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The flash crash: An examination of shareholder wealth and market quality[☆]



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ABSTRACT

We investigate stock returns, market quality, and options market activity around the flash crash of May 6, 2010. Abnormal returns are negative on the day of and the day after the flash crash for stocks that had trades that executed during the crash subsequently cancelled by either Nasdaq or NYSE Arca. Consistent with studies that suggest that other sources of liquidity withdrew from the markets during the flash crash, we find that the fraction of trades executed by the NYSE increases during this volatile period. Market quality deteriorates following the flash crash as bid-ask spreads increase and quote depths decrease. Evidence from the options markets indicates that investor uncertainty increased around the time of the crash and remained elevated for several days.

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1. Introduction

On May 6, 2010, the Dow Jones Industrial Average (DJIA) opened at 10,862.30 and closed at 10,517.83. Not captured in this 3.2% loss are the specifics of one of the most tumultuous days in U.S. stock market history. Fig. 1, which reports the price performance of the SPDR Dow Jones Industrial Average ETF, illustrates the dramatic events of the day. After creeping slowly downward following the market's open, the DJIA began a rapid decline at around 2:30 p.m. that ultimately shaved nearly 1000 points off of the index. However, the decline was short-lived as things quickly reversed course, leading

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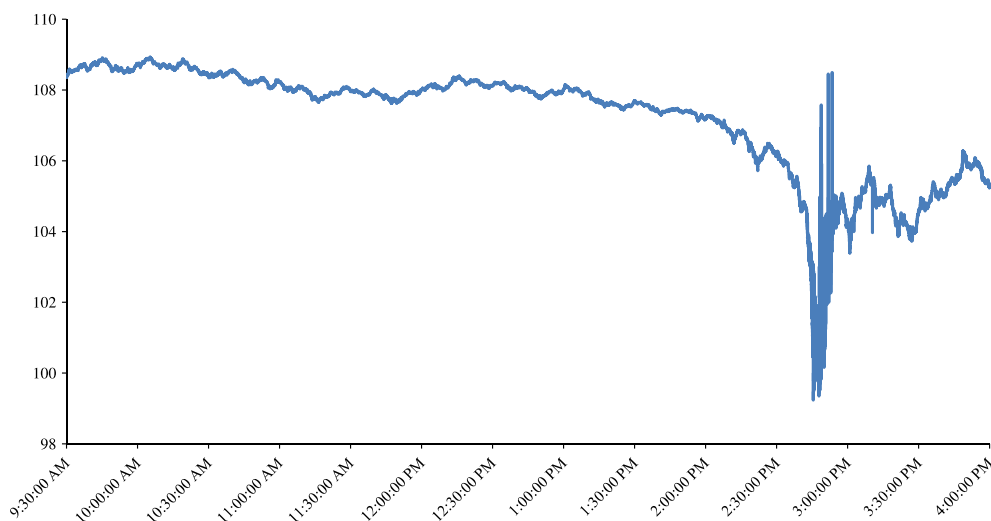


Fig. 1. Dow Jones Industrial Average ETF (May 6, 2010). This figure reports the price of the Dow Jones Industrial Average ETF on May 6, 2010. The horizontal axis shows time during the day and the vertical axis shows the level of the index.

to an equally rapid recovery. A number of individual stocks also experienced harrowing, but brief, price shocks. For example, shares of The Procter & Gamble Company, which traded at over \$60/share at 2:40 p.m., fell to \$39.37/share in approximately 3.5 min, only to bounce back above \$60/share about a minute later. Of the 30 DJIA components, 18 experienced price declines of at least 5% between 2:40 p.m. and 2:50 p.m., and the remaining 12 fell by at least 2.3%. Due to their sudden and dramatic nature, the events of May 6, 2010 are often referred to as the ‘flash crash.’

Regulators, researchers, and other market participants continue to seek explanations for that day’s events. Within 2 weeks of the flash crash, the U.S. Commodity Futures Trading Commission (CFTC) and the U.S. Securities and Exchange Commission (SEC) jointly issued a report that proposed a number of contributing factors, including the linkage between ETFs and E-mini S&P 500 futures and individual securities; mismatches in liquidity; disparate trading conventions among various exchanges; stub quotes; and market and limit orders.¹ The report places particular emphasis on the impact of an unusually large sell order in E-mini S&P 500 futures contracts. Academic studies of the flash crash tend to focus on the role of high frequency traders. While stopping short of blaming high frequency traders directly, [Easley et al. \(2011\)](#) and [Kirilenko et al. \(2011\)](#) conclude that they did contribute to the extreme market volatility witnessed on the day of the crash. [Lee et al. \(2011\)](#) suggest that the flash crash resulted from systematic traders with similar trading strategies, while [Yu \(2011\)](#) finds evidence that contrarian trading strategies helped to mitigate the effects of the flash crash.

We contribute to the search for answers by studying NYSE-listed stocks that had trades executed during the flash crash that were subsequently cancelled by either Nasdaq or NYSE Arca and a closely matched sample of stocks that did not experience cancelled trades. The focus of our analysis is four-fold. First, we examine stock returns around the flash crash. Second, we provide details on the allocation of trading volume across trading venues during this period of extreme volatility. Third, we examine market quality before, during, and after the flash crash, including measures of bid-ask spreads and quote depth. Fourth, for sample stocks with tradable options, we study changes to the sensitivity of option prices to quantifiable risk factors around the flash crash.

¹ U.S. Commodity Futures Trading Commission (CFTC) and U.S. Securities and Exchange Commission (SEC), “Findings Regarding the Market Events of May 6, 2010”, report filed September 30, 2010. Available online at <http://www.sec.gov/news/studies/2010/marketevents-report.pdf>. Henceforth referred to as CFTC-SEC (2010).

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