Chapter 11

Financial Innovation and Technology Firms: A Smart New World with Machines

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Abstract

There has been a financial revolution lead by technology firms over the past decade. Many large established technology giants, from Google, Apple to Amazon in the US are entering the financial service industry. Smaller start-ups, in particular robotic advisors, a.k.a. Robo-Advisors, have been taking market shares from traditional asset management firms. In China, firms like Tencent and Alibaba have created a whole new field of online finance. At the center of our study is a critical examination of the key components of the financial innovation over the past 10 years. Mobile banking was the beginning, followed by trading, investment, and insurance business. We study innovation through several cases. Due to the size and number of firms in Financial technology (FinTech) space, the US and China are the focus of the chapter. Artificial intelligence (AI) and machine learning are included for discussion in this chapter. We emphasize a market approach in our study, albeit, incorporating the historical and cultural perspectives in our analysis. Our goal is to develop a thorough understanding of the art and science of financial innovation, from both bottom-up market indicators and a top-down holistic view. We want to demonstrate that the technological changes are just the beginning of a new world of financial services. Unprecedented changes are still yet to come and it is crucially important to be prepared and even embrace the changes. A special discussion was devoted to the phenomenon of FinTech boom in Asia. Lastly, many new technologies are being developed to combat fraudulent activities in the FinTech space.
Innovation is moving at a scarly fast pace.

Bill Gates

1. Introduction

Financial technology, or FinTech, has been evolving rapidly over the past decade. There have been many confusion and misunderstanding about what is the field of FinTech? What does FinTech want to achieve? Why are FinTech firms suddenly becoming so important to the society? Are we going to see the end of traditional financial market? Obviously, many classical monetary policy and tools are less effective after the 2008 global financial crisis. As King (2016) wrote in his highly influential book, the credit creation function by traditional banking system has been severely challenged over the past decade. Since the FinTech innovations are rapidly evolving, there have been limited research on this subject. We review the literature in the following paragraphs.

Gomber, Koch, and Siering (2017)’s recent paper surveyed recent research in digital finance field and pointed some interesting directions for future research. Haddad and Hornuf (2016) discussed the technological determinants of the global FinTech market. Arner, Barberis, and Buckley (2015) provided a summary of the FinTech development from historical and legal perspective. Regulatory regime changes were suggested in the chapter as a main reason for the FinTech to be developed rapidly in emerging markets. On a more specific topic of blockchain technology, Walch (2015) detailed the operational risk aspect of the technology. With regarding to the investing perspectives of FinTech, Kuo, Lee, and Teo (2015), suggested important factors for these firms to be viable. Dhar and Stein (2016) summarized current FinTech platforms and strategies. Schindler (2017)’s paper showed that FinTech firms were bringing deep changes and innovation to the financial industry. Philippon (2017) demonstrated that FinTech could improve both financial stability and access to services, albeit at a changed regulatory regime.

It is fair to say that due to the recent rapid development of the subject, many of these researches did not cover the most recent innovations. In addition, some of them tended to focus on a narrow technical aspect of FinTech. Others tended to look at the topic from legal and regulatory point of view. For example, in their recent paper, Buchak, Matvos, Piskorski, and Seru (2017) presented the regulatory arbitrage for FinTech firms in the
US Zetsche, Buckley, and Arner (2017)'s paper discussed the specific liability of distributed ledgers as the legal risks of blockchain. In a recent study about the risk pricing within FinTech industry, Jagtiani and Lemieux (2017) provided evidence that the alternative information were used in the pricing process. On the other hand, Guild (2017) argued that adopting a responsive regulatory approach was suitable to increase the financial inclusion. Bromberg, Godwin, and Ramsay (2017) suggested using sandboxes approach to achieve a balance between regulation and innovation in FinTech. Even traditional central bank functions might be disrupted by the FinTech development, as discussed by Caruana and Warsh (2017) in their joint research presented to a conference hosted by the Basel Bank of International Settlements. From application point of view, Ma, Nahal, and Tran (2017), at Bank of America Merrill Lynch research team, published a detailed handbook about Global Big Data Investment. For technical details about bitcoin futures that have been listed on Chicago Board Option Exchange, CBOE’s introduction paper (2017) is a useful reference. Sironi (2016)’s book examined the FinTech industry from a comparison to the traditional banking perspective.

In this study, we provide an overview of the FinTech industry, with a strong emphasis on the recent development in the applications of these newly set-up unicorns. The financial market has experienced constant innovation. For the past 10 years, the convergence of finance and technology has been truly revolutionary. The financial crisis of 2008 put the global financial system toward the brink of collapse. In the aftermath of the crisis, most of the large financial institutions in the US and the rest of the world have been in a shell-shocked mode. Many of them took government bailout money, which severely restricted their capability and willingness to take risk. Most of the traditional financial institutions became extremely risk-averse. Thus, the leadership of financial innovation has been passed on to many smaller start-up financial firms, or large technology firms, that have little to no crisis baggage and regulatory burden. It is truly a welcome changing of guards, since the new entrants to the financial innovation have been less driven by financial rewards in a traditional sense, and more driven by a vision for more social inclusion. In this chapter, we survey the new world of financial innovation with the new smart players (Figure 1).

2. Payment

One core function of traditional financial institutions is to facilitate payments. Ever since the modern banks were created in Italy, they have been serving as the intermediary between the payer and the payee. No matter if
it is a small person to person money transfer, or a large corporate payment of hundreds of millions to merchandise suppliers. The payment process has been notoriously slow, inefficient, and expensive with the traditional banks. PayPal is one of the earliest firms that started to challenge the existing model of payment through financial institutions. The company established a web-based system that relies on the users to submit payment to each other, without the need to open up complex bank accounts. Later on, the company expanded their service to mobile devices. It revolutionized payment process and completely changed the traditional way of banking. As of 2017, PayPal is a company with 10 billion dollars in annual revenue, and 210 million active users.

AliPay is a payment service that was launched by Chinese e-commerce giant Alibaba. The service was launched in 2012, and it has already attracted 451 million active users. AliPay has about 153 million daily transactions, according to a recent report by Alibaba Group. More importantly, for many Chinese individuals who did not have access to banking services, AliPay enabled them to purchase goods or service for the first time without using cash.

In India, a similar service Paytm has been launched and has grown rapidly. Founded in 2010, the company got a substantial capital injection from Alibaba group in its early days. Indian society has been largely relying on cash transactions, which have been plagued by counterfeiting and tax evasion. With Paytm, the country’s rickshaws were able to be paid electronically, and cellphones became the primary banking tools for a huge number of average Indians.

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In an interesting development, two friends Andrew Kortina and Iqram Magdon-Ismail, who met as freshman roommates at the University of Pennsylvania, started a peer-to-peer mobile payment service Venmo. The company was eventually acquired by PayPal. The unique feature of Venmo is its social-network component. Since it is used mainly for splitting small bills between friends, meals, or movies, it becomes typically for social interactions during “Venmo time.”

In a groundbreaking paper, Nakamoto (2009) proposed a direct payment system that will not go through traditional financial institutions. Essentially, two parties can effectively conduct a direct payment, using an online blockchain of information. The maintenance of the information accuracy is achieved by computers and the rewards are “Bitcoins” that are generated by the booking efforts. The proof-of-work, or PoW, cannot be changed without rewriting the whole chain, which is close to impossible. With the network of users of Bitcoins increasing exponentially, the value of Bitcoin rose many hundred times.

Since then, the traditional payment system has been disrupted by the introduction of Blockchain technology. Blockchain is essentially a global anonymous secured recording of a data ledger. Many crypto-currencies have been invented based on blockchain, including the most well-known one Bitcoin. Despite all the concerns of high volatility and lack of government supervision, blockchain is likely to survive and prosper, bringing along a new wave of payment channels. For a survey of major crypto-currencies, one can refer to a recent publication from Morgan Stanley (2017). Higginson, Lorenz, Münstermann, and Olesen (2017) provided a discussion about what Blockchain technology can be used in payment system. For industry use cases, IBM (2017) illustrated real life examples of Blockchain applications. In many countries, crypto-currencies have been accepted as an alternative payment option. Notably, the Ministry of Finance of Germany (Bundesministerium der Finanzen, 2018) signed a decree recognizing bitcoin as legal tender in February 2018. The decree cites the decision of the European court of 2015, which determined bitcoin currency in terms of taxation and abolished value-added tax when buying goods and services using crypto-currency. Other countries are likely to publish similar regulations.

3. Loan and Credit

In addition to payments, credit and loan issuance is another core function of the modern financial system. In fact, for most of financial institutions, issuing loans and charging interest is the bread and butter of their business.
However, it is a well-known shortcoming that the traditional banking services have been inadequate for many segments of the society. The problems range from excess lending to the subprime borrowers in the US, which ended up causing a worldwide financial crisis,\(^2\) to lack of credit for small and medium side companies and start-ups, and other mis-allocations of resources.

Since the end of Great Recession of 2007–2009, the global banking system has been ordered by regulators in many countries to tighten up its lending criteria, which inevitably caused a lack of credit or capital formation for many regular borrowers. In many developing countries, the Microcredit model invented by Professor Muhammad Yunus has been highly successful. He was awarded the Nobel Peace Prize for founding the Grameen Bank and pioneering the concepts of microcredit and microfinance.

Different from the rural area borrowers in emerging market countries, FinTech firms in the US loan and credit space have been tackling the problem from an urban and technology-savvy user base. Lending Club is a pioneer in this field. Lending Club is a peer-to-peer lending platform. The concept is very simple, people can go online and borrow directly from other users. Obviously, the platform needs to create a score system to grade and rank the credibility of hundreds of thousands of borrowers, and hopefully allow borrowers to get a differentiated interest rate based on their individual credit worthiness. Since Lending Club’s founding in San Francisco in 2006, the company has grown to 1,500 employees and 400 million dollars revenue in 2016. More importantly, Lending Club has been able to lend at interest rate as low as 6\(^\%\),\(^3\) which was substantially lower than the interest rate charged by traditional credit card firms or banks.

In the US, the traditional payday loans have been used to charge high interest rates on lower income borrowers. A payday loan is a small, short-term unsecured loan. The loans are also sometimes referred to as “loan sharks” or “cash advances,” with the interest rate several times higher than a traditional bank loan. Typically, the borrowers have no credit card or other means to access credit. According a Federal Reserve Report, “The typical brick-and-mortar payday lender charges $15 per $100 borrowed per two weeks, implying an annual interest rate of 391 percent!”\(^4\)

CommonBond is a FinTech firm founded in New York in 2011, to address the predatory lending issue. Initially, the company was founded by

\(^3\)“Interest Rates and How We Set Them.” Lending Club. May 2012.
\(^4\)Reframing the Debate about Payday Lending, Robert DeYoung, Ronald J. Mann, Donald P. Morgan, and Michael R. Strain. Federal Reserve Bank of New York, October 2015.
three Wharton MBA students to address the high student loan interest rate problem. They have been able to help student refinance their loans with a much lower rate, and drastically cut down their debt burden. In addition, the loan service, the company has aimed to achieve social vision by helping students “one on one” model.

For the peer-to-peer lending in UK, Bholat and Atz (2016) provided a survey of the three major lending platforms in UK In China, Sesame Credit is a lending platform founded in Hangzhou, China, in January 2015, by Ant Financial, a Chinese FinTech company. Sesame’s goal is to use online information to build a credit score for users, and let them access financing by strong credit score. Since the start of the platform, already 130 million people have used the system to borrow small loans. It is clear that for a country like China, which did not have a credit system like credit bureaus in the US, FinTech firms are filling a gap that traditional banks were not able to fulfill. Later on, Sesame Credit was also used for a wide range of fields, including dating, classified ads, and public services.

Obviously, the traditional financial institutions are not willing to give up a hugely lucrative business to technology firms. Many of them are trying to learn and setup subsidiaries to compete again the Lending Clubs of the world. Goldman Sachs Group Inc. has setup its own peer-to-peer lending platform called Marcus formerly known as “Mosaic.” Other banks have invested in the leading peer-to-peer lending firms to be part of the future growth.

4. Investment

FinTech firms have been disrupting the whole traditional financial ecosystem, and investing is no exception. From money market, to fixed income assets, to equities, new firms have mushroomed in all areas of investment to provide better solutions. One reason for the dramatic growth of new investment firms in the FinTech space is the subpar service that the traditional investment advisors have offered. It is no secret that the majority of active mutual funds have underperformed a passive buy and hold index strategy, while charging higher fees. The conflict of the “Warehouse” investment banks in provide investment solutions have disappointed many individual investors and intuitional investors. Furthermore, the Zero Interest Rate Policy, ZIRP, by the Federal Reserve Bank, since 2008, or negative interest rate by major central banks including European Central Bank, Swiss National Bank, and Bank of Japan, have forced many investors to look for alternative ways to gain any return that is better than zero.
4.1. Money Markets

For alternatives to traditional money market funds, the pioneer is probably the PayPal. PayPal has been running a highly successful payment business, thus, it expanded toward money market fund business to provide investment choice for its users. The PayPal Money Market Fund was incepted in January 1992, way ahead of its time. By the end of 2010, PayPal Money Market Fund has attached more than 1.5 million investors, with average account balance at about $300. Clearly, the concept proved to be well received by investors. However, due to the relatively large operation cost of the fund, at about 0.85% per year, the Fund was run with operational deficit covered by the PayPal Company. Because of the zero interest rate policy from the Federal Reserve System in the US, PayPal was losing money for two years, until it was shut down in mid-2011.

Yu’E Bao, a money market fund launched by Ant Financial in China in June 2013, has so far been able to grow more successfully. The business model was similar to the PayPal Money Market Fund, which is to let individuals to put their small account balance toward a money market instrument that generates higher yield. After three years operation, Yu’E Bao has attracted more than 152 million users, with total assets of 720 billion Chinese RMB (roughly $108 billion). Part of their success might be attributed to the lack of investment products for Chinese individual investors, which is very different from the highly mature US capital market.

4.2. Fixed Income and Equity Investments

Fixed income and equity markets are the more complicated ones for FinTech firms to crack. However, the need here is very clear, since the fixed income mutual funds and equity mutual funds have been lagging the passive index for decades. In addition, the excess fees being charged to the investors have been scandalous. A paradigm shift is that investors, both large institutions and small retail investors, have been “voting with their feet,” leaving mutual funds and moving into passive indexing.

Betterment is probably the first Robo-Advisor that started in 2008 and focused on using passive indexing for investors. Essentially on betterment, investors are advised to apply Modern Portfolio Theory, which aims to optimally allocate capital based on risk tolerance. No individual stocks or bonds are required. All investments are allocated to passive index ETFs.

Wealthfront is a similar Robo-Advisor in this field. The Chief Investment Officer of Wealthfront is a renowned professor from Princeton University, Burton Malkiel. His book A Random Walk Down Wall Street (Malkiel, 1973) essentially said that market is efficient and investors shall
not try to pick up individual stocks. Thus, Weathfront put the theory into real world practice and it has been a success.

In addition, some of the large traditional investment banks and asset management firms have launched their in-house robo-advisor business. Vanguard is a large asset management firm that focuses on passive index funds, in particular the S&P 500 index funds. Thus, the firm is quick to build up a robust Robo-Advisor business with almost $41 billion assets.

Lastly, there are some newest players in the Robo-Advisor field, which try to provide a fusion solution toward the traditional financial institutions who want to enter the field, albeit lack of expertise. Marstone is a FinTech company in this category. The company runs a “White Labelled” platform that can be tailored with large institutions. Users might be accessing a traditional financial institution’ Robo-Advisor service, without knowing that the underlying infrastructure is in fact from a third party start-up.

It is important to note that Robo-Advisors are not designed to “out-perform” traditional investments. It is intended to deliver a better user experience versus traditional brokerage services. The cost for these services tends to be very competitive versus traditional asset managers. Lastly, Robo-Advisors are usually able to offer fractional shares of ETFs or stocks that have high denominations. Naturally, this innovation lowered the investment account minimum size and reduced the entry barriers for retail investors. Since Robo-Advisors tend not use any leverage, nor financial derivatives, their return might not be comparable to hedge funds or private equities.

4.3. Artificial Intelligence in Investment

Many Robo-Advisors rely on the traditional portfolio management theory. However, the recent technology breakthrough has made artificial intelligence (AI) possible in investment arena. The two keys for successful AI investing are big data and computation capability. It has been only until two to three years ago, that technology was advanced enough to accumulate huge amount data for analytical work. The proliferation of big data collection algorithm is a recent phenomenon, but it has opened the new doors for new pools of information.

Second, without the recent advancement of computation power, the AI investing would not be possible either. In fact, we are the beginning of a new era, which combines the real time mega-data and analytical system.

QPlum is one example of AI in the investment advisory world. The company is founded by Gaurav Chakravorty, formerly a successful high frequency trader at Tower Research. His approach at QPlum is essentially combine AI with data science. According to Qplum, three broad investing
styles: market allocation, risk parity, and momentum investing are offered to investors. All strategies are implemented with 40 plus ETFs.

5. Insurance

Insurance is one of the remaining areas that has seen limited penetration of FinTech firms. Part of the reason is that insurance business tends to be a more opaque market, with limited attentions been paid by users. People tend to just buy an insurance policy and forget about it.

Interestingly, medical insurance is the first field that FinTech firms entered. Oscar Health is a company founded in New York City in 2012. It was launched in the same time that Affordable Care Act, ACA, went into effect. Oscar started selling health care insurance online in New York State first, then expanded to other states. Currently, Oscar sells individual health insurance plans, both directly and through health insurance marketplaces, in New York, Texas, and California. However, they have exited the New Jersey market. It is worth noting that despite the company is not profitable yet, the valuation of Oscar Health is well above $1 billion, put the company into the category of “unicorn” companies.

For property insurance, for example, car insurance and life insurance, many traditional insurance companies took the initiative to start their online division. For example, according to GEICO, a highly successful car insurance company owned by Mr. Warren Buffet’s Berkshire Hathaway Companies, a significant portion of its business has already been generated by its web portal.

Zhong An Insurance is probably the world’s first online insurance that went IPO in Hong Kong Stock Exchange in September 2017. Ping An (a Chinese financial holding company that specializes in insurance business), Tencent, and Alibaba (the top two Chinese e-commerce and online gaming company) joined forces in 2013 to launch Zhong An. Zhong An is China’s first property insurance company that sells all its products online along with handling claims. It was expected to launch life insurance products online shortly. The company has underwritten over 630 million insurance policies and serviced 150 million clients in its first year of operation. Big data and analytical capabilities make this company a unique firm in FinTech space. Before going public, the market valuation of the company was about $11 billion.\(^5\) After the company became a publicly traded

\(^5\) Zhong An to offer life insurance after Hong Kong IPO worth up to $1.5 billion. Reuters, September 2017.
company, the market valuation of the company surpassed HK$100 billion ($12.8 billion).

6. Case about FinTech in Asia

From China, India, to Korea, and Japan, it is evident that Asian countries have been particularly driven in FinTech space. From large online payment systems to crypto-currency exchanges, one can be amazed by many groundbreaking innovations in Asia. Many factors can be attributed to the success of Asian countries in developing a robust FinTech culture and a high penetration rate by FinTech firms in Asia.

First, a technology driven entrepreneurial culture in many Asia countries is a key factor for this success. Originated in Japan in the 1970s, technology firms have been a pillar of economic development in Asian countries. The baton was passed on from Japan to the original Asian Tigers: Korea, Taiwan, Singapore, and Thailand in the 1980s. Furthermore, after the reform and opening up of China, technology firms were started in many Chinese cities. The education of large number of engineers, combined with the entrepreneurs, provided a fertile ground for FinTech decades later.

Second, a high saving rate and limited traditional financial services created a huge number of lenders, borrowers, and investors in FinTech space in Asia. Billions of people in Asian countries were underserved by traditional banks. Many of them were deemed to be too small to be served. In addition, zero or close to zero interest rate provided by banks to savers was a clear financial suppression. Citizens in Japan, China, or India were delighted to use online savings platform and achieve a higher return, with better user experience.

Lastly, regulators were supportive. Despite many FinTech start-ups’ lack of traditional banking experience, or capital, regulators in most of the Asian countries did not use a heavy-handed approach. Obviously, some setbacks were caused by fraudulent firms, which were persecuted accordingly. The majority of FinTech firms in Asia were honest and ethical. They thrived under a highly competitive, but rapidly growing domestic market. In the process, the regulators were relatively open-minded, willing to adapt the regulatory framework to the new FinTech environment.

7. Summary

It is no coincidence that most of the FinTech firms of the new era started after the global financial crisis of 2008–2009. With the traditional banks,
insurance companies, and asset management firms in retreat, under both shareholders and regulators’ pressure, the void was filled by the new entrants. Armed with mega-data, AI, the FinTech firms have been embraced by users worldwide. The key to their success is really the user friendly approach. In addition, the proliferation of smart phones since Apple launched iPhone in 2007 created a new generation of consumers that prefer everything on mobile.

We believe the FinTech revolution has just started. They have been particularly successful in many Asian countries. However, many new innovations are yet to be invented or commercialized. Many existing financial service models are likely to be disrupted in the near future. Obviously, there are still many uncertainties with these new approaches in finance, in particular the data security issue and money laundry problem. The regulators need to catch up with the new development. From a user’ perspective, FinTech firms have brought a much better set of financial services. Ma et al. (2017) estimated that by 2020, the big data revolution is likely to generate amount of data in excess of 44 zetabytes. It has the potential to double the growth rates of developed countries economies by 2035 and add 0.8—1.4% to global productivity growth in the long run. It was also estimated by them that global big data market will arrive USD 210 billion by 2020.

Importantly, the FinTech development is not limited to developed markets. In fact, one can expect that Emerging market countries are likely to be a larger market to FinTech firms. Similar to the phenomenon that many emerging market countries went from no phone to wireless phones, leapfrogging the fixed-line phones, many of these consumers might go from no financial service to FinTech services, skipping the traditional brick-and-mortar bank branches all together. The lack of established financial players, huge population growth, and cost-savings are going to be the key drivers for FinTech firms to prosper in many emerging market countries.

References


