Everything You Need to Know About the Knight Capital Meltdown

What went wrong?

Matt Koppenheffer (TMFKopp)
Sep 14, 2012 at 12:00AM

If the climax of **Knight Capital**'s (NYSE: KCG) story is a piece of trading software going disastrously haywire, the beginning was the trading giant trying to defend its turf.

Knight's primary business is market making. As Georgetown professor Jim Angel explains it, a market maker is like a used-car dealer. At the time you want to sell your car, you may or may not be able to find another individual to buy it. But you can take it to a used-car lot, and they'll offer to buy it from you immediately in the expectation that they can then turn around and sell it later for more and pocket the difference.

In a similar way, a market maker will buy a stock from you right when you want to sell it, and then hope that they can sell it to someone else at a slightly higher price. In short, market makers buy at the bid and sell at the offer price. Of course, while a used-car dealer might hope to see a turnaround time of days or weeks and a profit of hundreds or thousands of dollars on your car, with a market maker we're talking about turnaround times of seconds, or even fractions of seconds, and profit per share calculated in pennies.

In 2011, market making accounted for almost exactly half of Knight's $1.4 billion in revenue, but because of pre-tax losses in both its institutional sales and trading and corporate divisions, the $256 million in profit from market making actually eclipsed the $187 million in consolidated pre-tax earnings. As that suggests, market making can be a lucrative business, particularly for a large, dominant player like Knight. However, it's also a business that's faced significant challenges in the past 12 years.

The collapse of the dot-com bubble eviscerated stock prices, but also meant plummeting trading volumes, which hurt market makers. That was only exacerbated by the mid-2000 shift to decimalization -- that is, pricing stocks in increments of a penny rather than 1/16th of a dollar --

which drastically reduced the spreads that market makers could capture on their trades. A few years later, Regulation National Market System (aka Reg NMS) set down a framework for an integrated nationwide market system and flung the doors open for increased competition. As with any industry, increased competitive forces turned the screws on existing players.

Notably, these changes all benefited individual investors, as commission rates rapidly declined and bid-ask spreads -- an oft-overlooked cost of trading for individual investors -- contracted. But what was good for retail traders was a bitter pill for market makers, as profitability was seriously pinched.

But Knight persevered, and today it is retail traders that are the bread and butter of the company's market-making business. Among Knight's biggest customers are **TD AMERITRADE**, **E*TRADE** (Nasdaq: ETFC), Scottrade, and Vanguard. So when you punch in a trade with your online broker, there's a good chance that it's being sent off to Knight for execution.

Knight competes directly for retail trading action with giants like **Citigroup**, **UBS**, and Citadel. But due in large part to Reg NMS, the competition isn't simply *who* makes the trade, but also *where* the trade is made. Thanks to the ability of these traders to internalize -- to make the trade on their own, off the exchanges -- and the proliferation of trading venues, exchanges like **NYSE Euronext**'s New York Stock Exchange and **Nasdaq OMX**'s Nasdaq are likewise in a struggle to get a piece of the action. And last year the New York Stock Exchange had its eye on increasing its slice of the pie.

Back in October 2011, the NYSE introduced a controversial proposal dubbed the Retail Liquidity Program. The RLP essentially sought to create a pool of traders within the NYSE that would be allowed to pay retail investors fractions of pennies more for their stocks -- or sell for fractions of pennies less -- than the displayed bid and offer prices. If approved, this would give the exchange a way around the prohibition in Reg NMS of sub-penny quoting on stocks valued at more than $1. As with other evolutions of trading over the past decade, this had the potential to be good for investors while at the same time challenging market makers' profits.

For Knight specifically, this meant a lot of things, few of them good. The most pressing issue, though, was the potential loss of business as trades found their way to venues outside of Knight. Near term, that would mean the NYSE's RLP, but if the RLP was approved, competing exchanges like Nasdaq and BATS would almost surely release RLP clones of their own.

In the months of debate over the RLP, Knight CEO Tom Joyce wryly referred to the NYSE as "our friends at 11 Wall Street" and explained the RLP as "an attempt to garner more retail market share." Joyce didn't give the RLP much chance of approval -- he also quipped, "Frankly, I don't see how the SEC can possibly OK it" -- but, if it did somehow get the nod, he was confident that Knight could "defend [its] place in the market quite ably."

In early July, the Securities and Exchange Commission did in fact OK the Retail Liquidity Program. If Knight could defend its place in the market, it was time to prove it.

Building the beast

In a sign of the extent to which market makers and exchanges are intertwined, Knight's route to defending its market share from the threat of the Retail Liquidity Program was to actually participate in the Retail Liquidity Program. As the RLP represented a potentially attractive trading pool for retail investors, Knight could limit its market-share losses by jumping in the pool itself and trying to out-hustle other traders in there. In order to do that, though, Knight's tech team would have to build a new software system that would be able to talk to and trade with the RLP.

There have been questions raised over whether Knight should have attempted to have its software ready for RLP's debut at all. There was only a month-long window between when the RLP received its approval and when it was slated to go live, and the system was brand-new and unproven. "Surely," this argument goes, "Knight was asking for trouble by trying to be ready for RLP's first day."

Retrospect is a funny thing, though. It's easy, $440 million later, to say that it was a dumb move by Knight. But linking into the RLP wasn't like building a NASA launch system; instead this was more likely an iteration on software that Knight was already running elsewhere in its operations. Furthermore, this is Knight's business, after all -- as much as it's a financial company, it's just as much a technology company. When I spoke with Bernard Donefer, Baruch College professor and former head of Fidelity's Capital Markets Systems, whether it was a reasonable move for Knight, his view was straightforward:

> Of course it was. Had they not, I would have been very surprised. That's what they do for a living. *That's what they do*. They're market makers in those securities. For them to not to post bids and offers and give up that order flow -- that would not have been acceptable for management.

And to be sure, Tom Joyce is no pushover. The 6'2" Harvard graduate was an honorable-mention all-American linebacker for the 1976 football season. Former New York Stock Exchange chairman Richard Grasso once said of him, "When even your most bloodthirsty competitors speak highly of you, that says a lot." Joyce took over Knight's leadership role in 2002 when seemingly everything was going wrong -- trading volumes were down, the company was losing money, and squabbles with regulators had investors constantly on edge -- and he brought the company back to sound profitability. Earlier this year, he gave Nasdaq hell when its **Facebook** IPO glitch cost Knight millions.

Sure, Joyce thought the RLP was all wrong, but with approval in the bag, he also wasn't going to let it off without a fight. So, when Aug. 1 rolled around, you'd better believe Knight was going to be there with new software, ready to participate in the RLP.

Let the madness begin

At 9:38 a.m. EDT on Aug. 1, Nanex founder Eric Hunsader tweeted that 14 stocks already had

higher trading volume than the **S&P 500 SPDR**, something, he noted, "that never happens." By 10 a.m., a post on Nanex's website noted that 51 stocks had higher trading volume than the SPY.

Through that first *half hour* of the trading day, **Juniper Networks'** (Nasdaq: JNPR) stock had traded nearly 21 million shares. **Ford**'s (NYSE: F) volume had breached 20 million. In the three months prior to the incident, roughly nine million shares of Juniper and 44 million shares of Ford changed hands on a typical *full day* of trading. Other stocks also saw huge price moves as trading action went wild. **Rare Element Resources** plummeted 29% from its high to low price by 10 a.m. **RadioShack** investors watched that stock soar as much as 27% from the early morning low to its high.

The level of trading activity was off the charts and at the center of it all was Knight Capital.

Knight has yet to say much in the wake of the meltdown. It's possible that's because the SEC is in the process of investigating Knight and the circumstances of the failure. The SEC would neither confirm nor deny an investigation was taking place, but on Aug. 4 Chairman Mary Schapiro said, "Existing rules make it clear that when broker-dealers with access to our markets use computers to trade, trade fast, or trade frequently, they must check those systems to ensure they are operating properly. And, naturally, we will consider whether such compliance measures were followed in this case." Or perhaps Knight just doesn't really feel like talking about losing $440 million and nearly going out of business. The bottom line, though, is that repeated attempts to get in touch with Knight received no response.

Thanks to that information lockdown at Knight, we don't know for sure what happened behind the scenes on Aug. 1. But that doesn't mean we can't put together some of the pieces.

Early rumors suggested that something went awry with Knight's TWAP ("tee-whap") program. The TWAP is a relatively standard algorithmic trading program that chops up big orders to trade them automatically throughout the day. But even as that rumor made the rounds, few people seemed to think that Knight screwed up the programming of the actual trading software. As Baruch's professor Donefer put it:

> I'll tell you right now that they tested it dozens of different ways. There's no question in my mind that Knight did thorough testing. These guys are highly sophisticated, highly experienced, highly disciplined. They did substantial testing. While nobody has talked about it ... they must've done a test with the New York Stock Exchange. How well did that go? The New York Stock Exchange doesn't just say "Put in any new software and we're OK with it"; they usually have to approve any new software that connects up with them.

Later, Bloomberg reported that "old computer software" was activated that "started multiplying stock trades by one thousand." That made for a somewhat more reasonable explanation, but it still wasn't clear that it fit the details of the actual trading.

Meanwhile, over at Nanex, by combing through the second and sub-second trading data, Eric Hunsader has suggested that the glitch was actually an inadvertent activation of Knight's testing software. Hunsader pointed to the fact that it appeared there were a lot of wash trades -- that is, trades with the same party on both sides. He also emphasized that if there was an inordinate amount of buying or selling action on one side of a given stock, prices would likely have swung more wildly than they did. As Hunsader explained it:

> In some stocks like **Nokia** and **Exelon**, we saw lots of what looked like wash trades and we thought this has to be the same player on both sides. Otherwise you'd expect to see that market really widen out when it sees a lot of buying or selling and it didn't. In the other affected stocks, we saw that one side of the trades [was] always NYSE, marked regular and had the same size: 100 shares. It was in these other stocks Knight ended up accumulating a position.

This theory fits many of the pieces of the puzzle. The wild trading only took place on the NYSE, which would make sense since Knight had been updating its software that interacts with the NYSE. Trading data from Nanex shows a ping-ponging trading pattern that looks like a trader was repeatedly buying at the ask and selling at the bid -- the classically terrible buy-high-and-sell-low strategy. That's far from normal trading activity, but could make sense for a testing algorithm.

Most important, though, it helps explain some of the bizarre time lag between when the trading started and when it was finally shut down. In the three-alarm fire that was raging during the aberrant trading, Knight's electronic firefighting team was likely attending to and pulling the plug on programs that were *supposed* to be running. Checking on something -- like a testing program -- that wasn't supposed to be running may have only occurred to them after many other interventions had been exhausted. As Hunsader put it, "It couldn't have been in the market-making software or they just would have shut it off!"

Finally, the catalyst to start up the testing software could have been a very small, easy-to-overlook bit of code within the larger trading program. That would also mesh with the simple, sad mantra that was heard repeatedly around Knight's Jersey City offices after the meltdown: "One line of code."

The pain train cometh

No matter what actually caused the meltdown, what is clear is that as Knight's software was busy firing off trades, other market participants were stepping in. As they say in the Las Vegas poker rooms, if you can't spot the sucker at the table, then *you* are the sucker. On Aug. 1, Knight was that sucker.

As the glitch barreled ahead almost completely unimpeded, Knight was racking up stock positions that it had no intention of building. At one point, the trading house was reportedly holding as much as $7 billion in stocks related to the rogue trading. In the scope of the markets as a whole, that's a drop in the bucket. For Knight, which had just over $9 billion in total assets at the end of June, it was gigantic.

But the growing tumor on Knight's balance sheet wasn't the only problem. Customers ran for cover as they watched the trader's systems erratically and uncontrollably blast orders. TD AMERITRADE, Vanguard, Fidelity, Scottrade, and E*TRADE, among many others, collectively said, "Good luck with that, Knight, we're going to trade elsewhere for now." One small computer glitch was simultaneously wrecking Knight's balance sheet, business reputation, and long-held customer relationships.

As the day wore on, Knight did what it could to unravel its unwanted stock positions. While it did manage to eliminate a bit more than $2 billion of the trades, it likely lost more than $200 million in the process and was still holding billions more in stocks at the end of the day. Those were billions of dollars that Knight couldn't afford to have tied up.

Knight needed a steady hand with deep pockets, and it needed it fast. If you've been wondering how a big Wall Street debacle like this goes on without **Goldman Sachs** making an appearance, here's where the much-maligned investment bank enters the picture. Goldman stepped in and bought the remainder of Knight's unwanted stocks in one fell swoop. Why? That's easy: Goldman bought the block at a discount, immediately booking a profit to the tune of a quarter of a billion dollars.

On the bright side, the glitch had been turned off, the immediate bleeding was cauterized, and Knight had cleaned its balance sheet. However, the $440 million that was lost was nearly 30% of the company's stated book value and amounted to more than two full years of operating profits. And the struggle for survival was far from over -- the company had blown a giant hole in its capital base and its customers had run for the hills. As Knight later wrote in an SEC filing, "[T]here was substantial doubt about the Company's ability to continue as a going concern."

The rush to recover

In an eerie reflection of the state of the company, Tom Joyce, following a July 31 knee surgery, hobbled around the Knight offices in the wake of the disaster. Between the open of trading on Aug. 1 and the very next day, his net worth had declined by as much as $12 million. He was also at risk of ending up the CEO of the market's largest retail market maker when it was snuffed out by a single line of computer code.

Although it looked bleak going into the weekend, there was still plenty of reason for hope. According to RBC Wealth Management CEO John Taft, a chief reason for that hope was Knight's chief. In a column for *Forbes*, Taft described Joyce as "a stand up guy who is admired, respected and trusted by his peers," and called him a "man of character," suggesting that this was why "the financial services industry went out of its way to save Knight Capital."

Taft contrasted that with the less-well-liked leaders of Bear Stearns and Lehman Brothers. Bear's Jimmy Cayne appeared to be more concerned with a bridge tournament than his failing investment bank back in the darkest days of 2008, while Lehman's Dick Fuld reportedly said of his competitors that he wanted to "rip out their heart and eat it before they die."

Stifel Financial CEO Ron Kruszewski had a similarly positive view of Joyce, as he described Knight's chief to me as "a very capable CEO" and lauded the way he handled the crisis: "The way that [Joyce] responded, you have to give him credit. A lot of companies wouldn't have made it."

With due respect to Joyce, he wasn't the only reason that a quick rescue was possible. Glitch aside, the technology and platform at the core of Knight's operations are valuable. Though certainly shaky after the trading debacle, Knight's relationships with the largest retail brokers in the business are also valuable. Maybe most important, though, Knight's balance sheet was nothing like that of Bear Stearns, Lehman Brothers, or the too-big-to-fail banks like Citigroup and **Bank of America** (NYSE: BAC) during the financial crisis. The clarity of equity markets -- in contrast to the opaque over-the-counter trading in mortgage-backed securities and credit derivatives at the heart of the 2008-2009 financial crisis -- made it such that potential investors could figure out the risks and the value of Knight's balance sheet in very short order.

As Stifel's Kruszewski put it: "The problem with too-big-to-fail institutions is that they still don't understand where the other side of their trades are. I, in a matter of hours, understood Knight's counterparty risk."

In what could have led to a visit of the corporate grim reaper, Knight instead ended up with what RBC's Taft dubbed an "embarrassment of riches" -- some 90 offers of assistance from various financial players ranging from the behemoth Bank of America to archrival Citadel.

In the end, Knight struck a $400 million deal led by investment bank **Jefferies** with additional backing from TD AMERITRADE, investment bank Stephens, Stifel Financial, private-equity giant **Blackstone**, and GETCO, a competing market maker principally owned by private equity firm General Atlantic. The investors bought 267 million newly issued convertible preferred shares with a 2% dividend and a $1.50 conversion price. In all, the shares give the new investors 73% ownership of Knight. As part of the agreement, Knight also assented to three new board members -- Blackstone managing director Martin Brand, former General Atlantic managing director Matthew Nimetz, and TD AMERITRADE CEO Fred Tomczyk.

In a technical sense, previous Knight shareholders weren't completely wiped out. But you can forgive them if they felt that way. The stock now trades at a price that's roughly 70% lower than the pre-glitch trading price and a new set of investors have majority control of the company. For investors who put their money behind Knight prior to Aug. 1, this was a very costly debacle.

On the other hand, thanks to the new investors, Knight is still a going concern today. As Tom Joyce told CNBC not long after the investment was announced, "Our financial footing is arguably better than it was. As far as I'm concerned it's business as usual at Knight Capital Group." And not only does Knight have a shot at recovery, but it's taking that shot with a bunch of deep-pocketed investors behind it and one of its key customers' CEOs on its board.

Of the potential outcomes for Knight following the trading glitch, this one is far from the worst.

But while Knight may be back on its feet, in many ways its meltdown may be a symptom of bigger risks affecting today's markets. It's one more high-profile stock-market-computer blowup that implores us to take a closer look at how our trades are made in these modern electronic markets and better understand how high-speed, computer-based traders are pulling the levers.

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AUTHOR

Matt Koppenheffer

(TMFKopp)

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Sep 14, 2012 at 12:00AM

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