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Market quality breakdowns in equities ☆

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ABSTRACT

Market quality breakdowns are extreme price movements that reverse during the trading day. We analyze changes in the national best bid and offer for all stocks in CRSP and TAQ. The average daily breakdown frequency from 1993 to 2013 is 1.03%, with averages in 2010–2013 only 0.34%. Breakups, extreme price increases, occur as frequently as breakdowns. Breakdowns and breakups have fallen significantly since Regulation National Market System was implemented. Spikes in market correlation make breakdowns and breakups more likely. Both exchange-traded funds and high-frequency trading Granger cause market correlation. Breakdowns and breakups are predictable for up to two days.

1. Introduction

The collapse and sudden rebound of market indices and nearly 2,000 equity prices during the May 6, 2010 “Flash Crash” was a singular event in the history of the equity markets. The Securities and Exchange Commission (SEC) and Commodity Futures Trading Commission (CFTC) both launched full-

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scale investigations into the causes of the collapse, and academic researchers have also examined the causal mechanisms behind the crash. Although regulators have implemented a set of rules after the Flash Crash, including single stock circuit breakers and a ban on stub quotes, trading glitches are still happening. These serious errors in 2012, such as the BATS Global Markets' initial public offering (IPO) failure on March 23, Facebook's IPO miscue on May 18, and Knight Capital's erroneous order flood on August 1, are merely the latest in a series of breakdowns. These events were not confined to a single stock exchange and the effect of each of these incidents was not transitory: BATS withdrew their IPO, NASDAQ faces billions of dollars in lawsuits from market making firms, and Knight nearly went bankrupt. The run of technology snafus has raised the concern that they could rattle investor confidence and result in reduced liquidity in the equity market.

The new circuit breakers now trip at a 10% movement intra-daily. Many of these movements will be due to information released about individual stocks. To filter these out, we isolate stocks where prices recover to at least 2.5% below the 09:35 price. Using this definition, we find that the Flash Crash is not an isolated event. For example, on April 4, 2000, more than 1800 stocks fell more than 10% intra-daily before recovering most of their losses. There are more than 60,000 breakdown events in 2000.

We ask a simple and straightforward question: How frequently do these breakdowns in market quality occur? We analyze every change in the national best bid and offer (NBBO) for 1993–2013. In total, we examine more than 30 million files of intra-day bid and offer quotes. We find that market quality breakdowns have been endemic to the equity markets. The daily average breakdown frequency is 1.03% throughout our sample period, an average of 74 stocks per day.

There is an uptrend in breakdown frequency from 1993 to 2000. This trend reverses from 2000 to 2006 but then begins to rise again in late 2007, in the early stages of the financial crisis. Breakdowns continue to rise through 2008, a particularly volatile period for the market. In 2009–2010, the breakdown frequency declines. Despite the Flash Crash, breakdowns occur the least frequently in 2010 during the 1993–2010 period. The breakdown frequency averages 0.34% between 2010 and 2013, which is lower than the 0.47% from 1993 to 1997 when the majority of the quotes were manual.

Academic researchers have suggested a number of possible explanations for market quality breakdowns: (1) regulatory changes; (2) fragmentation; (3) excessive correlation; (4) exchange-traded funds (ETFs); and (5) high-frequency trading (HFT). We develop an explanatory model, with controls for volume and volatility, to assess the marginal effects of these potential causes of breakdowns. By looking at a longer historical time frame, we can identify which explanations are robust.

Changes in the regulatory environment in the U.S. have dramatically effected quote and trade behavior. In 1996, the SEC adopted the display rule, which placed electronic trading networks on an even playing field with dealers. Many others have suggested that the SEC's regulations governing the national equity market system has led to market quality deterioration. The biggest change was the adoption of Regulation National Market System (Reg. NMS) in April 2005.[1]

The new regulations were extended in stages and were fully implemented by October 15, 2007. One of our most striking findings is that market quality breakdown frequency is 74 bps lower after Reg. NMS. This implies that approximately 13,000 fewer breakdown events occur each year compared to the prior period.

The new market structure in which stocks trade on multiple exchanges has limited breakdowns since October 2007. The average daily breakdown frequency based on the listing exchange alone since 2007 would be 597 bps higher for NYSE stocks, 30 bps higher for NASDAQ stocks, 293 bps higher for AMEX stocks, and 47 bps higher for ARCA listings.

Bennett and Wei (2006) claim that order flow consolidation improves market quality. Golub, Keane, and Poon (2012) attribute mini-Flash crash episodes in the 2006–2011 period to the use of inter-market sweep orders in fragmented markets. Madhavan (2012) suggests that fragmentation from equity market structure changes made markets more fragile and may have contributed to the

[1] On April 6, 2005, the SEC, in a 3–2 vote, adopted Reg. NMS. The SEC rules were adapting the national market system concept to the modern electronic marketplace. There are four major provisions: (1) Rule 610, which provides equal access to markets; (2) Rule 611, which prohibits trade-throughs of displayed and accessible quotations; (3) Rule 612, which prohibits subpenny quotations except in limited circumstances; (4) Rules 600, 601, and 603, which set up rules for market data.