Private Bank

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Global Equity Strategy

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FinTech – Wall Street meets Silicon Valley

- Banks used to view their future competitors as other banks. Now, they eye the disruptive technologies of the tech sector.
- The disruption is not only coming from tech startups. Companies such as Amazon, Alphabet, Apple and Facebook are widening their contact points with consumers, expanding "horizontally." This is likely to subsume aspects of financial services going forward.
- Most disruption has occurred in the payments area, but powerful ongoing demographic and technological changes suggests that the FinTech revolution is only just beginning and will impact other areas.
- In China, large tech companies' involvement in financial services is much further advanced than in the West. Alibaba with Alipay and Tencent with Tenpay each have a sizeable share of the Chinese third-party payments market. US tech giants on the other hand are estimated to have just a fraction of the market share in non-cash payments. Of course, this may change.
- Aside from payments and creating access points to lenders, disruptive companies are starting to target other areas of financial services, creating an entire FinTech ecosystem. This is underpinned by limited government regulations and easy access to funding.
- But the news is not only bad for incumbents. There are also huge potential costs savings on the back of new technologies which allow for smaller physical networks and staffing resources.
- As the FinTech ecosystem evolves, many seek partnerships with financial services incumbents rather than competition. Each wants what the other has; new entrants require customers and data while incumbents need innovation and cultural change.
- FinTech is a rapidly moving space with new technologies becoming potential game changers. Blockchain in particular is likely to have much broader and meaningful application than merely powering cryptocurrencies (an entirely digital alternative to government backed currencies).
- FinTech has already received considerable attention. At Citi Private Bank we continue to view FinTech as an investable equity theme.

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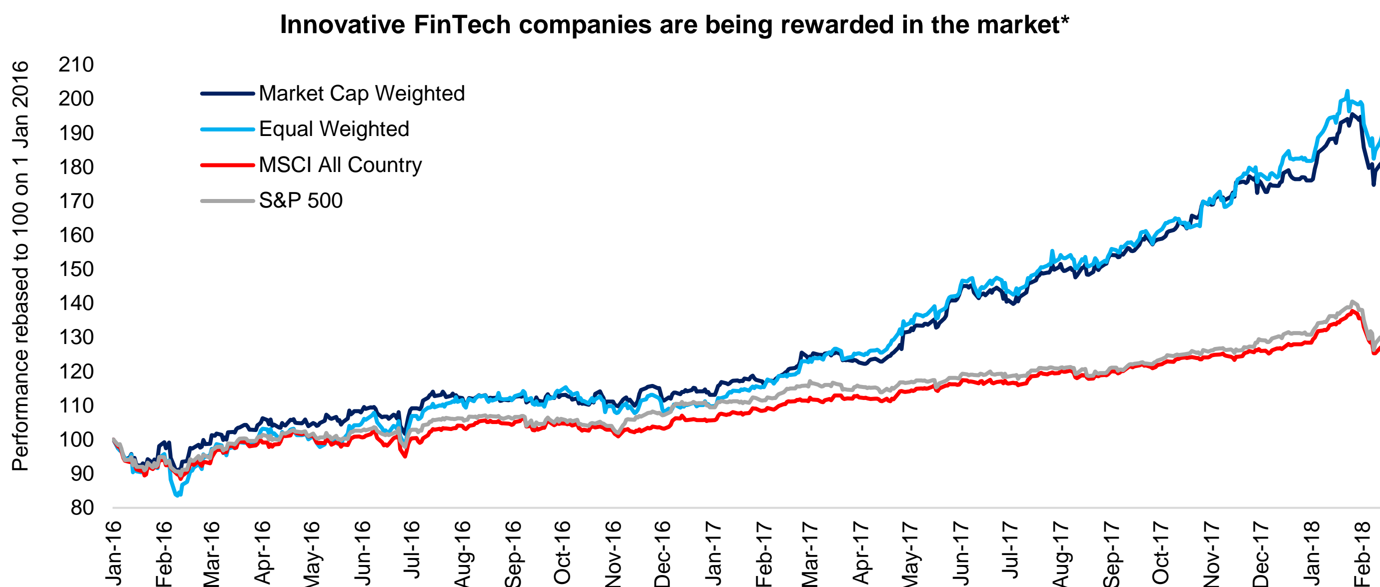
The rise of Fintech stocks



Sources: Citi Private Bank and Bloomberg, as of February 2018. *The chart shows the performance of a basket of fifteen of the largest FinTech equities on an equal weighted and market capitalisation weighted basis. The stocks included are Wirecard AG, Square Inc, PayPal Holdings Inc, Temenos Group AG, SS&C Technologies Holdings, Intuit Inc, Fidelity National Information Services, Fiserv Inc, Guidewire Software Inc, LendingTree Inc, First Data Corp, HealthEquity Inc, Ellie Mae Inc, SimCorp A/S, Envestnet Inc. Indices are unmanaged. An investor cannot invest directly in an index. They are shown for illustrative purposes only and do not represent the performance of any specific investment. Past performance is no guarantee of future results, and future results may not meet our expectations due to a variety of economic, market and other factors. Real results may vary. For illustrative purposes only. This should not be construed as an offer of, or recommendation of companies discussed.

FinTech – As much evolution as disruption

Over the past several hundred years, many aspects of banking have hardly changed - just as the Medici family gathered data on customers, using it, along with their judgement to decide whether or not to extend credit, today's banks essentially do the same thing. Borrowing and lending from banks creates money. Central banks merely influence the process. Thanks to its systemic importance and strict regulations, financial services has historically been an industry relatively insulated from disruption.

The dotcom boom saw very few successful entrants into financial services. This time it's different.

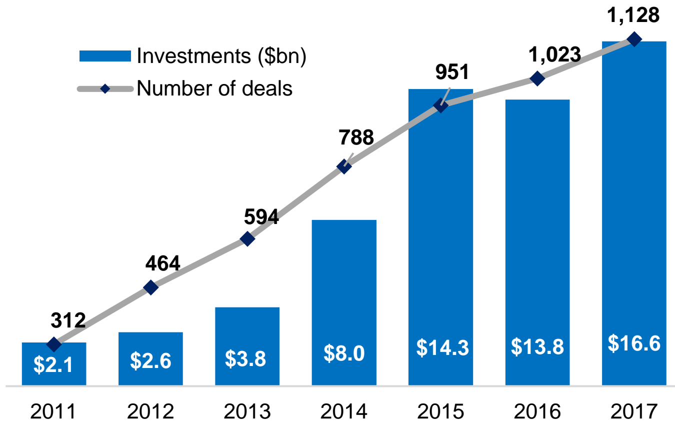
Barriers to entry meant that banks were able to achieve and maintain high average returns on equity in the decades leading up to the global financial crisis. The emergence of the internet and the dotcom boom around the turn of the millennium provided a test of the resilience of financial services to technological change. The sector emerged unscathed, with successful new entrants into the sector from that period few and far between. PayPal, (co-founded by Elon Musk and later acquired by EBay) is one of the few names which springs to mind.

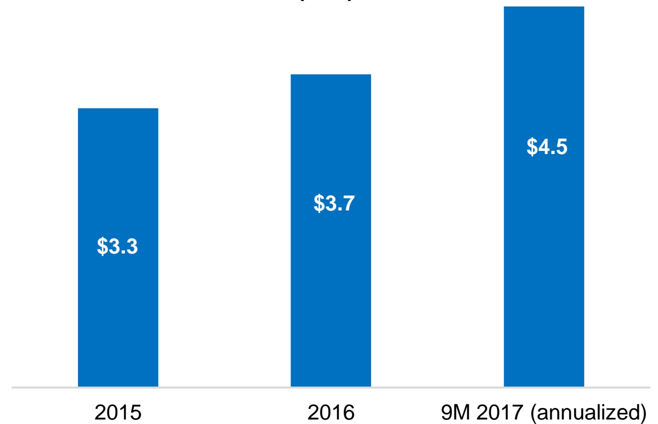
However, times have changed and arguably for the first time ever, financial services are facing real disruption. Easier access to funding for tech start ups and innovations such a mobile banking mean that the advantages enjoyed by incumbent banks are being subverted.

'Millennials' view of financial services has been shaped by the experience of the global financial crisis. As a result, they are more open to non-traditional banking solutions.

The challenges for traditional financial services do not only come from the pace of recent technological change. 'Millennials' – the generation born between the early 1980s and 2000s - will overtake other generations in terms of share of the population. Many millennials are much more open to non-traditional banking solutions. Crowd funding and peer to peer (P2P) lending are two examples which bypass traditional financial services.

With the help of these powerful demographic and technological drivers FinTech companies have managed to break into the mainstream of financial services trends, even if currently they are only impacting a fraction of the consumer banking wallet. However, the scope for further disruption and the amount of investment in FinTech leads us to believe that FinTech companies' share of financial services will grow substantially in the years to come.





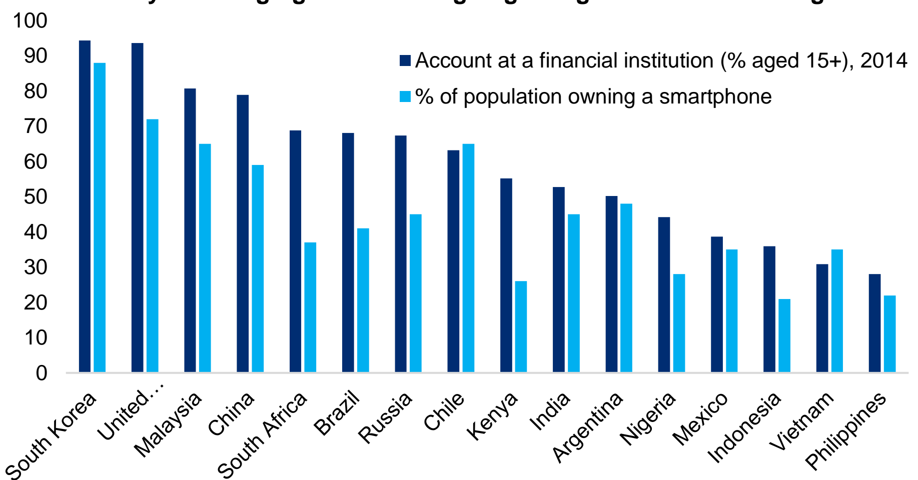
Source: Citi Research, CBInsights, as of February 2018

This time it's different – mobile banking

Smartphones have helped FinTech companies gain a foothold in financial services by greatly facilitating financial inclusion

The key differences between now and the dotcom boom which make it more likely for financial services to be disrupted are 1) easier access to funding, 2) changed demographics, 3) government and regulatory support for innovation and 4) high and growing internet penetration rates facilitating financial inclusion (the access to a form of financial services). Currently the World Bank estimates that 2 billion adults globally are without access to financial services, this number is falling rapidly thanks to the internet.

In fact, large populations without traditional bank accounts but with access to smartphones accelerate financial inclusion as customers "leapfrog" traditional banking services and jump straight to mobile banking.



Source: Pew Research Center, World Bank Financial Inclusion Index, Smartphone penetration measured by the Pew Research Center survey conducted in 40 nations among 45,435 respondents from March 25 to May 27, 2016

As was the case during the dotcom years, the failure rate of FinTech companies is likely to be high.

The overall backdrop remains supportive for FinTech innovators. However, with thousands of companies having sprung up over the past several years (and as was the case in the dotcom period), the failure rate of FinTech companies is likely to be high. Those which are successful are already forcing prices for financial services lower, while companies unable to maintain their innovative edge will disappear.

At risk from the FinTech revolution first and foremost are traditional financial services providers. At the same time however, given their customer base, they are in the best position to leverage innovative solutions. The disruption is not only coming from tech startups, internet retailers and major tech companies are among those challenging the status quo within financial services. Successful incumbents will be those which embrace the disruptive technologies and forge partnerships with innovative companies across the whole FinTech ecosystem.

A Chinese blueprint for US tech?

The ability of tech companies to disrupt financial services varies by country and depends on factors such as financial inclusion, smartphone penetration, user bases and government regulation.

Chinese tech companies were quick to take advantage of an underdeveloped banking system which focuses too much on servicing large companies and state-owned entreprises.

In China, companies like Alibaba, Tencent and Baidu benefitted from a relatively underdeveloped financial services industry which was slow to adapt to changing technologies and which has focused predominantly on servicing state-owned enterprises. Alibaba with Alipay and Tencent with Tenpay identified opportunities early on to bypass traditional financial services and facilitate their e-commerce and gaming businesses (in 2004 and 2005 respectively) by venturing into payments. By contrast Google waited until 2011 with Google Wallet (to attempt) to do the same.

The potential for Chinese tech companies to effectively leverage their huge user bases to gain a foothold in financial services has been much greater than in the US, where well-established financial infrastructure was already in place. Tencent's WeChat multi-purpose social media app is closing in on 1 billion active users, meaning the tech company has vastly more customers than any bank in China. By offering faster, secure, reliable and cheaper payment services Alipay and Tenpay managed to gain a 53% and 39% share of the third-party payments market in China (Q2 2017 data). US tech giants on the other hand are estimated to have just a fraction of the market share in non-cash payments.

US tech giants have lagged their Chinese counterparts in terms of financial services involvement, but this could change.

That is not to say that the Chinese model can't be a blueprint for US tech companies to follow, after all, Amazon in particular has already shown a willingness to diversify across sectors with its acquisition of Whole Foods. Indeed, venturing from e-commerce into payments would be a more natural progression for Amazon than the transition from consumer electronics or social media into financial services for the likes of Apple or Facebook.

Clearly, financial services incumbents in the US will have to watch this closely. For now, however, it seems more likely that the advent of Apple Pay and Android Pay to name two examples are designed more to improve customer loyalty and stickiness to the respective ecosystems rather than to make genuine inroads into financial services. However, this could change as society gradually shifts away from cash and (further down the line) card based payments, something which is further advanced in countries like Canada and Sweden.

High credit and debit card penetration, card loyalty schemes and well-established point of sale infrastructure have raised barriers to entry for US tech giants in the payments business.

High credit and debit card penetration is parts of the developed world, card loyalty schemes and expensive point of sale (POS) infrastructure (both physical and IT systems) slow down the adoption of mobile wallet type payments. A recent study by ForexBonuses[1] found that of the 10 most cash less societies in the world, the US has the most credit cards per capita, 2.9 compared with 2.16 in Canada, 1.04 in Sweden and 0.33 in China. The US also has a relatively low proportion of cards (both debit and credit) which are issued with contactless technology (23% according to the same study). However, with contactless pay becoming more widespread and as merchants in the US upgrade their POS infrastructure, mobile wallet payments such as Apple Pay and Android Pay will increase.

The comparisons between Chinese tech and US tech companies are very interesting and warrant further analysis, something we will focus more on in a future report. In general, growth opportunities for Asian tech companies are greater given underlying demographics as well as regulation. The doubling of the internet population in the coming years is mostly an EM Asian phenomenon. In Europe, new consumer privacy protections may limit fin-tech innovation. This comes at a time when European Commissioner for Competition Margrethe Vestager is also taking on the tech giants over competitive concerns.

[1] http://www.forexbonuses.org/cashless-countries/, as of October 2017

FinTech Ecosystem

Regulators are essential for innovation; in the UK the Financial Conduct Authority launched Project Innovate to help FinTech navigate regulatory hurdles.

The FinTech ecosystem consists of many types of companies, from those focusing on payments, lending access and insurance to wealth management and regulatory compliance. For this ecosystem to function, interaction between FinTech companies, incumbent financial institutions and governments is required. Governments are responsible for both regulation and the environment for innovation. Financial institutions have access to vast amounts of customer data. Certain tech companies have their finger on the pulse of customers and are able to deliver new and innovative technologies swiftly to meet the constantly evolving needs and expectations.

The explosion in FinTech means that companies have sprung up across the full spectrum of financial services. Very broadly these can be divided into four categories each with their subcategories.

1. **Payments and Access**
    - **Payments** such as mobile payments, point-of-sale & remittances using Blockchain/distributed ledger technology as well as digital currencies.
    - **Personal finance** solutions offer innovative ways for customers to monitor their spending, savings, credit score or tax liabilities.
    - **Lending access** based on data & analytics which facilitates/automates access to bank and non-bank lenders.
2. **Wealth Management**
    - **Advisory services** delivered via new channels such as robo-advisory which cut costs and improve efficiency.
    - **Portfolio management** solutions using artificial intelligence and machine learning.
3. **Insurance Services**
    - **Products & solutions** using data & analytics to improve and reduce the cost of coverage. Examples include safe-driving phone GPS trackers, wearable devices lowering health insurance costs and on-demand insurance.
    - **Claims management** platforms which vastly reduce the time for making claims thereby improving customer experience.
4. **Other**
    - **Capital markets** services which have traditionally been the domain of large banks and brokerages are becoming more accessible, such as trade execution and investment research.
    - **Regtechs** facilitating the (ever increasing) regulatory compliance of financial services firms.
    - **Business to business** technology solutions such as software which simplify financial processes and improve security and decision making.

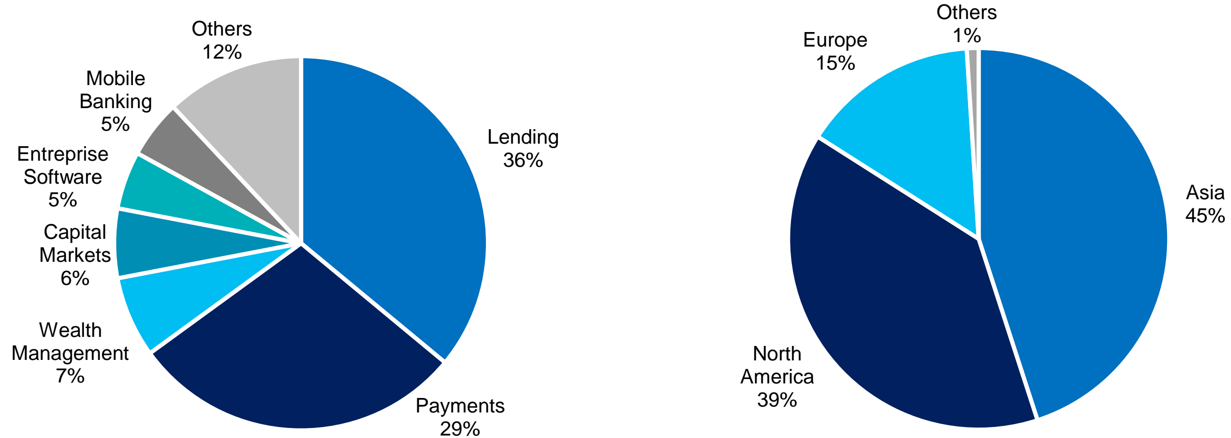
Payments and Lending

Payments and lending portals have been the main focus of FinTech companies so far, thanks to the capital-light nature of those segments

Banking, and more specifically the personal and SME (small and medium sized enterprises) segments are the areas most targeted for disruption. Within these segments it is estimated that approximately 65% of venture capital deployed in private FinTech companies in the first 9 months of 2017 was in the payments and lending product areas. Unsurprisingly, by region, Asia and North America (predominantly China and the US) are leading the way in FinTech investments.

The reason most FinTech companies are focusing on these product areas is because both are capital-light. Companies can add value by improving the user experience at the point-of-sale in the case of payments, or by streamlining the borrowing process (as well as offering lower borrowing rates) in the case of P2P lending platforms. Mortgage lending, corporate lending and wholesale banking are areas FinTech companies have mostly avoided so far given their balance sheet intensiveness and exposure to large-scale credit risk. Many countries regulate banking and lending activity far more intensively than brokering access to banks.

Venture capital investments in private FinTech companies by product (left) and by geography (right), 9M 2017



Source: CBInsights, Citi Research Sources, as of February 2018

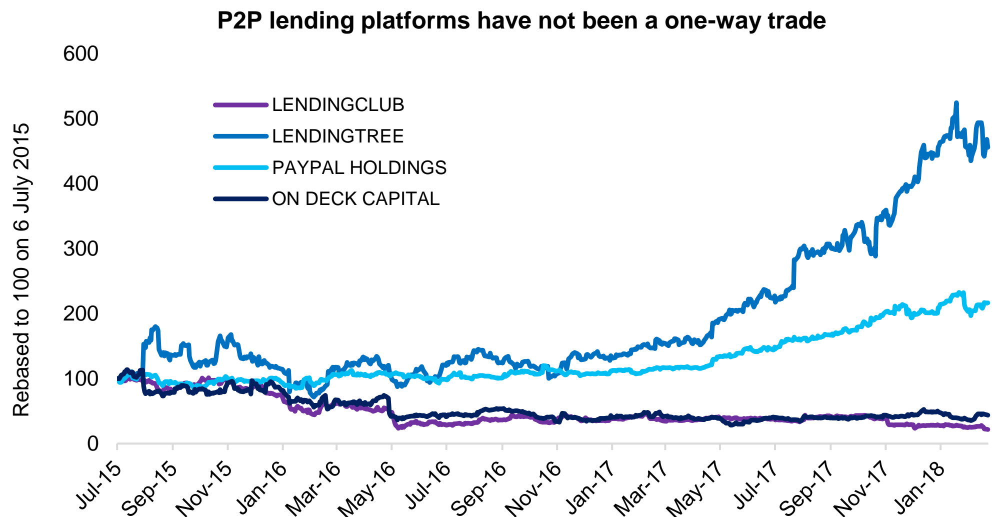
Not all FinTech companies have thrived after going public. The peer-to-peer lending area has seen big divergences in performance.

Marketplace lenders operate online platforms matching (and aggregating) lenders with borrowers (typically individuals and SMEs). They do not take deposits or lend themselves, thereby limiting their risk. Some examples of marketplace lenders are *Lending Club*, *OnDeck Capital* and *Lending Tree* in the US and *Yirendai* and *Hexindai* in China. In the US loans range from $1,000 to $40,000 on 3-5 year terms. Rates will vary based on the borrower's profile, but occupy a broad range of 5.99%-36%. Most loans are for debt consolidation, credit card payoff and home improvement purposes.

So far, marketplace lenders have mostly filled gaps, i.e. targeting consumers with more limited access to traditional credit channels, student loan refinancing for example. For traditional lenders it is therefore more a case of opportunity lost rather than an erosion of existing earnings. The worrying thing, however, is that disruption typically occurs in stages, first eating into industry growth by taking new segments, and ultimately targeting traditional revenue streams.

Despite their growing popularity, marketplace lenders have not all had an easy ride, and post IPO performance has varied.

P2P lending platforms have not been a one-way trade



Sources: Citi Private Bank and Bloomberg, as of February 2018. Companies are shown for illustrative purposes only and do not represent the performance of any specific investment. Past performance is no guarantee of future results, and future results may not meet our expectations due to a variety of economic, market and other factors. Real results may vary. For illustrative purposes only. This should not be construed as an offer of, or recommendation of companies discussed.

One of the key concerns surrounding marketplace lenders is that most have only been around for roughly a decade, a period of unusually low interest rates. Their business models have not yet had to weather an interest rate hiking cycle of note, let alone a recession. In addition, marketplace lenders have thus far avoided strict regulatory oversight. Increased regulation cannot be ruled out, especially if the sector begins witnessing sizeable credit deterioration.

Payments & Blockchain

Payments is an area where FinTech companies face relatively fewer risks but intense competition. Payment companies such as *Square* and *Worldpay* (acquired last month by *Vantiv*) allow customers to buy, sell and send money using their mobile devices, an increasingly competitive area as economies shift towards cashless societies.

Perhaps the biggest risk for incumbents in the payments space is the loss of important customer transaction data.

For traditional financial services incumbents, the impact of so many new entrants has thus far been relatively limited given that companies like *PayPal* already hold a large share of the online payments market (even *Worldpay* itself has been around since 1989). While in the offline space high credit and debit card penetration in the developed world is proving difficult for newer systems (such as Apple Pay and Samsung Pay) to usurp. However, over time it is reasonable to assume that credit and debit cards will be replaced by mobile devices, as is already happening in several Asian markets. In the age of big data and with consumption increasingly shifting online, perhaps the biggest risk for incumbents is the loss of important customer transaction data. This data can be used to offer targeted additional services such as savings and wealth management products.

For the most part, innovations in payments sit on top of existing infrastructure, often focusing only on the “last mile”, the user experience at the point-of-sale (contactless payments or paying with smartphones for example). The underlying infrastructure has not changed that much in recent times. This might be about to change with Blockchain.

Blockchain is a decentralized ledger technology (DLT) which allows transactions to be simultaneously verified by hundreds or even thousands of computers across the world.

Still in its infancy (in terms of its application), Blockchain is a decentralized ledger technology (DLT) which allows transactions to be simultaneously verified by hundreds or even thousands of computers across the world, rather than by one or two financial intermediaries. Each transaction forms part of “block” of transactions which in turn are encrypted and form part of a “chain”. Once it is part of the chain it can no longer be altered or tampered with. As a result, it is considered to be extremely secure. The technology is not yet perfect, scalability is an issue and as yet there is no option to cancel a completed transaction. However, significant time and investment is going into developing Blockchain further.

A number of start ups working on Blockchain solutions are attracting major investors

Active Companies	Description	Notable investors
Digital Asset Holding	Provides DLT platform services to financial institutions.	Citigroup, ABN Amro, Accenture, BNP Paribas, IBM, Goldman Sachs, Deutsche Börse, DTCC, Santander, JP Morgan
R3	A DLT company developing Blockchain database systems for the world’s largest financial institutions.	Barclays, BBVA, Credit Suisse, Goldman Sachs, UBS, State Street, Citigroup, Morgan Stanley, Deutsche Bank and many more
Ripple	Secure, instant, and nearly free global financial transactions.	Google, UBS, Santander, MoneyGram, Standard Chartered, Accenture
Stratumn	Builds Blockchain-based tools for securing enterprise processes, mostly in the insurance sector to help providers remain compliant.	Nasdaq, BNP Paribas, CNP Assurances, Digital Currency Group, Otium Venture

Source: Citi Private Bank, as of February 2018

Blockchain is still predominantly used as the underlying technology for cryptocurrencies such as Bitcoin. However, more widespread applications are being explored across financial services. The technology has the potential to completely overhaul how payments and transfers happen in areas such as trade settlements, land registry, trade finance and beyond. Governments such as China, the UK, Australia, Canada and the Nordics are also investigating uses for the technology. Improvements in the speed and security of payments and transfers will also facilitate the shift

The Australian Securities Exchange (ASX) announced in December 2017 that it will replace it current clearing system with Blockchain technology.

towards cashless societies. Sweden is leading the way; many stores no longer accept cash and even church donations can be made using the Swish mobile payments app[2].

The benefits of cashlessness are vast. Without cash, governments could find it easier to crack down on corruption, tax evasion and crime (although cryptocurrencies, as they now exist, are also a channel). India's demonetization in 2016 was primarily aimed at reducing crime while also bringing people into the banking system. There are also benefits for businesses as they won't need to worry about storing cash or transporting it to the bank, while households won't need to waste time going to an ATM or waiting for change.

The Australian Securities Exchange (ASX) announced in December 2017 that it will replace its current clearing system with Blockchain technology. A timeline for the transition is expected to be given in March 2018, but the exchange expects the adoption of the technology to cut the cost of transacting while simultaneously making it faster and more secure.

The attention received by Bitcoin (and other cryptocurrencies) in recent years is entirely disproportional with its place within the FinTech ecosystem.

It is worth mentioning at this stage that Blockchain is much more than Bitcoin. The attention Bitcoin (and other cryptocurrencies) has received in recent months is entirely disproportional with its place within the FinTech ecosystem. Blockchain is a technology which could revolutionize payments & transfers, one area of financial services. Cryptocurrencies are merely digital currencies powered by Blockchain.

At Citi Private Bank we have regularly communicated the view that cryptocurrency investing (read speculation) is very risky and instead we prefer to focus on the potential benefits of the underlying Blockchain technology (see link).

Robo Advisors, Insurtech and Regtechs

So far we have focused on the lending and payments segments, because this is where digital disruption is most advanced. However, other areas are also garnering Silicon Valley's attention.

Robo advisors aim to make wealth management more accessible by targeting the lower end of the market. However, wealthier customers are likely to continue to want a personal touch.

Robo Advisors are digital platforms which replace human financial advisors and investment management services. They use mathematical rules and algorithms to allocate, manage and optimize a client's investments based on their preferences, risk tolerance and expected returns. The advent of robo advisors opens up wealth management services, which have typically been accessible only to wealthier investors to a much broader audience.

The 5 largest Robo Advisors are all in the US

Company	Country	AuM ($bn)
Vanguard	US	83.0
Charles Schwab	US	19.4
Betterment	US	9.1
Wealthfront	US	6.8
Personal Capital	US	4.3

Source: Wikipedia, AuM as of October 2017

Robo-advisors AuM doubled to $200bn in 2017 from $100bn a year earlier. Some forecast this to reach $2trn by the end of 2020.

In 2017 assets under management (AuM) by Robo Advisors is estimated to have reached $200bn, double that of 2016. To put that into context, this represents 0.002% of the Global assets under management in 2016, which according to PWC stood at $84.9trn. Nevertheless, established industry players such as Vanguard and Charles Schwab are taking the lead and a 2016 study by KPMG estimated that Robo Advisors AuM could reach $2trn by end 2020.

Robo Advisors are still in their infancy. They have not yet been tested through the cycle and could be more vulnerable to cyber-attacks or software malfunctions. Having said so, they are rapidly gaining popularity. Rather than present a threat to traditional asset managers, they are likely to supplement the existing offering. Wealthy investors are likely to continue to demand and expect a bespoke service. However, more automation in wealth management, especially in more time consuming tasks will improve efficiency and enhance product offering. The likelihood is therefore that traditional wealth management and Robo Advisory can sit side by side.

[2] https://www.bloomberg.com/news/articles/2017-05-14/in-cashless-sweden-even-god-now-takes-collection-via-an-app

InsurTechs describes FinTech companies focusing on the application of technology to insurance sector models with a view to eliminating inefficiencies and generating savings. Insurtech companies are exploring ways to offer more customized approaches to insurance, for example being insured for one trip in a friend's car. Technology is also being applied by linking wearable devices which monitor activity or driving habits with a view to insurance premiums, generating cost savings for more 'active' people and safer drivers. Furthermore, artificial intelligence is being explored to act as insurance brokers while new apps can monitor any overlaps or gaps in insurance policies.

Insurance is a sector ripe for disruption. New entrants are making insurance quicker, cheaper and more customizable. You can now insure yourself for one ride in your friend's car.

Insurance has been one of the areas most resistant to disruption given its highly regulated nature. Underwriting and risk management are tricky businesses, and thus far insurtechs are mostly filling gaps rather than making inroads into existing revenues. The primary focus for insurtechs has been new products & services. One example is *Slice*, an instant and on-demand insurer which specializes in the sharing economy, allowing you to insure your home only for the days rented out during Airbnb. Another example is *BIMA*, a micro-insurer using a mobile platform offering low cost insurance in emerging markets with high mobile penetration rates but with low insurance coverage. People can get accident or life insurance from as little as 60 cents a month.

Other insurtechs focus more on developing technologies which lower costs, be it on the acquisition side; such as better and interactive user interfaces or on the claims management and policy administration side.

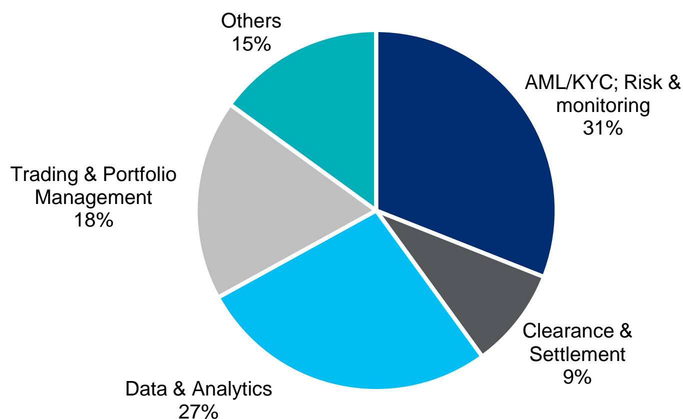
So far most insurtechs are focused on streamlining the insurance process or filling gaps in coverage as opposed to disrupting the value chain. That being said, incumbents can learn from and partner with/acquire new entrants into the sector to help better align themselves with new generation customers in the digital world.

Post global financial crisis large banks' compliance related spend has skyrocketed. In some cases regulatory costs are >10% of banks' operational spending.

RegTechs are companies focused on new technologies which improve security, mitigate risks and enhance regulatory compliance of companies. Post-global financial crisis banks have paid in excess of $150bn in fines in the US as a result of regulatory failings. It is therefore no surprise that compliance related spending in financial services has risen sharply in recent years.

According to Citi Research, the number of financial services compliance and regulatory employees doubled on average over the last 5 years. Systems which can monitor compliance and automate regulatory activity can generate massive cost savings and improve compliance. According to a report by *Medici*, the demand for RegTech solutions is expected to reach $118bn by 2020. The areas of particular focus are KYC (Know Your Customer), reporting requirements as well as fraud prevention. Technologies such as machine learning, big data analytics and cloud computing automate many risk management and compliance processes. At the same time Blockchain is also being explored within the regtech space as a means of identity verification.

Capital Market FinTech by Category



Source: Citi Research, CBInsights; Based on 150 FinTech companies that target the capital markets business; Based on number of companies (not value), as of February 2018.

Conclusion – FinTech is here to stay

Financial disruption is broad-based and spreading, impacting more and more areas of financial services.

The advent of the internet and mobile banking, along with powerful demographic shifts have combined to force changes in financial services, an area historically resistant to disruption. Unlike the dotcom years, financial services disruption is here to stay. It is broad based and spreading, impacting more and more areas of financial services; from payments and lending, to insurance, wealth management and compliance.

So far, FinTech companies have largely filled gaps (such as P2P lending and offering customizable insurance) or improved service delivery and customer experience (such as payment improvements at the point of sale). For incumbents it is therefore more a case of opportunity lost, rather than lost profits. However, disruption typically occurs in stages, first eating into industry growth by taking new segments, and ultimately targeting traditional revenue streams.

In China, incumbents have not only had to deal with disruption from FinTech start ups, but also from tech companies such as Alibaba, Tencent and Baidu. These internet giants have leveraged their vast user bases to enter into financial services, something which has not yet happened on a large scale in the US, given the already highly developed financial services and payments infrastructure in place there. But that is not to say that e-commerce companies won't decide to target certain financial services as a potential growth area ripe for shake up.

Disruption is coming from many directions, not only from startups. Tech giants are also eyeing financial services. In China this is already well advanced.

Disruption is therefore likely to come from increasingly more directions. Most financial services incumbents understand this and are learning from, partnering with or acquiring FinTech companies with a view to integrating innovation and implementing change.

The news for incumbents is not only bad. There are huge potential costs savings on the back of new technologies. For example, as customers increasingly bank online, the need for large networks of physical branches diminishes. Nordic and Dutch banks have already cut total branch levels by around 50% from recent peak levels. Savings can also be made by innovations in areas such as regulatory compliance where banks have spent billions of dollars on post the global financial crisis.

FinTech is fast moving area which has already seen considerable attention. Private companies have received billions of dollars in funding while publicly traded FinTech companies have in many cases outperformed the market. At Citi Private Bank we continue to view FinTech as a critical and investible equity theme, and we believe that we are still in the early stages of the FinTech revolution.

Asset Allocation Definitions

Asset classes	Benchmarked against
Global equities	MSCI All Country World Index, which represents 48 developed and emerging equity markets. Index components are weighted by market capitalization.
Global bonds	Bloomberg Barclays Capital Multiverse (Hedged) Index, which contains the government -related portion of the Multiverse Index, and accounts for approximately 14% of the larger index.
Hedge funds	HFRX Global Hedge Fund Index, which is designed to be representative of the overall composition of the hedge fund universe. It comprises all eligible hedge fund strategies; including but not limited to convertible arbitrage, distressed securities, equity hedge, equity market neutral, event driven, macro, merger arbitrage and relative value arbitrage. The strategies are asset-weighted based on the distribution of assets in the hedge fund industry.
Commodities	Dow Jones-UBS Commodity Index, which is composed of futures contracts on physical commodities traded on US exchanges, with the exception of aluminum, nickel and zinc, which trade on the London Metal Exchange (LME). The major commodity sectors are represented including energy, petroleum, precious metals, industrial metals, grains, livestock, softs, agriculture and ex-energy. The Thomson Reuters / Core Commodity Index is designed to provide timely and accurate representation of a long-only, broadly diversified investment in commodities through a transparent and disciplined calculation methodology.
Cash	Three-month LIBOR, which is the interest rates that banks charge each other in the international inter-bank market for three-month loans (usually denominated in Eurodollars).

Equities	
Developed market large cap	MSCI World Large Cap Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure the equity market performance of the large cap stocks in 23 developed markets. Large cap is defined as stocks representing roughly 70% of each market's capitalization.
All Country Ex US	MSCI All Country ex US, which is free-float adjusted and weighted by market capitalization. The index is designed to measure the equity market performance of the large cap stocks in all countries excluding the US.
US	Standard & Poor's 500 Index, which is a capitalization-weighted index that includes a representative sample of 500 leading companies in leading industries of the US economy. Although the S&P 500 focuses on the large cap segment of the market, with over 80% coverage of US equities, it is also an ideal proxy for the total market.
Europe ex UK	MSCI Europe ex UK Large Cap Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure large cap stock performance in each of Europe's developed markets, except for the UK
UK	MSCI UK Large Cap Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure large cap stock performance in the UK
Japan	MSCI Japan Large Cap Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure large cap stock performance in Japan.
Asia Pacific ex Japan	MSCI Asia Pacific ex Japan Large Cap Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure the performance of large cap stocks in Australia, Hong Kong, New Zealand and Singapore.
Developed market small and mid-cap (SMID)	MSCI World Small Cap Index, which is a capitalization-weighted index that measures small cap stock performance in 23 developed equity markets.
Emerging market	MSCI Emerging Markets Index, which is free-float adjusted and weighted by market capitalization. The index is designed to measure equity market performance of 22 emerging markets.

Bonds	
Developed sovereign	Citi World Government Bond Index (WGBI), which consists of the major global investment grade government bond markets and is composed of sovereign debt, denominated in the domestic currency. To join the WGBI, the market must satisfy size, credit and barriers-to-entry requirements. In order to ensure that the WGBI remains an investment grade benchmark, a minimum credit quality of BBB–/Baa3 by either S&P or Moody's is imposed. The index is rebalanced monthly.
Emerging sovereign	Citi Emerging Market Sovereign Bond Index (ESBI), which includes Brady bonds and US dollar -denominated emerging market sovereign debt issued in the global, Yankee and Eurodollar markets, excluding loans. It is composed of debt in Africa, Asia, Europe and Latin America. We classify an emerging market as a sovereign with a maximum foreign debt rating of BBB+/Baa1 by S&P or Moody's. Defaulted issues are excluded.
Supranationals	Citi World Broad Investment Grade Index (WBIG)—Government Related, which is a subsector of the WBIG. The index includes fixed rate investment grade agency, supranational and regional government debt, denominated in the domestic currency. The index is rebalanced monthly.
Corporate investment grade	Citi World Broad Investment Grade Index (WBIG)—Corporate, which is a subsector of the WBIG. The index includes fixed rate global investment grade corporate debt within the finance, industrial and utility sectors, denominated in the domestic currency. The index is rebalanced monthly.
Corporate high yield	Bloomberg Barclays Global High Yield Corporate Index. Provides a broad-based measure of the global high yield fixed income markets. It is also a component of the Multiverse Index and the Global Aggregate Index.
Securitized	Citi World Broad Investment Grade Index (WBIG)—Securitized, which is a subsector of the WBIG. The index includes global investment grade collateralized debt denominated in the domestic currency, including mortgage -backed securities, covered bonds (Pfandbriefe) and asset-backed securities. The index is rebalanced monthly.

Other miscellaneous definitions	
Asset Backed Securities (ABS)	A security whose income payments and hence value are derived from and collateralized (or "backed") by a specified pool of underlying assets such as consumer credit card debt or auto loans.
Commercial Mortgage Backed Securities (CMBS)	Commercial mortgage-backed securities (CMBS) are a type of mortgage-backed security that is secured by mortgages on commercial properties, instead of residential real estate.
High Yield Corporate Bonds (HY)	High yield corporate bonds are bonds with a credit rating less than BBB- (S&P) or Baa3 (Moody's), and are debt securities issued by a corporation and sold to investors. The backing for the bond is usually the payment ability of the company, which is typically money to be earned from future operations.
Investment Grade Corporate Bonds (IG)	Investment grade corporate bonds are bonds with a credit rating equal to or above BBB- (S&P) or Baa3 (Moody's), and are debt securities issued by a corporation and sold to investors. The backing for the bond is usually the payment ability of the company, which is typically money to be earned from future operations.

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Bond rating equivalence

Alpha and/or numeric symbols used to give indications of relative credit quality. In the municipal market, these designations are published by the rating services. Internal ratings are also used by other market participants to indicate credit quality.

Bond credit quality ratings	Rating agencies		
Credit risk	**Moody's[1]**	**Standard and Poor's[2]**	**Fitch Ratings[2]**
Investment Grade			
Highest quality	Aaa	AAA	AAA
High quality (very strong)	Aa	AA	AA
Upper medium grade (Strong)	A	A	A
Medium grade	Baa	BBB	BBB
Not Investment Grade			
Lower medium grade (somewhat speculative)	Ba	BB	BB
Low grade (speculative)	B	B	B
Poor quality (may default)	Caa	CCC	CCC
Most speculative	Ca	CC	CC
No interest being paid or bankruptcy petition filed	C	D	C
In default	C	D	D

1 The ratings from Aa to Ca by Moody's may be modified by the addition of a 1, 2, or 3 to show relative standing within the category.
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Mortgage-backed securities ("MBS"), which include collateralized mortgage obligations ("CMOs"), also referred to as real estate mortgage investment conduits ("REMICs"), may not be suitable for all investors. There is the possibility of early return of principal due to mortgage prepayments, which can reduce expected yield and result in reinvestment risk. Conversely, return of principal may be slower than initial prepayment speed assumptions, extending the average life of the security up to its listed maturity date (also referred to as extension risk).

Additionally, the underlying collateral supporting non-Agency MBS may default on principal and interest payments. In certain cases, this could cause the income stream of the security to decline and result in loss of principal. Further, an insufficient level of credit support may result in a downgrade of a mortgage bond's credit rating and lead to a higher probability of principal loss and increased price volatility. Investments in subordinated MBS involve greater credit risk of default than the senior classes of the same issue. Default risk may be pronounced in cases where the MBS security is secured by, or evidencing an interest in, a relatively small or less diverse pool of underlying mortgage loans.

MBS are also sensitive to interest rate changes which can negatively impact the market value of the security. During times of heightened volatility, MBS can experience greater levels of illiquidity and larger price movements. Price volatility may also occur from other factors including, but not limited to, prepayments, future prepayment expectations, credit concerns, underlying collateral performance and technical changes in the market.

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