



HFT and the Hidden Cost of Deep Liquidity

In this essay we present evidence that high-frequency traders' ("HFTs") profits come at the expense of investors. In competing to earn spreads and exchange rebates by posting passive orders, HFTs crowd out directional traders' passive orders, force them to cross the spread more often, and result in higher trading costs for investors. We argue that while high-frequency market making is a legitimate activity, the combination of the maker/taker system of exchange fees and rebates and the penny tick size distorts the market and effectively forces investors to subsidize the activity of HFTs.

Villains or heroes?

Much attention in recent years has focused on HFTs – highly automated proprietary traders who reportedly account for upwards of 50% of market volume, and whose ability to make consistent profits depends at least in part on raw speed. This need for speed has led to the rise of an entire technology sub-industry, including massive projects to lay submarine fiber optic cables along a slightly straighter line between New York and London and the creation of specialized computer chips to shave tiny fractions of a second off the time it takes to react to market events.

HFTs' operation at timescales so far removed from ordinary experience has generated deep fear and suspicion in much of the financial industry and mainstream media. HFTs have been blamed for volatility, accused of causing the flash-crash, even of being able to manipulate the entire market for their own benefit. The reality is far less dramatic. Most high-frequency trading is fundamentally a form of market making with very tight inventory control and very short-lived positions. And contrary to general sentiment, the consensus academic view is that HFTs provide a valuable service to the market in the liquidity they provide. Like any market-maker they bridge liquidity demands by directional traders that are separated in time; their competition to provide liquidity narrows spreads and therefore reduces trading costs.

However, this argument is not entirely satisfying. Given that HFTs are very short-term intermediaries between the directional traders who are actually trying to accumulate or unwind a position, it is hard to see how they can simultaneously be saving investors money and pulling billions out of the markets in trading profits. This riddle is at the heart of the HFT controversy as it stands today. From first principles it seems their profits must come at the expense of investors, yet the only empirical evidence seems to suggest the opposite.



Resolving the Paradox: the Difficulty of Trading “Ultra-Liquid” Stocks

This brings us to Pragma Securities’ recent research note, which examines the counterintuitive difficulty of trading ultra-high-volume stocks. High volume is associated with high liquidity, and liquidity by definition means cheap, easy trading. But it turns out that the highest volume stocks – the BACs and MSFTs of the world – are actually costlier to trade than their lower-volume peers.

In a nutshell, the research note shows that many ultra-high-volume stocks have disproportionately long queues – a result of the huge number of orders competing to provide liquidity compared with the rate at which aggressive orders arrive to take that liquidity. This excessive competition makes it harder for directional traders to successfully provide liquidity, forcing them to cross the spread more frequently and increasing their overall trading costs. The difference in costs between the highest volume stocks and the more moderate volume stocks is on the order of several basis points, representing billions of dollars per year in spread costs across the shares traded in these high-volume names.

These observations suggest an intuitive resolution to the HFT paradox. HFTs, like all market makers, earn money by positioning themselves between directional traders and capturing the spread. In principle, directional traders could trade with each other directly and (on average) meet at the midpoint of the bid-ask spread. The more directional traders trade through intermediaries instead of directly with each other, the more that bid-ask spread (along with the fees exchanges charge for taking liquidity) is siphoned away from investors and into the pockets of those market makers. Although competition among market-makers narrows spreads, the research note shows that reduction in spread is more than offset by the fact that market participants are effectively forced to trade through unwanted intermediaries, resulting in inferior execution prices.

Smoking Gun

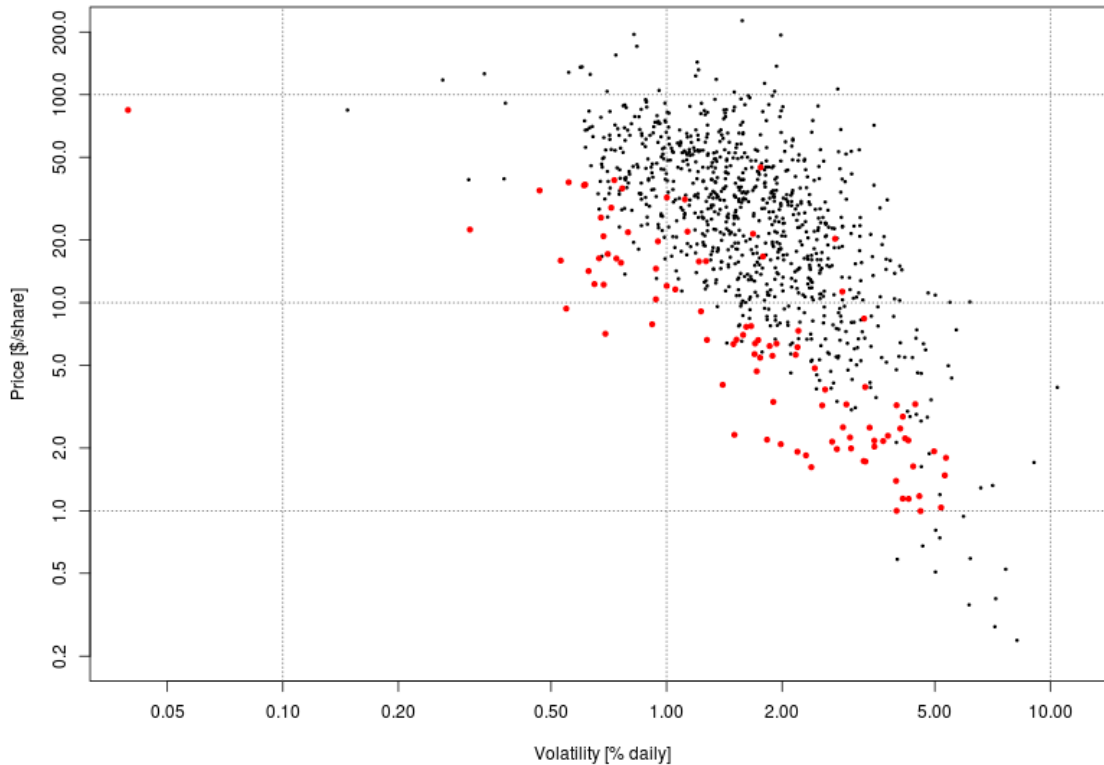
But what is the evidence that HFTs are responsible for the disproportionately long queues in these ultra-high volume stocks? Perhaps only a full consolidated view of all market activity could answer this question definitively, but here we present some strong circumstantial evidence.

There are a few other interesting things that this group of stocks with disproportionately long queues have in common besides high volume: low volatility and low price – characteristics that are very attractive to HFT market makers. High volumes are essential because with lots of incoming demand it’s easy to lay off a position quickly, and there are



more trading opportunities per day (HFTs are generally capacity-limited). Low volatility is a benefit because there's less chance the price will run away and cause a loss during the seconds the HFT holds a position. And low prices mean both wide spreads and high rebates for providing liquidity on a percentage basis – so for a given amount of risk they're making more money when they capture the spread and earn a rebate.

In the graph below, each dot represents one of the 1000 highest volume stocks on an arbitrary date, June 29, 2012. The 10% with the longest queues (measured in terms of percentage of ADV) are colored red.

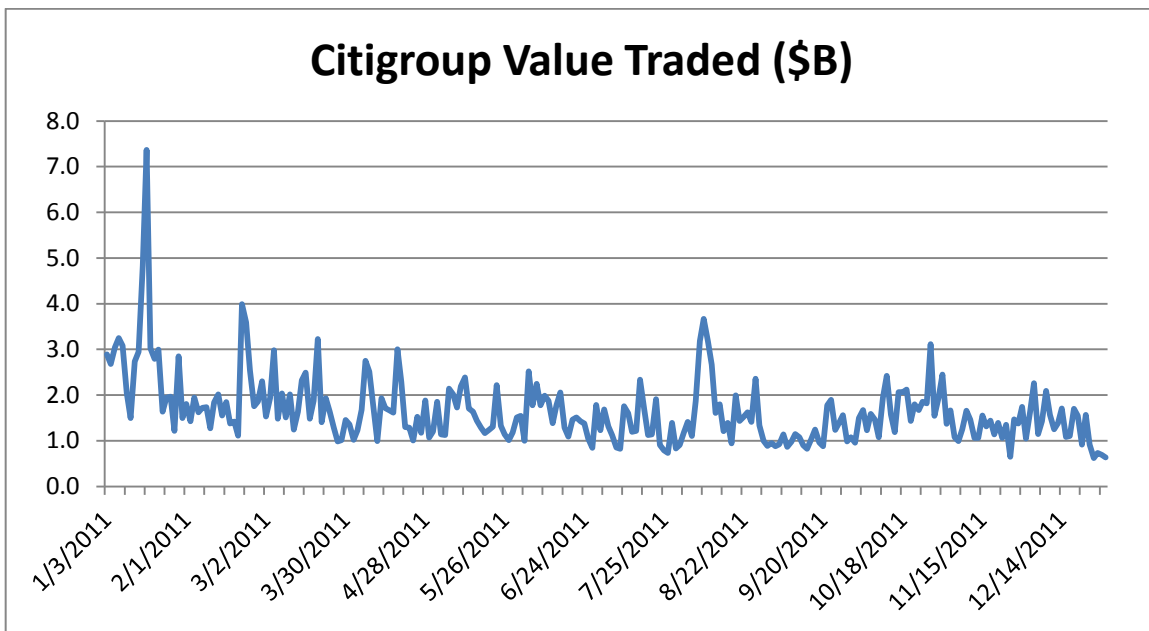


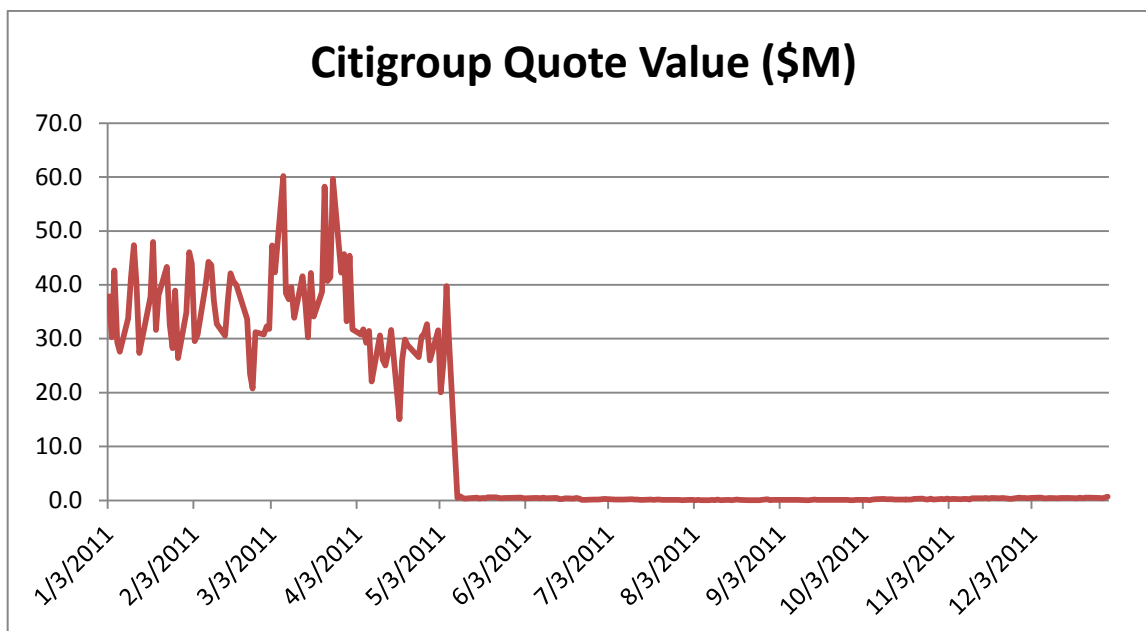
As can be easily seen, there is a high correlation between the features that make for profitable market-making and disproportionate queue length. An obvious explanation is that in addition to patient directional traders trying to provide liquidity, whose numbers are naturally balanced with takers for most stocks, HFTs crowd in trying to provide liquidity for stocks with high volume, low volatility, and low price, creating a supply of liquidity out of proportion to the demand.



Another suggestive detail of this graph is the total absence of ultra-long queues for stocks priced below a dollar, while there are many between say \$1 and \$2. There are two reasons for this. One is the lower tick size allowed for orders below \$1: \$0.0001 vs. \$0.01 above \$1. The other is the rebate scheme offered by exchanges: there is a break-point at \$1.00. For example on Nasdaq, the rebate for providing liquidity drops from \$0.0029 per share for stocks priced a dollar and up to \$0.00009 (1/30 of the rebate) for stocks priced below a dollar. No forced excessive spread, no huge rebate, no HFT, no ultra-long queue.

Another exhibit, shown in the two graphs below, is anecdotal but telling. The first shows Citigroup (C)'s daily volume in dollars over the course of 2011, and the second shows C's average queue length, also in dollars, over the same period. The point of interest is C's 1:10 reverse split on 5/6.





The volume chart shows a gradual downward trend in volume over the course of the year, but nothing anomalous around the split. This is expected – a split should not materially change the demand for the stock in dollar terms. The queue length chart, in contrast, shows a precipitous step-down from massive \$30mm displayed at the inside before the split to a modest \$0.5mm after. Note, the graph is in dollars, so the split does not directly explain any part of this 60-fold reduction in depth. But while the reverse split changed nothing fundamental about the value of dollar of C, it did significantly change the value of trading a dollar of C to a market maker: overnight the bid-ask spread dropped from 22 basis points to 2, and the rebate dropped from 6bps to 0.6bps. With a narrow spread and small rebate, after the split C was no longer the HFT darling it was before May 6.

Conclusion

In this essay and the accompanying research note, we have presented novel evidence that HFTs' trading gains come at the expense of investors. By competing to earn spreads and rebates by providing liquidity, HFTs crowd out directional traders' passive orders, force them to cross the spread more often, and result in higher trading costs for investors.

Market making is an important function in the smooth operation of markets. In theory, there should be a natural equilibrium: market makers will compete only to the point that they can no longer profit by quoting more aggressively. This means they will trade at



times or prices that directional traders will not, narrowing spreads and improving market quality.

However, the existence of ultra-long queues suggests that this equilibrium is out of whack. Market makers compete en masse where there is already deep liquidity and no opportunity for price improvement because of the tick size. From a market structure perspective, the concern is that there is no practical way to opt out of interacting with these superfluous market makers, and because of the take fees charged by exchanges, directional traders are effectively forced to subsidize HFTs even though there are other directional traders they could interact with directly. This effect is most pronounced where the spread size is very large despite fundamental liquidity, i.e. for low-priced, high-volume stocks. As demonstrated by the preponderance of ultra-long queues in lower-priced stocks and the total absence of ultra-long queues in stocks priced below \$1, it appears that the penny tick size and the liquidity rebates paid by exchanges in the maker/taker model effectively subsidize HFTs in a way that is essential to much of their profitability, and are the root causes of this market distortion.

By eliminating or limiting rebates for providing liquidity, and reducing the tick size in low-priced stocks above \$1 to \$0.001, regulators could allow the market to settle on more reasonable spreads in liquid low-priced stocks, and reduce the investor-financed subsidy to HFT market makers and the technology industry that supports them. While HFT volumes and quoted size in these stocks would likely decrease, directional traders would still have plenty of counterparties to interact with at a more natural equilibrium, and abundant tools with which to find these counterparties. The net result would be narrower effective spreads (especially when exchange fees are included), a reduction in profits drawn out to HFTs, and a corresponding net savings for investors.

Pragma Securities is an independent electronic trading boutique specializing in broker-independent algorithmic trading tools and analytical services for a wide range of market participants including institutions, hedge funds, brokers, and exchanges.

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