THE CREDIT RESEARCH INITIATIVE, NATIONAL UNIVERSITY OF SINGAPORE

Business Analytics – a rising star in FinTech

Contrary to common beliefs, FinTech traces its origin back to the 1950s when technology was first employed to provide financial services. The credit card was introduced by the Diner's Club in 1950 and the Automatic Teller Machine, invented in the 1960s made banking more convenient to customers. The recent FinTech wave has seen greater demand for a number of FinTech segments – transaction technology, regulatory technology (RegTech) and business analytics – resulting in the proliferation of financial technology startups worldwide. More companies are using business analytics, or big data and artificial intelligence (AI) techniques to get insights for making better business decisions. IT and analytics technologies have indeed reached a level of maturity with which competitive forces are at work to materialize many of people's long-standing wishes/fantasies; for example, AlphaGo has convincingly demonstrated that AI can beat top pros at the game of Go hands down. With these factors in place, we can expect to witness major developments in FinTech in years to come.

FinTech in Different Forms

The application of FinTech stretches across multiple business areas including financial services, bank compliance and business processes. In terms of the technologies it is employing, transaction technology, regulatory technology and business analytics are gaining most of the spotlight.

Transaction technology enables people to perform financial transactions in more efficient and consumer-friendly ways. In recent years, technologies involved in peer-to-peer (P2P) lending, crowdfunding, payment, and electronic currency are developing at a staggering rate. P2P lending, aiming to provide a marketplace where lenders and borrowers can meet and trade directly with each other, has for example grown so rapidly that Goldman Sachs predicted in a research paper published in 2015 that lending platforms could potentially reduce annual profits of the banks by 7% in the next five years. Payment technologies have helped replace cash or credit cards in transactions with the use of mobile phones. Today, dominant technology companies, including Facebook, Apple, and Google, have all tried to disrupt the online payment market. Blockchain technology also challenges the financial industry with a potential decentralized record/verification system that enables secure, fast and nearly free global financial transactions in many instances. Through Bitcoin, one can already see the power of the blockchain technology.

RegTech is information technology used by financial companies to conduct regulatory monitoring, reporting and compliance. Tightening regulatory requirements has significantly increased the operating costs of financial institutions.*[1] Therefore, there has been a strong incentive to build a more efficient system to control risks and reduce compliance costs in the industry. In October 2014, the Financial Conduct Authority of the UK government recognized the potential of RegTech and a year later announced plans for a regulatory sandbox that will help firms experiment with their RegTech solutions. According to a report by the UK government's chief scientific adviser, RegTech is a growing application of FinTech and is a crucial issue to the future success of the UK financial services industry and FinTech.*[2]

Besides transaction technology and RegTech, business analytics is another area of FinTech offering real potential. Business analytics makes it possible to manage vast amounts of data and discover new regularities in certain behaviors/functions, for example, factors that better predict insurance claims. Many information technology companies have been set up to collect data via usage of mobile phones and sensor technologies. According to IBM, 2.5 quin-

tillion bytes of data are created every day. Ninety percent of the world's data has been collected during the last two years and its collection rate has been increasing since then.*[3] In short, business analytics enabled by modern IT and scientific computing serves to maximize the value of "big data" and acts as a bridge to link problems with solutions. Large corporates like Oracle, IBM, Amazon and Microsoft are all investing heavily in data management and analytics projects. As of 2010, these companies had spent over USD 15 billion on software firms specializing in data management and analytics. The business analytics industry is estimated to be worth more than USD 100 billion by 2018 and is growing roughly twice as fast as the software business as a whole at almost 10% a year.*[4] As the world becomes increasingly digitalized, aggregating and analyzing data are likely to bring huge benefits to a variety of fields.

The Heightened Importance of Business Analytics

According to KPMG and H2 Ventures research in 2016 on the 100 most distinctive FinTech companies, eight companies are focused on RegTech, eight companies on business analytics, while the remaining run businesses in transaction technology. Anecdotal evidence shows that data collected from consumer transactions and social media can yield rich implications in business developments and profit generation. Providing sophisticated business analytics solutions has so many potential value propositions, and this area seems to be less represented in the current FinTech market and therefore has a greater potential in expanding its presence.

The amount of data increases tenfold every five years, and so will always have an impact on company and individual decisions. Raw data is usually generated from a variety of sources and carries information as well as random noise. Well-managed and objectively analyzed data can be used to unlock new sources of economic value. Today, data serves as one of the essential raw materials for all industries as it can or has potential to provide useful information to help businesses decisions in-house, and it may also be a marketable asset to parties of interest. Hence, we are likely to see business analytics applied in many more fields.

Take Amazon as an example. It surpassed Walmart as the most valuable retailer in the U.S. by market capitalization in 2015, and its growing online sales are eroding away revenues of American retail stores like Sears, JCPenny and Ascena (owner of Ann Taylor, Lane Bryant, etc.). One reason for Amazon's popularity is its sophisticated blend of personalized and social item recommendations engine. The process can be simply summarized as collecting and analyzing customer data to achieve a higher level of customer relevance. About one third of all sales at Amazon is generated by its recommendation engine,*[5] showing the importance of its business analytics efforts. Similarly, Netflix whose core business is to provide online stream media also makes use of data science to rate customers' preferences and give highly relevant recommendations.

Financial transaction technology's implementation has already collected and will continue to collect a vast quantity of new data which will aid the further development of business analytics in FinTech; for example, solutions for credit scoring, predicting financial customer behavior, and risk and investment management are presenting unprecedented opportunities to FinTech firms. With business analytics, financial services firms can get a better understanding of their customers, set competitive prices for their products or services, and better handle the risks they may come across in the future. Information gathered by many companies is labelled as big data, but it is not enough to simply collect data. Getting insights through applying smart business analytics is the only way to unleash the power of data and materialize its value.

Most lending platforms face the challenge of accurately assessing their potential borrowers. Credit scoring and risk rating are in fact complex, requiring a vast amount of data and scientific methods to support the analysis. Without enough information and robust models, FinTech companies can still conduct credit analysis in a traditional and intuitive way, but it is a FinTech in transaction technology only. SoFi, a FinTech company that provides loans to students in top universities seems to be such an example. The company bets on the future outlook and the earning potential of students to pay back their loans without conducting a systematic review of their creditworthiness. With sufficient operating experience and data gathering, one can imagine the benefits of business analytics to a firm like SoFi. To say the least, business analytics arising from its database will serve as an entry deterrent helping ensure its market position in the longer run.

Deep Credit Analytics at the Credit Research Initiative of the National University of Singapore

In the credit analysis space, the Credit Research Initiative (CRI) of the National University of Singapore has pioneered a "public good" approach to creating and maintaining a credit risk analytics infrastructure by consistently transforming massive amounts of economic, market and financial data ("big data") into directly useful credit information ("smart data"). Established in 2009, the CRI was a positive response to the much-criticized credit rating practices at the time.*[6] Over the years, it has managed to build up a significant smart credit risk platform that is conducive to deep credit analysis, and has been granting free access to the CRI database to any interested user.

The CRI differentiates itself from others by conducting "deep credit analytics". "Deep" refers to the complex nature of the problems facing users in the credit domain. It also refers to the multiple dimensions that the CRI's credit analysis gets into. To measure creditworthiness in the first place, the CRI team uses a scientific model calibrated to the big data to generate a probability of default (PD), which is the likelihood of an obligor being unable to fulfil its financial obligations. The granularity in this numerical measure allows users to conduct more in-depth credit analysis than any categorical credit rating system (e.g. AAA, BB, etc.). For example, one can assess a portfolio's credit risk by aggregating the individual PDs together by factoring in their default correlations. The CRI's PD also has concrete term structures as the PDs cover a range of prediction horizons from a month to five years. The PD term structure is essential to any serious credit analysis because debt obligations usually have a tenor, and an obligor with good credit in the short term may turn out to be a bad credit in a longer term, and vice versa. Deep credit analysis is also reflected in the CRI's creation of a CDS-like credit risk

measure referred to as Actuarial Spread.

The CRI platform typifies a new possibility for business analytics in FinTech. As of now, the CRI's analytical platform produces a suite of data products, including the PD, Actuarial Spread (AS), Corporate Vulnerability Index (CVI), CRI Systemically Important Financial Institutions (CriSIFI), etc. These measures cover 65,000 exchange-listed firms in 121 economies and are updated on either a daily or monthly basis, depending on practical needs. They are freely available on the CRI's website (www.rmicri.org) but are also distributed at a cost by Thomson Reuters to users who prefer to leverage on their existing data service infrastructure.

The CRI's analytical platform has been proven valuable in many real-world applications. In a joint undertaking with the International Monetary Fund (IMF), the CRI has developed a Bottom-up Default Analysis (BuDA) toolkit, which is capable of translating a presumed economic turbulence into a change in a portfolio's credit risk profile (i.e., stress testing). This new style business analytics has thus contributed to the IMF's macro-prudential surveillance practices. The CRI has also played a role in the FinTech industry; for example, it has spun off CriAT, a FinTech start-up specializing in deep credit analytics services. Helping a P2P lending platform deepen its credit analysis capacity on Small and Medium-Sized Enterprises (SMEs) lending is another concrete example of how this new style business analytics can contribute.

An Application of CRI's Credit Analytics in SMEs

SMEs are major drivers in both developing and developed economies as they employ a large segment of the workforce and in some cases drive innovation and technology advances, leading to progress in the long run. The approximate number of SMEs in emerging markets alone is between 365 to 445 million and formal SMEs contribute up to 60% of total employment and up to 40% of national income in emerging economies, according to a paper published by the World Bank in 2015.*[7] However, the key constraint to SME growth is access to finance.

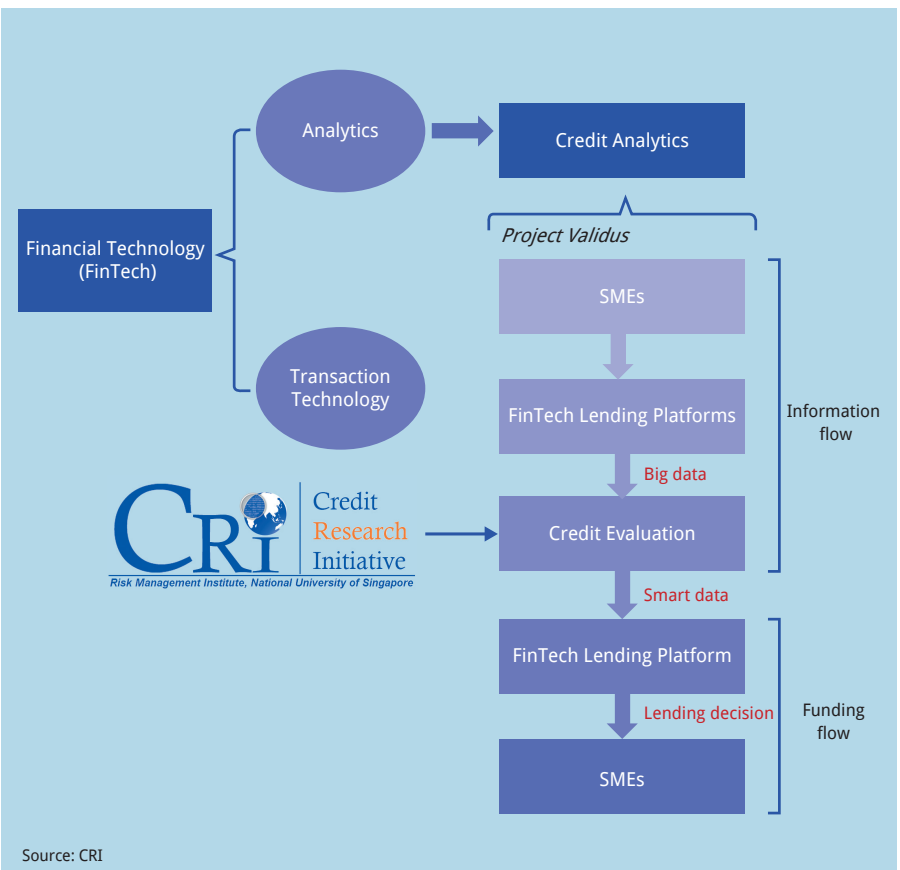
SME financing is different from that for large corporates in that they mainly rely on internal funds and/or cash from friends and family to run their business. According to the World Bank, about 70% of SMEs in emerging markets lack access to credit and the total credit gap for SMEs is USD 2.6 trillion.*[8] Lending from banks is usually limited for SMEs as it is often difficult for banks to ascertain their financial information and thus the ability to assess their credit quality is limited. From a cost-benefit analysis standpoint, banks can be expected to be less enthusiastic about SME credit business even when funds for lending are available. Credit support programs created by governments, say, to share the credit loss in SME lending are often met with lukewarm responses from lending institutions. In short, the central issue of concern is the limited ability to assess the credit quality of SMEs rather than the availability of funds for lending.

Validus Capital, founded in 2015, is a Singapore-based peer-to-business (P2B) lending company that provides short term financing to SMEs. To help Validus set up a credit analysis system, the CRI has devised a bespoke PD model for SMEs, leveraging on its existing methodology and "smart data" for public firms. Figure 1 illustrates the stages of the lending decision with information flow and funding flow.

With a large public firm database, the CRI designs models that provide quantitative assessment of credit risk for SMEs. By the use of macroeconomic data and appropriate proxies for market data, the firm level PD model developed by the CRI team can incorporate the economic environmental information together with the target firm's current financial information provided by Validus to compute the PD of the obligor. Applying credit analytics already developed but customized to this specific application into an automated system speeds up credit decisions, helps minimize human error in the process, and benefits from the regularities in data discovered by credit analytics. The system is intended to complement the decision-making process by seasoned credit analysts. It would be hard to imagine that a modern P2P lending platform could effectively function at the expected turnaround time without the help of an automated credit analytics system.

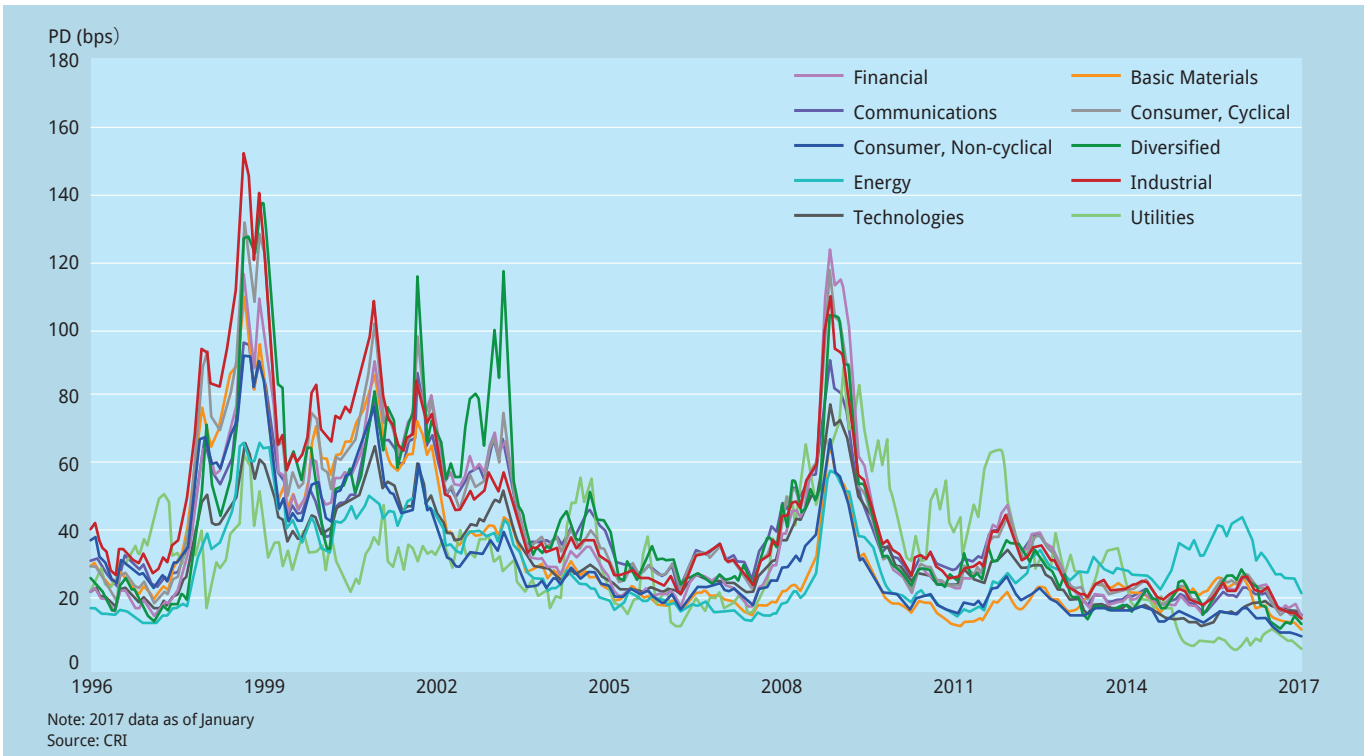
In addition to the firm level PD, the

Figure 1: The Application of CRI Data for Private SMEs



Source: CRI

Figure 2: Sample of Industry Level 1-Year PDs, 1996-2017



Note: 2017 data as of January
Source: CRI

CRI also provides industry level PDs (Figure 2) using information from companies of similar characteristics to those in the SME portfolio. Creditors have long recognized the importance of industry factors in examining a company's credit quality as firms of different sizes and industries are likely to have different credit profiles. Information on credit cycles and industry-specific trends is reflected in industry level PDs, which provide an overview of the aggregate credit risk for the SMEs, aiding P2B lenders like Validus in identifying high risk companies by comparing its PDs over time and across categories. By downloading a monthly data file through the CRI's portal, lenders can explore the PD term structure over different periods and horizons.

Conclusion

FinTech has already exerted tremendous influence on the financial industry and its fast-paced developments are naturally drawing attention from all sectors in the economy. Venture capital has been actively financing FinTech startups since 2012. In 2015, total global investment in FinTech companies peaked at USD 46.7 billion but has since dropped to USD 24.7 billion in 2016.*[9] Some FinTech companies have already collapsed due to low barriers to entry when the FinTech transaction technologies deployed by them are commoditized. FinTech companies that are likely to succeed in the long run need to develop advanced and sustainable technologies as a differentiator, and there is no doubt some will do so.

Business analytics as a product of the big data era is becoming increasingly indispensable today because when properly developed, it serves as a differentiator and the driver for long run success. There is a huge potential for the FinTech industry to explore deep business analytics and subsequently to capitalize on the information. The CRI's deep credit analytics effort is used as an example to showcase how it can be applied by FinTech firms, and we expect to see more business analytics development along the lines of the CRI.

Notes

*1 https://www.imf.org/external/pubs/ft/sdn/2012/sdn1211.pdf
*2 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/413095/gs-15-3-fintech-futures.pdf
*3 https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html
*4 http://www.economist.com/node/15557443
*5 http://www.mckinsey.com/industries/retail/our-insights/how-retailers-can-keep-up-with-consumers
*6 "NUS Institute to offer credit rating system," *The Straits Times*. July 17, 2009. Duan and van Laere (2012), "A public good approach to credit ratings - from concept to reality," *Journal of Banking and Finance* 36(12), pp.3239-3247.
*7 http://www.worldbank.org/en/topic/financialsector/brief/smes-finance
*8 Ibid
*9 https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/02/pulse-of-fintech-q4-2016.pdf

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The Credit Research Initiative (CRI), founded in July 2009 at the National University of Singapore, offers credit risk measures (ratings, etc.) for exchange-listed firms worldwide as a "public-good" which are based on scientific models developed in-house and with contributions from researchers and practitioners globally.

CRI constructs high quality credit measures with transparent methodologies and free of human bias. It is widely used by international banks, asset management firms, insurance companies, international organizations (e.g. IMF, World Bank) as well as academic researchers.

The CRI produces Probability of Default (PD), and Actuarial Spread (AS) with term structure from 1-month to 5-year horizons for over 65,000 exchange-listed firms in 121 economies that are updated daily. CRI also provides Corporate Vulnerability Index (CVI), which can be viewed as stress indicators, measuring credit risk in specified economies/industries. In 2017, CRI released the Systemically Important Financial Institution (CriSIFI), which assesses and ranks the systemic importance of listed banks and insurers.

These credit measures are available for free download on the CRI website. The CVI data are also available through Bloomberg and CBonds which offer their users free access. The comprehensive CRI data are recently made available through Thomson Reuters at a cost. Additionally, CRI provides customized delivery of credit risk data and analytical risk solutions for credit portfolio monitoring, validation, benchmarking, and stress testing upon client's requests.