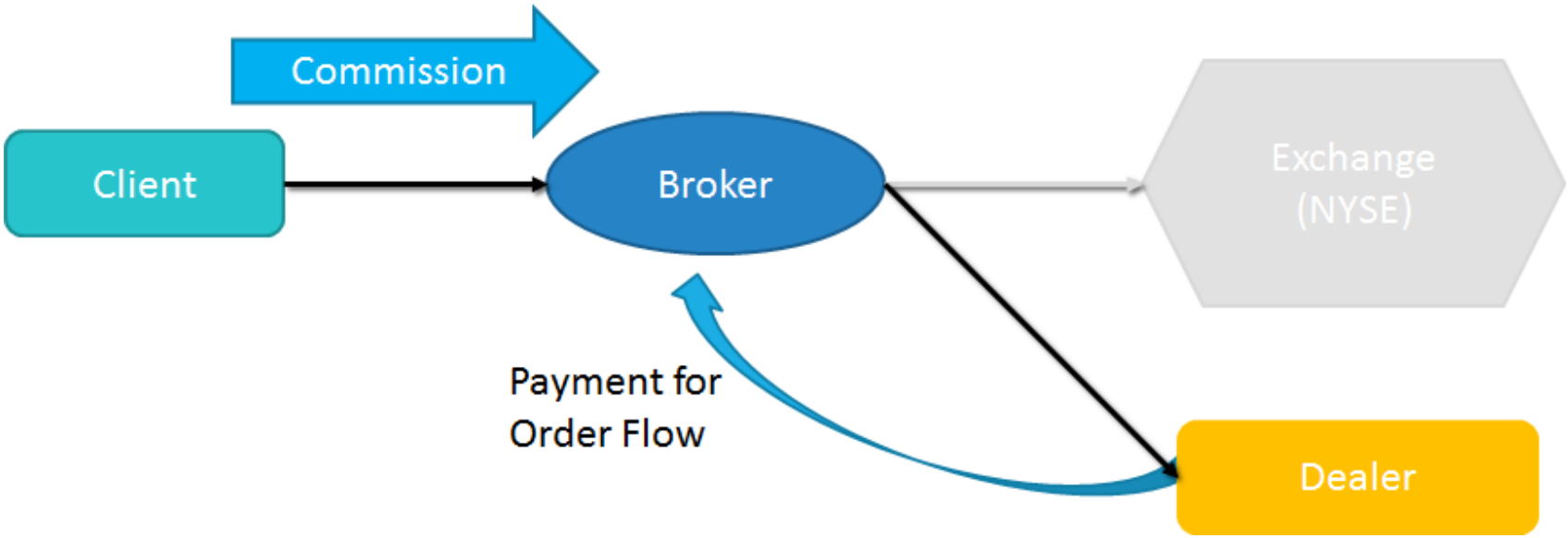
- The International Organization of Securities Commission (IOSCO) defines maker-taker pricing as
  - "a pricing model whereby the maker of liquidity, or passive [limit] order, is paid a rebate and the taker of liquidity, or aggressive [market] order, is charged a fee"
- Brokers do not pass on maker-taker fees to their customers but charge a flat commission

Exchange fees for adding/subtracting liquidity



Source: Credit Suisse AES

Payment for Order Flow(PFOF)

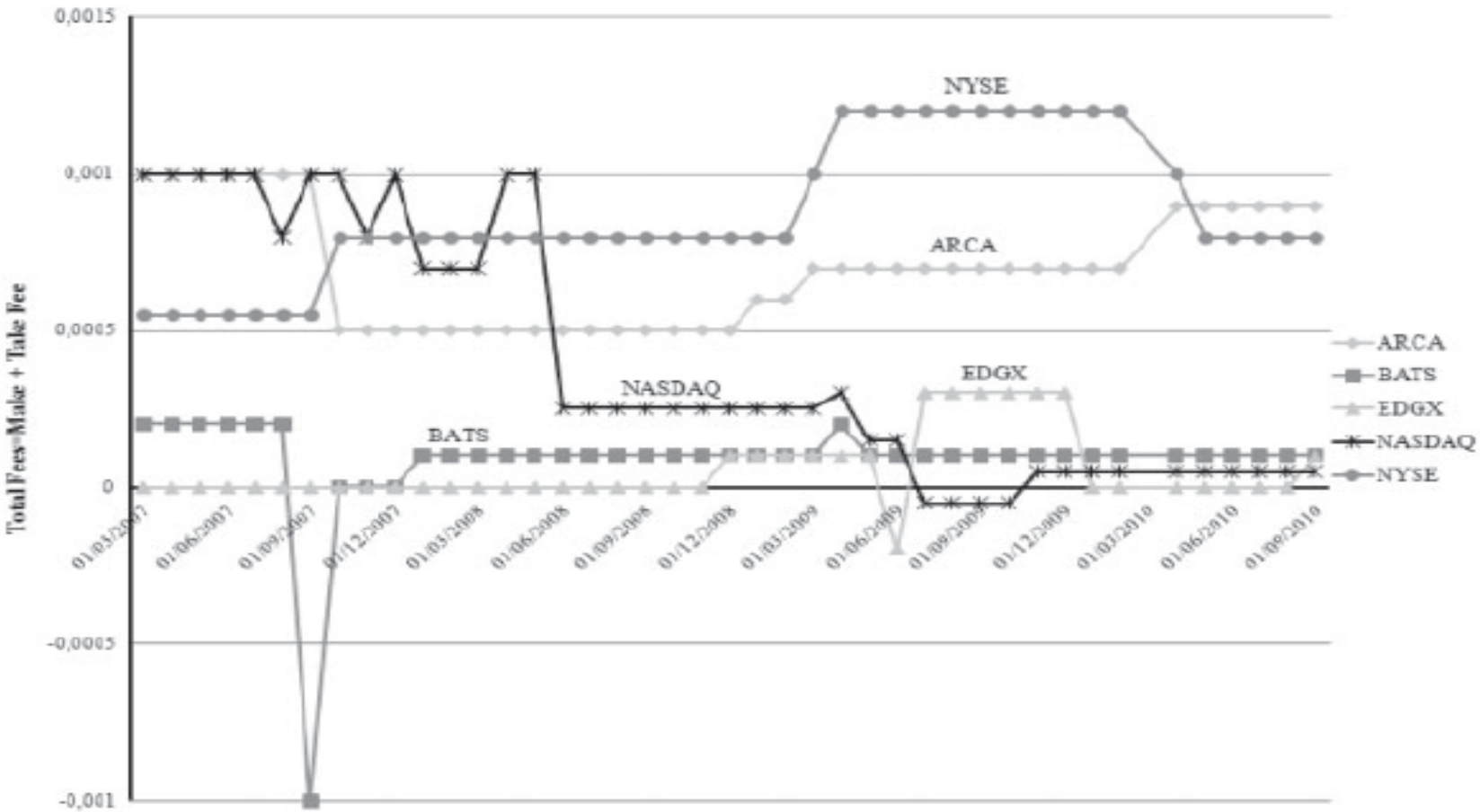


- Internalization
  - The NBBO is 10.10/10.20
  - A broker has a customer order, and he sends the customer order to the dealer, who sells to the customer at 10.20
  - The dealer sends to the broker about $0.0014

History of Maker/Taker Pricing

- In 1990s, electronic trading venues were alternatives to registered exchanges and NASDAQ by
  - Charging low fees
  - Offering fast and fully automated trading
  - Enabling co-location service
- In 1997, the Island ECN was among the first markets to adopt MT fees to attract order flow through liquidity rebates
  - Island's market share increased to almost 13% in 1999 from roughly 3% in 1997.
  - Other non-exchange ATSs soon followed Island to attract liquidity and order flow from equities exchanges
  - In response to the competition from non-exchange markets, many exchanges began to adopt MT model
  - By the mid-2000s, the MT model gained widespread adoption as a standard pricing model in the U.S. equities market

Trading fees for Tape A stocks (Mar 2007-Oct 2010)



Source : Colliard, Jean-Edouard, and Thierry Foucault, 2012, "Trading Fees and Efficiency in Limit Order Markets", *Review of Financial Studies* 25, 3389-3421

Maker/Taker pricing

- With more than 10 operating equities exchanges and dozens of ATSs, there is price competition among the U.S. equity markets
  - Fees are tailored and modified to attract particular types of order flow
- Maker-taker pricing also has been adopted on some of the options markets at least for certain classes of options
  - The market structure of options markets differ from that of the equities markets
  - Standardized options must be traded on an exchange whereas a substantial portion of equities trading occurs off-exchange

Options Markets in the U.S.

- Mix of pricing models are used in the U.S. options markets
  - MT : NYSE Arca, BATS, C2
  - PFOF : CBOE, NYSE Amex, MIAX Pearl
  - Both: Nasdaq PHLX, Nasdaq ISE, NASDAQ Options Market (NOM)
- Unlike equity exchanges, off-exchange trading is disallowed in options
  - Payment for order flow in options is sponsored by exchanges
  - Market makers on traditional options exchanges are at the best bid and ask quotes
- In 2007, NYSE Arca introduced make-take pricing to options markets
  - Starting for options added to the Penny Pilot Program: minimum increment of \$0.01 ($< \$3$) or \$0.05 ($> \$3$)
  - On November 1, 2012, NYSE Arca adopt make-take pricing for non-penny option classes

Issues about the MT model

- Advantages
  - MT model is a significant competitive tool for exchanges
  - MT model may benefit retail investors by narrowing posted spreads
  - MT model can provide better prices for retail investors
- Disadvantages
  - MT model may exacerbate conflicts of interest between brokers and their customers
  - MT model may increase market fragmentation and market complexity through the proliferation of new exchange order types
  - MT model may cause adverse effects on price transparency

Angel, Harris, and Spatt (2011, 2015), Quarterly Journal of Finance

- AHS ask for the prohibition of make/take or take/make pricing
- MT pricing has significantly distorted trading because orders are priced on different bases in different markets
  - Distorting order routing decision
  - Aggravating agency problems between brokers and their clients
  - Unleveling the playing field among dealers and exchange trading systems
  - Producing fraudulent trades
  - Producing quoted spreads that do not represent actual trading costs

Studies about MT model

- Theory
  - Colliard and Foucault(2012, RFS)
  - Foucault, Kadan, and Kandel (2013, JF)
- Empirics
  - Malinova and Park (2015, JF) : TSX (cross-listed stocks)
  - Battalio, Corwin, and Jennings (2016, JF) : Order routing data
  - Battalio, Shkilko, and Van Ness(2016, JFQA) : PFOF vs. MT in US options markets
  - Anand, Hua, and McCormick(2016, MS) : Introduction of MT at the NYSE Arca

Theoretical Predictions: Colliard and Foucault(2012, RFS)

- Holding the total fee constant, a change in make/take fees has no effect on the cum fee bid-ask spread and on volume
  - Change in make/take fees is neutralized by an adjustment in the raw bid-ask spread
  - Increase in take fee without change in total fee $\rightarrow$ market order becomes expensive $\rightarrow$ switch to limit order $\rightarrow$ fill rate declines $\rightarrow$ improve quotes to attract matches $\rightarrow$ benefits from maker rebates will be offset by the narrower bid-ask spread
- Change in total exchange fee affect the cum fee spread, volume, and the fraction of marketable orders

Theoretical Predictions: Foucault, Kadan, and Kandel (2013, JF)

- In reality, quotes must be multiples of the tick size
  - Traders cannot fully neutralize make/take fees
  - The make/take breakdown matters due to this friction
- Exchanges can maximize the trading volume (and profits) by using maker-taker fees
  - Liquidity cycle : large market orders $\rightarrow$ spread widens $\rightarrow$ posting new quotes $\rightarrow$ trading opportunity
  - Each trading opportunity is short-lived, thus traders monitor the market to react faster than competitors
  - Durations between quotes and trades depend on traders' monitoring decisions and are determined by the trading fees
  - Speed of providing $<$ Speed of consuming $\rightarrow$ slowdowns the trading process $\rightarrow$ increasing take fees and decreasing make fees $\rightarrow$ market makers increase the intensity of monitoring
  - Algorithmic trading decreases market monitoring costs

Empirical Studies

- MT fees result in reduced transaction costs and lower execution costs (Malinova and Park(2015), Anand, Hua, and, McCormick(2016)) supporting Colliard and Foucault(2002)
- Changes in fees of either makers or takers cause changes in the length of the liquidity cycles (Skjeltorp, Sojili, and, Tham(2012, WP)) supporting Foucault, Kadan, and, Kandel(2013)

Empirical Studies

- Higher MT fee levels are related to poorer limit order execution measured by fill rates, execution speed, and realized spreads (Battalio, Corwin, and, Jennings(2016))
  - Brokers might focus on collecting the rebates and deviate from their obligations to obtain best prices for their clients
  - Order routing decisions based on rebates/fees are inconsistent with best execution
  - Maximizing rebates might allow brokers to reduce commissions but lower commissions do not compensate investors who miss favorable limit order executions

Empirical Studies for Options Markets

- Anad, Hua, and McCormick(2015)
  - Execution costs (including fees) for liquidity demanders decline after the event
  - MT structure encourages market makers to improve quoted prices
  - Brokers change their routing behavior to include fees in the routing decision
- Battalio, Shkilko, and, Van Ness(2016)
  - Average relative spreads are higher for PFOF venues than for MT venues
  - When liquidity fees are incorporated, PFOF venues offer lower average liquidity costs net of taker fees
  - When liquidity fees are incorporated, MT venues offer lower average liquidity costs net of taker fees for high-priced options

Other Related Research

- Market Fragmentation: O'Hara and Ye(2011)
- PFOF: Battalio(2003), Battalio and Holden(2001), Chordia and Subrahmanyam(1995), Parlour and Rajan(2003), Kandal and Marx(1999)
- Routing: Battalio, Hatch, and Jennings(2004), Foucault and Menkveld(2008), Bacidore, Otero, and, Vasa(2011)
- Internalization: Chung, Chuwonganant, and, McCormick(2006)
- ISO: Sugato, Jain, Upson, and Wood(2012)
- Sub-penny: Kwan, Mclnish, and Masulis(2015)
- Odd-lot: O'Hara, Yao and, Ye(2014)

Conclusion

- The use of Make/Take fees has become widespread as more trading venues employ the model as a tool to gain market share and trading volume
  - Proponents argue that it helps reduce "the frictional costs of trading to their lowest level in history" (D. Keith Ross(2014))
  - Opponents claim that it has "distorted order routing decisions, aggravated agency problems among brokers and their clients, unleveled the playing field among dealers and exchange trading systems, produced fraudulent trades, and produced quoted spreads that do not represent actual trading costs" (Angel, Harris, and Spatt(2011,2015))