

News Trading and Speed

Ioanid Roşu (HEC Paris)

with Johan Hombert and Thierry Foucault

8th Annual Central Bank Workshop on the Microstructure of Financial Markets
October 25-26, 2012

Why Bank of America is the new Citigroup

High-frequency traders target Bank of America and take investors along for a wild ride



By Pallavi Gogoi, AP Business Writer | Associated Press – Fri, Feb 10, 2012 3:05 AM EST

[...]

When the market goes up because of positive news about the economy, Bank of America stock shoots up past the stocks of other big banks. When traders get worried about Greek debt, Bank of America takes the biggest plunge.

The big swings are not driven by a fundamental bet that the bank will be more profitable because the economy is getting better or a real concern that it will lose more money than others if there is a default in Greece.

Instead, Bank of America is the stock of the moment for high-frequency trading, the supercomputer-driven buying and selling that barely existed a few years ago and now accounts for as much as two-thirds of U.S. trading.

The bank's single-digit stock price and flood of shares on the market — three times as many as its nearest big-bank competitor — make it an attractive target for hedge funds and banks that employ high-powered, computerized trading.

"The movement of Bank of America stock on most days has nothing to do with Bank of America," says Joseph Saluzzi, co-founder of brokerage firm Themis Trading.

In other words, the stock moves because it moves. Bank of America stock has risen or fallen 1 percent or more on 20 days this year. The Standard & Poor's 500 index has only done it three times.

High Frequency Trading

Real-time market insight for high-frequency trading

High-frequency trading professionals are responsible for many of the dynamic shifts taking place in the equities, commodities and currency markets. That's because high-frequency trading models automatically move huge numbers of shares based on market drivers and can trigger large, sustained price shifts. **Timing is everything and to make lucrative, well-timed trades, institutional and electronic traders need accurate real-time news available, including company financials, earnings, economic indicators, taxation and regulation shifts. Dow Jones is the leader in providing high-frequency trading professionals with elementized news and ultra low-latency news feeds for algorithmic trading.**

Dow Jones Lexicon helps build more predictive models for high-frequency trading

To make the absolute most of market cycles, high-frequency trading professionals need to know where the market is headed, not just where it is right now. **Dow Jones Lexicon** helps traders get more out of their low-latency news to uncover hidden market trends and opportunities algorithmic applications miss.

Instead of assigning news stories an arbitrary "sentiment score," **Dow Jones Lexicon's** derived data technology looks at news – even archival content -- in a truly unbiased, quantitative way. **As real-time news is published, words are coded based on sentiment, strength and litigiousness and then quantitatively analyzed for frequency and use.** This data can then be use to create objective indicators to support high-frequency trading models.

High Frequency Traders on News

- Flow of news is enormous and virtually continuous
- Some traders able to react in real time and trade on news at high frequency
⇒ **High Frequency Traders on News (HFTNs)**

Issues

- How do HFTNs trade on news?
- What are the effects of HFTNs on liquidity, volatility, price discovery?
- How to detect these effects empirically?

What we do

- Informed trader's informational advantage has 2 components:
 1. More precise info
 - ▶ As in Kyle (1985) and most of literature
 2. Faster reaction to public info
 - ▶ Even infinitesimal speed advantage generates large effects on equilibrium trading strategies and market performance

Some related literature

- Models of informed trading

- ▶ Kyle 1985; Kim and Verrecchia 1994; Back and Pedersen 1998; Chau and Vayanos 2008

→ No speed issue

- Models of traders with speed advantage

- ▶ Liquidity providers: Jovanovic and Menkveld 2011; Cartea and Penalva 2011
- ▶ Liquidity takers: Biais, Foucault and Moinas 2011

- Empirical analysis of HFT

- ▶ Hendershott, Jones and Menkveld 2011; Menkveld 2011; Brogaard, Hendershott and Riordan 2012; Kirilenko, Kyle, Samadi and Tuzun 2011; Hasbrouck and Saar 2011; Zhang 2012

Model: Asset

- Continuous time $t \in [0, 1]$
 - ▶ Asset liquidated at $t = 1$
- Fundamental value follows random walk process v_t

Model: Market participants

- Informed trader: observes v_0 and dv_t
 - ▶ Risk-neutral: maximizes expected profits
 - ▶ Market order dx_t
- Uninformed noise trader
 - ▶ Market order du_t
- Market maker: observes $dz_t = dv_t + de_t$
 - ▶ Observes aggregate order flow $dy_t = dx_t + du_t$
 - ▶ Competitive and risk-neutral: set price equal to expected value

⇒ **Informed trader has more precise info**

Model: Timing

- During $[t, t + dt]$:
 1. Informed trader observes dv_t
 2. Trading: MM sets quote q_t and price impact λ_t
Informed trader submits dx_t and noise trader du_t
MM executes OF at price $p_{t+dt} = q_t + \lambda_t(dx_t + du_t)$
 3. Market maker observes $dz_t = dv_t + de_t$

⇒ **Informed trader has higher speed**
- Compare to benchmark with no speed advantage: switch 2. and 3.

Equilibrium: Optimal trading strategy

- Informed trader's optimal strategy:

$$dx_t = \beta_t(v_t - q_t)dt + \gamma_t dv_t$$

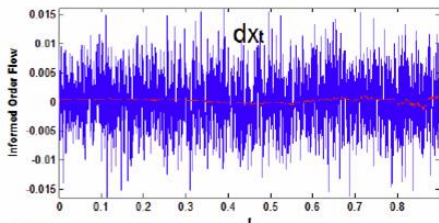
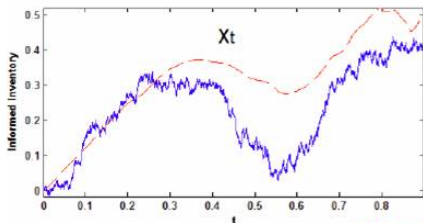
- β part = **level trading**
 - ▶ Trade on the MM's pricing error, as in literature
 - ▶ Correlated with long-run return
- γ part = **news trading**
 - ▶ Trade on the innovation in fundamental, to anticipate next quote update
 - ▶ Correlated with short-run return
- In benchmark: $\gamma_t = 0$

Empirical implications: Informed order flow

Compared to benchmark, in model with speed advantage:

- Informed trading volume is larger by an order of magnitude
 - ▶ Level trading is a drift
 - ▶ News trading is stochastic

⇒ fraction of volume due informed trading > 0 *versus* $= 0$ in benchmark
- Auto-correlation of informed order flow $= 0$ *versus* > 0 in benchmark



red = benchmark

blue = model with speed

Empirical implications: Price impact

Compared to benchmark, in model with speed advantage:

- Immediate price impact (Kyle's λ) is higher
 - ▶ Speed advantage = additional source of adverse selection

Empirical implications: Price discovery

- Informational efficiency: $E[(v_t - p_t)^2]$

Compared to benchmark, in model with speed advantage:

1. Price changes are more correlated with innovation in fundamental:
 $Cov(dp_t, dv_t) \nearrow$

- ▶ “Price better tracks news”

2. but less correlated with pricing error: $Cov(dp_t, v_t - p_t) \searrow$

- ▶ Because trade less aggressively on pricing error when also trade on news
- ▶ “High frequency news trading is unrelated to fundamental”

- Overall, informational efficiency is unaffected

Empirical implications: Volatility

- Volatility can be decomposed into two components (Hasbrouck 1991)

$$\text{Var}(dp_t) = \underbrace{\text{Var}(p_{t+dt} - q_t)}_{\text{Trades}} + \underbrace{\text{Var}(q_t - p_t)}_{\text{Quotes}}$$

Compared to benchmark, in model with speed advantage:

1. Volatility due to trades is higher
 - ▶ Because trades are more informative about imminent news
 2. but volatility due to news is lower
 - ▶ Quotes less sensitive to news because info already incorporated through trading
- Overall, volatility is unaffected
 - ▶ Equal to fundamental volatility

Empirical implications: The determinants of HFTNs

- If precision of market maker's signal improves ($Var(de_t)$ lower):
 - ▶ Informed trader trades more aggressively on news (because anticipates better next quote update)
 - ▶ Liquidity improves (less info asymmetry)
- \Rightarrow Spurious correlation between HFTNs and liquidity if econometrician does not control for precision of MM info

How to detect HFTN empirically?

- Empiricists often aggregate data over time and estimate VAR models
- Difficult to detect news trading when sampling frequency is too low
 - ▶ Empirical correlation between Δx_t and r_{t+1} decreases to zero when sampling frequency decreases

Summary

- Speed advantage gives rise to news trading
 - ▶ Informed trades much more volatile
 - ▶ Market less liquid
 - ▶ Returns more correlated with news, less with fundamental (market efficiency stays the same)
 - ▶ Vol coming from trading increases, vol unrelated to trading decreases (total vol stays the same)
- Caveat: paper about High Frequency Trading on News (HFTNs), not all HFTs

Formulas

Speed advantage

Benchmark

Quote: q_t

$$q_t = p_t + \mu_t dz_t$$

Informed trade: $dx_t = \underbrace{\beta_t(v_t - q_t)}_{\text{Level trading}} + \underbrace{\gamma_t dv_t}_{\text{News trading}}$

$$dx_t = \beta_t(v_t - q_t)$$

Execution price: $p_{t+dt} = q_t + \lambda_t dy_t$

$$p_{t+dt} = q_t + \lambda_t dy_t$$

Quote update: $q_{t+dt} = p_{t+dt} + \mu_t \underbrace{(dz_t - \rho_t dy_t)}_{\text{Unexpected part of signal}}$