What Investors Should Know About **FinTech**, **High-Frequency Trading**, and **Flash Crashes**

REAL-TIME RISK

IRENE ALDRIDGE and **STEVE KRAWCIW**

WILEY

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To Henry and Rosalind

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CHAPTER 1

Silicon Valley Is Coming!

Knock-knock.

—Who is there?

—Bot.

—Bot who?

—Bot and sold, it's a stat-arb world.

Do you wonder why the markets have changed so much? Where's it all heading? How will it affect you? You are not alone. Today's markets are very different from what they used to be. Technological advances morphed computers and infrastructure. Changes in regulation allowed dozens of exchanges to coexist side by side. The global nature of business has ushered in round-the-clock deal making. All of this has created stratospheric volumes of data. The risks that come along with automated trading in real-time are numerous. Now, the inferences from these data allow us to go to previously untapped depths of markets and discover problems and solutions that could not even be imagined 20 years ago.

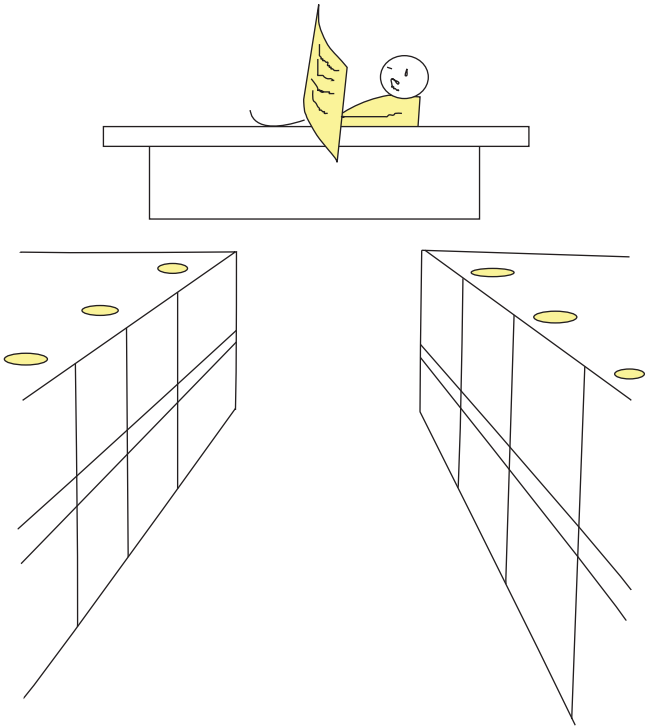
Do you remember Bloomberg terminals? If so, you are reading this book not so long after it was written. JP Morgan's January 2016 announcement "to pull the plug" on thousands and thousands of Bloomberg terminals is a leading example of the sweeping disruption facing investment managers. Billion-dollar hedge fund Citadel followed suit on August 16, 2016, by announcing that it was taking on Symphony messaging as Bloomberg's replacement. Symphony, who? Many still struggle to wrap their head around the situation, with social media platforms like LinkedIn buzzing with discussions about pulling the plug on traditional sources of market data. Yet, here is fact: The competition is not sleeping, but working hard. And now, the competition is so strong that Bloomberg, Thomson Reuters, and others may end up in significant financial peril if they ignore fintech. Is your company also oblivious to changes in innovation?

The unfortunate truth is that many established firms are completely unprepared for the fast train of innovation currently passing them by. Old, manual procedures may have been fine in the past, but with innovation

sweeping through, risk management executives have to be ready to see established operating models and platforms go out the door as newer, untried approaches take their place.

Consider the investment advisory industry. Reliance on charming brokers to seduce ever-dwindling pools of clients into paying for their commissions and overhead expenses remains the business model for some firms. At the same time, a number of well-established startups deliver cutting-edge portfolio-management advice to investors right over the Internet, with some charging as little as $9.95 per month.

TRADING FLOOR SUPERVISOR



Global banks like Barclay's and Credit Suisse have exited the US wealth management arena while at the same time hundreds of millions of dollars in venture funding have been channeled to fintech startups working to streamline financial advice and beyond.

The bet has been wagered that new innovative and cost-efficient business models are here to stay. Innovation can take the form of a completely new approach to conducting business or through advances in the information used for the existing way of conducting business. As an illustration, while

many finance professionals are still debating market structure and whether a new exchange will help people avoid high-frequency traders, companies like AbleMarkets deliver a streaming map of high-frequency trading activity directly to subscribers' desktops, leaving nothing to chance and helping to significantly improve trading performance across all markets. Similar innovations are going on in insurance, risk management, and other aspects of financial services, and firms that are not up to par on what's going on are at a significant risk of failure.

EVERYONE IS INTO FINTECH

Have you ever missed opportunities in the markets because you felt you were disrupted? We have been in a unique and fortunate position to be immersed in the heart of fintech innovation and to observe first-hand the extent of what is becoming a true disruption to businesses that, in turn, disrupted financial markets in the late 1970s and 1980s. Think of this as Finance 3.0. The possibilities are endless, and the new players are already embedded in most facets of traditional finance. These new players are not boiler rooms—most founders have advanced degrees and the most recent scientific innovations at their fingertips.

According to the Conference Board, investment in financial technology, trendily abbreviated into fintech, grew by 201 percent in 2014 around the world. In comparison, overall venture capital investments have only grown by 63 percent. The digital revolution is well underway for banks, asset managers, and customers. The impact on the financial institutions from the many startups that are trying unproven ideas is beginning to crystallize. Venture capitalists are betting that the once-stodgy financial industry is about to experience a considerable transformation.

The pace of change for the financial world is speeding up, and startups and venture capitalists are hardly alone in the fintech craze. Apple, Amazon, and Google, among others, have already launched financial services platforms. They have aimed at niches where they can establish a strong position. Threatened by these new entrants, traditional financial stalwarts are hearing the pitch: Adapt to the new environment or perish.

Banks are launching their own internal funds and hiring significant numbers of developers for internal builds. Why now? In his latest annual letter to shareholders, Jamie Dimon, CEO of JPMorgan Chase, wrote that "Silicon Valley is coming." While this statement went unnoticed by the news, it reflects the torrent of venture capital flowing into fintech. Estimates by the *Economist,* shown in Figure 1.1, suggest that 2014 was the watershed year for fintech startups.

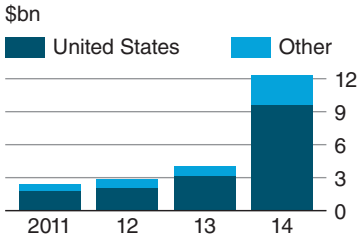


FIGURE 1.1 Global fintech investment
Source: Economist, May 19, 2015.

The Current State of Big Data Finance

What is big data finance? For many financial practitioners, *big data* is still just a buzzword, and *finance* is business as usual. However, looking at the hottest-financed areas of business, one uncovers particular trends that move beyond buzz into billion-dollar investments. According to Informilo.com, for instance, the fastest-growing areas of big data in finance in 2015 were:

- Payment services
- Online loans
- Automated investing
- Data analytics

Each of these areas, in turn, translates into automation. The payment services businesses, such as TransferWise, harness technology to commoditize counterparty risk computations. *Counterparty risk* is a risk of payment default by a money-sending party. Some 20 years ago, counterparty risk was managed by human traders, and all settlements took at least three business days to complete, as multiple levels of verification and extensive paper trails were required to ensure that transactions indeed took place as reported. Fast-forward to today, and ultra-fast technology enables transfer and confirmation of payments in just a few seconds, fueling a growing market for cashless transactions.

Similarly, the loan markets used to demand labor-intensive operations. Just 10 years ago, the creditworthiness of a bank's business borrowers were often judged during a round of golf and drinks with the company's executives. Of course, quantitative credit-rating models such as the one by Edward Altman of New York University have proved invariably superior for predicting defaults over most human experts, enabling faster online loan approvals. Online loan firms now harness these quantitative

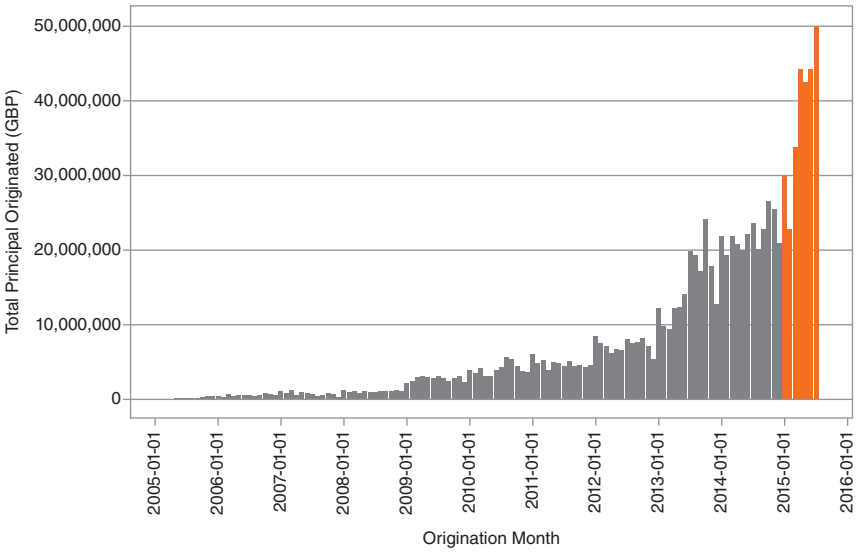


FIGURE 1.2 Zopa originations by month
Source: p2p-banking.com

credit-modeling approaches to produce fast, reliable estimates of credit risk and to determine the appropriate loan pricing.

Can anyone issue loans over the Internet or facilitate payments? According to recent industry reports, yes, the founders of many loan startups that originated during the credit squeeze of 2009—have little prior background in lending.

The key issues in lending are (1) having capital to lend, and (2) estimating credit risk of the borrowers correctly. The pricing of the loan service, *interest,* is then a function of the credit rating. If and when a borrower defaults, the loan should be optimally paid out from the interest. More generally, the average loan interest should exceed the average loan amount outstanding in order for the lender to make money.

The lending business is central to banking, and banks have had a near monopoly over the lending business for a very long time. New approaches to lending have emerged that compete with banks. Banks fund loans with deposits, whereas peer-to-peer lending is funded by investors. The leading players in this new approach to lending are the LendingClub and Prosper in the United States and Funding Circle and Zopa in the United Kingdom. In 2015, Zopa passed the Great Britain pound (GBP) 1 billion mark. Zopa's growth is shown in Figure 1.2.

With peer-to-peer lenders prospering with their new model, not only have banks noticed, but in some cases, started to acquire the upstart companies. SunTrust Bank acquired FirstAgain in 2012, later rebranding it LightStream.

New technologies are making their presence felt in wealth management as well. The topics of the robo-advising and a broad group of analytics are the most diverse and least exact. Robo-advising takes over the job of traditional portfolio management. The idea behind robo-advising is that a computer, programmed with algorithms, is capable of delivering portfolio-optimized solutions faster, cheaper, and at least as good as its human counterparts, portfolio managers. Given a selected input of parameters to determine the customer's risk aversion and other preferences (say, the customer's life stage and philosophical aversion to selected stocks), the computer then outputs an investing plan that is optimal at that moment.

Automation of investment advice enables fast market-risk estimation and the associated custom portfolio management. For example, investors of all stripes can now choose to forgo expensive money managers in favor of investing platforms such as Motif Investing. For as little as $9.95, investors can buy baskets of ETFs preselected on the basis of particular themes. Companies such as AbleMarkets.com offer real-time risk evaluation of markets, aiding the judgment of market-making and execution traders with real-time inferences from the market data, including the proportion of high-frequency traders and institutional investors present in the markets at any given time.

Not only are the changes aimed at managing the portfolios of the retail investor but also in the way companies are raising capital from these same investors. Crowdfunding has become a popular way for ideas to turn into projects with real funding. Kickstarter is one of the more popular sites.

And companies like Acuity Trading, Selerity, and iSentium are trying to harness data from platforms like Twitter to give an indication of investor "sentiment," which, in turn, gives them an idea of which way to trade.

The information-driven revolution is changing more than the investing habits of individuals. Institutional investors are increasingly subscribing to big data information sources, the more uncommon or uncorrelated is the data source, the more valuable it is. Each data source then drives a small profit in market allocations, and, when combined, all of the data sources deliver meaningful profitability to the data acquirers. This uncommon-information model of institutional investing has become known as Smart Beta or the Two Sigma model, after the hedge fund that grew 400% in just three years after the model adoption.

Underlying all these developments are the advances in scalable architecture and data management. Ultra-fast computation and data processing are

critical enablers of other innovative forms of financial research and investing. Several companies have lately generated multibillion-dollar valuations by providing analytics in the software-as-a-service (SaaS, pronounced "sass"). For instance, Kensho is delivering the power of human-language queries in customers' data, which have been rolled out across Goldman Sachs.

Risk managers face a daunting challenge. Finding a risk event is the needle in a haystack. With automation and big data, the haystack becomes a mountain, and that mountain is virtual. The potential to catch issues could never have been stronger, but the ways of doing so are drastically novel.

THE MILLENNIALS ARE COMING

Why is technology transforming financial services now? Where was it 20 years ago, when computers and the Internet already existed? The short answer is the millennials, a generation of young people loyal to their smart phones and technology platforms and caring little for other brands, such as those of banks. With this generation of people now in the workforce, the choices that this group of 84 million make can provide the momentum to carry change. The millennials, born between 1980 and 2000, are expected to hold $7 trillion in liquid assets by 2020.

Recent findings in the Millennial Disruption Index (MDI) paint a startling portrait of preferences so different from older generations and so aligned with corporate digital heavyweights that financial services may change further dramatically. For example, according to the MDI study, one in three millennials will switch banks in the next 90 days. Additionally, over 50 percent of the 10,000+ respondents consider all banks to share the same value proposition. In other words, millennials don't see any difference among financial institutions. With over 70 percent of respondents saying, "*They would be more excited about a new offering in financial services from Google, Amazon, Apple, Paypal, or Square than from their own nationwide bank,*" it is clear that change is before us. Such findings open the door for brands like Google to enter the market and build a stable business with the millennials before bringing in older generations.

Traditional banks are feeling the threats of new entrants. Apple, Google, and Amazon are now all actively participating in the financial services industry. Whether through payments, cloud infrastructure, or investments into other fintech companies, firms considered technology leaders are focusing on financial services. The technology giants have even created their own lobbying group to avoid getting mired in regulatory red tape encasing banks. (See "An Excerpt about the Silicon Valley Lobbying Entity.")

AN EXCERPT ABOUT THE SILICON VALLEY LOBBYING ENTITY

Leading Silicon Valley players are so intent on entering financial services that they have launched a collaborative advocacy group to push Washington to create rules that are friendly to new technologies for financial services. The group, known as Financial Innovation Now, comprises founding members Google, Apple, Amazon, PayPal, and Intuit.

> *"These five companies are coming together because innovation is coming to financial services," Brian Peters, the group's executive director, told BuzzFeed News. "And they believe that technological transformation will make these services more accessible, more affordable, and more secure."*

Whether through products like Google Wallet, Amazon Payments, and Apple Pay, acquisitions like PayPal's purchase of mobile payment startup Venmo, or investments like Google's in peer-to-peer lending outfit Lending Club, the group's founding companies all have a stake in the evolving industry and its regulation.

> *"The goal here is to serve as the voice of technology and innovators," Peters said. "Because honestly the banking policy conversations in Washington have not had that voice historically."*

Source: Buzzfeed, Nov. 3, 2015.

How can this affect you? For years, financial services companies focused their investments on meeting regulatory changes or incremental improvements—automation, workflow, and so on. The essential business model went untouched. What's changing now is that new startups are bringing a Silicon Valley approach, and they are entering financial services with bold new business ideas.

The same message resonates for most investors: institutional or retail, global macro or small-cap, trading in the dark pools or lit exchanges. The sudden demand for new technology concerns all aspects of the financial ecosystem. At least some of the demand is based on the idea that operating models need to become leaner to offer services at lower price points, utilize

a labor force based all over the world, and compete with new players. While slimming their offerings makes banks less prominent, it may enable them to face the challenge of new well-heeled Silicon Valley entrants as they get into the business of financial services.

How do you protect your company in an environment of disruptive change? How do you anticipate shocks to the markets precipitated by new dynamics at play? How do you ensure you know your customer when more and more of your company's process are moving to new platforms? These are some of the questions we explore in the following chapters.

How is the current environment different from the one, say, just 10 years ago? Today, many companies have adopted the *Digital One* company strategy with the idea to integrate social media, mobile technology, cheap computing power, fast analytics, and cloud data storage.

SOCIAL MEDIA

Social media alone creates change, and not just because of all the new tools connecting billions of individuals worldwide. People use social networks to gain immediate access to information that is important to them. The increased independence that people feel when they can access their networks whenever and wherever they want makes these networks a treasured part of the way they spend their day.

For investors, social media may mean wide access to a variety of information on the go. On the train and feel like learning the business model of some obscure public company? Not an issue. At the airport, but thought of investing in a specific municipal bond and need more information on the jurisdiction? Here it is. A successful fintech business has a social network that reaches investors both proactively and responsively. By offering a social experience, the business can provide traditional services in a setting that is consistent with the social network's way of navigating. Analyzing a customer's use of the social network allows a company to respond to clients in a tailored fashion, offering messages and ideas that are consistent with what the customer wants.

The implications of social media, however, go far beyond the communication and customer service experience a business can have with prospects and clients. Unlike news, social media is a powerful user-generated forum where ideas collide, opinions are formed, and beliefs are floated, often completely under the radar of traditional media. The participants who offer the opinions often join in anonymously, concealing their identity in a degree of masquerade where they feel comfortable to disclose their thoughts honestly and passionately. The same degree of honesty is often impossible