High Speed Trouble: Knight Capital

There has always been profit in being able to get stock information before the next guy. Before the mid-nineteenth century, some traders in Europe relied on carrier pigeons to send and receive prices from different exchanges. It would have been unimaginable for investors then that within 150 years pricing information would be transmitted through fibre-optic cables and microwave signals, reaching its destinations in mere milliseconds. Even more shocking perhaps would be learning that today's investors would make millions of dollars – indeed, even billions of dollars – by shaving a few of those milliseconds off transmission times. The advent of high frequency trading (HFT) would have mystified Europe's most accomplished pigeon fanciers.

Rapid progress in high-speed trading during the past three decades has created new companies with opportunistic business models, made markets more efficient for traders and investors, compelled traditional brokerage houses to innovate, and forced regulators to catch up with new technologies and get ahead of the pitfalls they bring.

Kenneth Pasternak, a veteran trader and former car salesman, was one of the outsized personalities that drove this change. In 1995, he co-founded Knight Capital with his business partner Walter Raquet, serving as CEO until 2002. The company acted as a market maker, or middleman between buyers and sellers, using its own money to create liquidity for stocks and profiting on the difference it could capture between the bid and ask prices for each trade. It also traded for its own book, using data from those trades to analyse market momentum. Pasternak's timing was ideal. He caught the wave of convergence between technology and capital markets using computers and algorithms to drive trading volumes and understand market patterns. In its first four years of operation, the upstart firm from Jersey City suffered only 10 days of losses, captured some 40% of all online trades and controlled almost one-fifth of the trading in Nasdaq/OTC stocks.[1]

Pasternak wanted to handle the trades of large institutional investors, displacing old-style Wall Street brokers, and the company's early success included persuading emerging online trading firms, such as E*Trade and Waterhouse, to join it in the creation of a trading group. In 1998, Knight Capital raised $145-million through an IPO, giving the firm a market valuation of $725-million. Eighteen months later its value had soared more than ten-fold.

But the rest of the industry was also looking at smart ways to deploy emerging IT, and within a few years Knight Capital's online trading partners began moving their business to electronic communications networks (ECNs), such as Archipelago, Island ECN and Globex, that did away with the cost of a middleman.

[1] https://archive.fortune.com/magazines/fortune/fortune_archive/1999/09/27/266168/index.htm

In early 2001, Knight Capital received two other blows: the dot-com bubble burst and the U.S. Securities and Exchange Commission (SEC) required that exchanges shift to decimal pricing from fractional pricing, reducing the size of the spread between bid and ask prices. As market conditions changed rapidly, the company's value plummeted and a year later industry veteran Thomas Joyce replaced Pasternak as CEO.

Joyce invested in new technology that moved the company into the realm of HFT, where complicated algorithms and blisteringly fast fibre-optic connections allow players to compare prices from many exchanges and execute thousands of trades in just milliseconds – all ahead of other traders operating with slower systems.

The new technology drew criticism from traditional traders. HFT was blamed for the "flash crash" of May 6, 2010, when the Dow Jones Industrial Average lost more than 1,000 points in a matter of minutes. The debacle led the SEC to institute circuit breakers to stop trading if the market lost more than 10% during a five-minute period.

Michael Lewis' popular 2014 book **Flash Boys – A Wall Street Revolt** left readers with the impression that HFT was creating a rigged marketplace, telling the story of a swashbuckling group of traders and their efforts to shave milliseconds off their high-frequency trades by secretly building a dedicated fibre-optics line between Chicago and New Jersey.

For Knight Capital, the shift to HFT secured its business and its reputation as one of the largest trading operations in the United States. But the ground was always shifting as different players sought new ways to capitalize on technology and improve their trading.

Late in 2011, the New York Stock Exchange (NYSE) proposed a means for institutional investors to trade large blocks of shares with each other relatively anonymously. The Retail Liquidity Program (RLP) was another step toward greater market efficiency and stability that reduced the importance of middlemen like Knight Capital. Joyce publicly stated that he did not believe the SEC would approve the proposal. Not only was he wrong, but when the SEC order came down it gave the market only one month to prepare for the change – and it sent Knight Capital's software engineers scrambling.

In their rush to get ready for the changes, the firm's developers allowed a piece of the new RLP code they had created to interact with some "dead code" left in Knight Capital's older system. They also failed to install the new software on one of the servers, and because the project lacked a review process the errors weren't caught.[2]

When the company's new system went live on August 1, 2012, it immediately encountered a glitch that caused the firm to mistakenly buy long and sell short billions of dollars' worth of stocks on the NYSE. The head of the exchange's parent company, NYSE Euronext, called Joyce

[2] https://medium.com/dataseries/the-rise-and-fall-of-knight-capital-buy-high-sell-low-rinse-and-repeat-ae17fae780f6

within minutes of seeing the unusual activity, but Joyce was recovering from knee surgery and unavailable. So, the NYSE contacted Knight Capital's chief information officer, who gathered the IT staff to try to figure out what was going wrong. Unfortunately, the company didn't have a "kill switch" to shut down its own wayward system so trading continued for a full 45 minutes before excessive price swings triggered SEC rules that halted trading.[3] By that point, Knight Capital had lost $440-million. By the end of the day the company's stock had fallen 75%.

Within days, a group of six investors rescued Knight Capital with a $400-million equity infusion that kept the company in business but significantly diluted the holdings of existing shareholders. The new owners included Jeffries Group, Blackstone Group LP, TD Ameritrade Holding Corp., Stifel Nicolaus, Stephens Inc. and rival market-maker Getco.[4]

But even as Joyce negotiated the deal to save his company, there were other forces at play hurting the entire computerized trading sector. Since the 2008/9 recession, trading volumes and volatility – two critical components of success for HFTs – had declined on all the exchanges, and at the same time the costs of operating high-speed trading networks was rising.

Chicago-based Getco moved to shore up its own business a few months later with a $1.4-billion merger agreement with Knight Capital. The deal closed in July, 2013, with the formation of a new, publicly traded entity called KCG Holdings Inc. The process required privately owned Getco to make its financials public for the first time. The results showed how much the high-speed trading market was suffering.

Getco's profit in the first nine months of 2012 was $25 million, down 82% from a year earlier, as trading revenue fell 43%, to $414 million. Meanwhile, the cost of maintaining high-speed data equipment in that period had risen by more than three times what it was in all of 2008.[5]

The high-speed trading bonanza that had minted billionaires had come to an end; US stock exchanges had already absorbed the ECNs into their own businesses, consolidation was the new trend, and as survivors looked for new ways to make money the secretive algorithms and fibre-optic networks were suddenly available for any trader or trading firm willing to pay a service fee.

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3 https://medium.com/dataseries/the-rise-and-fall-of-knight-capital-buy-high-sell-low-rinse-and-repeat-ae17fae780f6

4 https://www.reuters.com/article/us-knightcapital-rescue/knight-capital-gets-400-million-rescue-shares-tumble-idUSBRE8750HF20120806

5 https://dealbook.nytimes.com/2013/02/13/in-first-disclosure-getco-reveals-years-of-sagging-revenues-and-profits/

In 2017, Virtu Financial Inc. purchased KCG Holdings for $1.4-billion, making itself one of two heavy-weights, along with Chicago-based Citadel Securities, that now have clear leadership positions in a mature high-speed trading industry.

Case Study: High Speed Trouble – Knight Capital

COMM 420: Financial Technology and Innovation

Overview

The High Speed Trouble: Knight Capital Case Study is worth 10% of your final grade and is due at **11:59 p.m. EST on Friday, October 16th**. For the deliverable, students are expected to deliver a written case study report. The final report must be submitted through the course portal submission box.

Direction

Students will analyze the impact of high-speed training on the markets and the implications for investors and businesses. This case will provide students with an understanding of high-frequency trading (HFT) and how it has altered the trading landscape. The report should address the questions brought up in the case. Present analysis and research from the case and case files as well as external sources.

Along with your analysis, please answer the following multiple-choice questions:

Multiple-Choice:

1. What is the key lesson from the Knight Capital case?
   - a) Aggressive use of new technology in capital markets opens trading up to abuse that will hurt investors and listed companies and which regulators will have a hard time policing.
   - b) When new technology such as HFT rolls out, it takes regulators a while to develop appropriate oversight rules, during which time there is a greater risk of injury to market participants.
   - c) The adoption of new technology in capital markets produces a similar effect as in other industries: customers benefit from greater efficiencies, and early-adopter companies enjoy a competitive advantage until the rest of the industry catches up.

2. What changes could Knight Capital have made to improve its chances of survival?
   - a) Create better trading algorithms.
   - b) Invest additional capital in fibre optic cables and operations closer to exchanges.
   - c) Institute better oversight, review and risk management.
   - d) White-label its trading algorithms and sell them to large financial institutions.

3. What was the best course of action for Knight Capital when the NYSE rolled out its Retail Liquidity Program (RLP)?
   - a) Avoid participating in a new trading initiative that challenged the firm's own business model.
   - b) Participate in the program, but only at a time that was convenient to Knight Capital and its software development team.

- c) Move aggressively into the program on day 1 so the firm wouldn't get squeezed out by competitors.

Written-Answer:

1. Knight Capital was a pioneer in the world of high-frequency trading but ultimately was unable to survive as the market developed.
- What were the three critical moments in its history that turned the tide against the firm?
- Could management have charted a better course at any of these moments?

2. Knight Capital was run by men with big personalities who moved quickly and aggressively to try to stay ahead of their competitors.
- Why are these types of characteristics often beneficial for start-ups?
- As a company matures, what other characteristics might its senior leadership team need to possess and why?

3. Private companies often implement technology and innovative business models that regulators do not have experience overseeing. In the case of high-speed trading, the SEC tried to balance the interests of investors, listed companies and traders. Did it do a reasonable job or not? Why?

4. Knight Capital enjoyed success as a technological leader but began to lose its competitive advantage as high-speed trading became more commoditized. What should it, and other players such as Getco, have done to survive once the HFT systems became more common?

5. When Knight Capital launched its new computer trading system on Aug. 1, 2012, poor planning not only created a critical software error but also left the firm ill-equipped to manage the crisis that ensued.
- What fundamental systems integration steps were missing when Knight Capital switched over to its new trading system?
- What should the company have done to improve both communication and responsibility around the switchover?
- What technological solutions could Knight Capital have created to help mitigated its trading error?
- What are the pros and cons a company should consider before incorporating a "kill switch" in its IT systems?
- Who should have the authority to engage a "kill switch", in what circumstances, and what should the oversight process be?

The report should be no longer than 5 pages double spaced with 12-point font.

Identification of the Main Issue in the Case - Explain how the trading landscape has changed over the years - Explain how HFT works - Highlight what led to Knight Capital's success and what failures they experienced - Explain what led to the emergence of KCG Holdings Inc.	5
Analysis - Analyze the criticisms of HFT and present your own opinion on the outlook for HFT - Thorough research and analysis using case and external sources - Course material is applied - Answer case questions correctly	10
Professional Quality of Case write-up - Double spaced, 12 pt. font and 5 pages maximum - Free of grammar and spelling errors - Clear and concise presentation of ideas and analysis	5
TOTAL	20