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How Fintech Will Alter the Complexion of Financial Services

The Eight Most Important Areas that Will Shape Fintech's Impact on Financial Services

Global Equity Research | Industry Report Fintech

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All pricing metrics within this report as of November 18, 2021, unless otherwise noted.

Introduction

The financial services industry is undergoing major changes driven by disruptive fintech companies that are not only nimble and armed with better technological capabilities but are also enabled by groups of investors and regulators that have been promoting their expansion. While there are likely to be significant changes in the future, we believe the extent of these changes and their impact on the industry hinge on some factors outlined in this report.

Digitization and Embedded Finance Are Largest Drivers of Change – Technology is driving significant changes in the way consumers consume goods and services, and there is a clear preference among Millennials and Gen Z towards simplicity and aggregation where fewer intermediaries are involved. This might mean that consumers rely less on the major household financial services brands (i.e., Chase, Citi, American Express, Schwab, Prudential, etc.) and gravitate towards two-sided platforms like Apple, PayPal or Google; or others vying to be more like this, such as Amazon or Walmart. The onus is on the incumbents to stay ahead and being flexible as the world digitizes and more third-parties (i.e., merchants) embed financial services as an extension of their existing relationships with consumers. Open banking is also a factor as it democratizes consumers' ability to make financial information available to third parties.

Modern Tech Platforms Offer Greater Scalability and Utility – State-of-the-art global, cloud-based technologies are enabling new fintechs to disrupt legacy tech oriented players that are mired with disparate, redundant and antiquated platforms and tech architectures. New technology not only enables greater productivity from a top-line perspective but is significantly more scalable. For example, we estimate that Artificial Intelligence (AI) could improve RoTEs by 0.7-1.1ppts for US and European banks.

Broadly It's Still Early Days and Technology Is Still Evolving – While some aspects of the future as mentioned above are clearer to identify, others are still in their development phases. For example, it is early days in the development of crytocurrencies and the utilization of blockchain technology. While there is signifcant debate on the utility and viability of both, we believe they have a place in the future and their roles will become clearer over the intermediate term. Artificial Intelligence (AI) is being woven into the underpinnings of financial services whether it be for underwriting purposes, sifting through reams of data to find alpha generating or ESG compliant investment ideas, or routing customer inquiries to the appropriate channels. We expect this technology to play a larger role in not only modernizing the industry but also driving top-line growth and cost efficiencies.

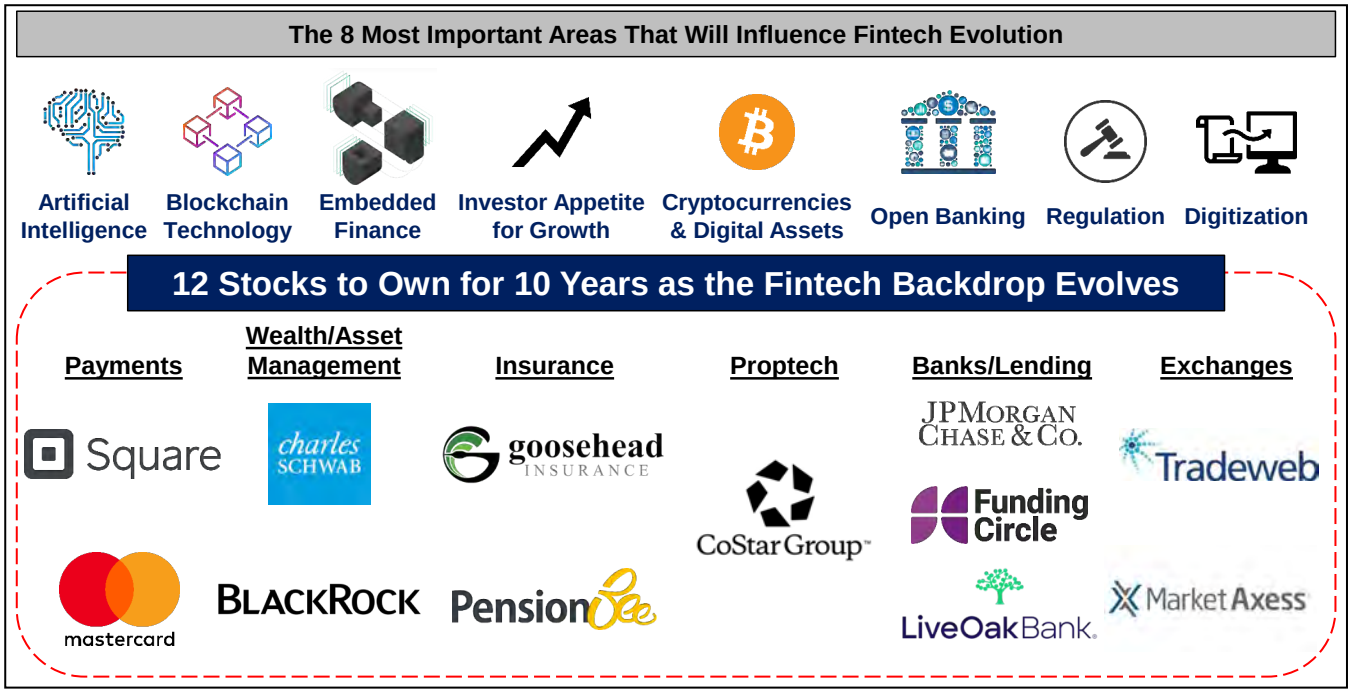
Success of Fintechs Also Predicated on How Patient Investors Will Be – Most surprising is how patient the investment community and regulators have been with the fintech industry as traditional norms have been cast aside in the name of inclusion and technological evolution. We think a big factor for the success of fintechs will be how pragmatic each of these parties will be given growth is unlikely to be linear (i.e., how long will investors focus on revenue growth and not profitability) and regulators are likely to change certain aspects of fintech models and how they operate.

The Eight Most Important Areas in Fintech

Technology is driving change to products, business models, and distribution channels and redefining the competitive landscape for financial services firms. We have identified the following eight areas as potentially being the most influential in shaping the future of the financial services industry. In this report, we attempt to provide a perspective on how these are likely to impact the various subsectors within financial services, the biggest opportunities, and threats for fintechs and incumbents, and the companies that we believe have the ability to be endgame players.

(i) Digitization
(ii) Embedded Finance
(iii) Open Banking
(iv) Cryptocurrencies and Digital Assets
(v) Blockchain Technology
(vi) Artificial Intelligence
(vii) Public Market Investor Hunger for Growth (i.e. Valuations)
(viii) Uneven Regulatory Playing Field

Exhibit 1: Companies In Our Coverage With the Most Ability to Adapt and be an End Game Player in the Face of all the Fintech Innovations that will Shape the Future of Financial Services



Source: Company websites, KBW Research

Prologue

The origin of the term "fintech" can be traced to the early 1990s when Citigroup named a project to facilitate technological cooperation with third parties, "Financial Services Technology Consortium." And while it might feel like we've reached a tipping point for fintech's proliferation recently, technological evolution inside of Financial Services has been happening since the mid-1900s (if not earlier) when consumers were first able to transact with a Diners Club card and send communications across regions via telex.

The period from the 1960s to early 2000s, or what might be dubbed Fintech 2.0 (Fintech 1.0 was marked by technologies such as transatlantic cable and fed wires), saw the rise of digital payment forms such as the payment networks (Visa, Mastercard, Automated Teller Machines [ATMs]) as well as global and domestic bank Automated Clearing networks to move money directly between banks. Michael Bloomberg also created his namesake platform which provided real-time market data, and other financial analytics to Wall Street firms. There were many more innovations like the formation of electronic stock trading platforms (Nasdaq), online trading platforms (E*Trade and Ameritrade) and the first Online Banking products (Wells Fargo first to offer online checking account).

What's unique about Fintech 3.0 (likely started around the 2008 financial crisis) is that it has the potential to be far more impactful on the incumbent players in the industry as it leverages advancements in technology and the internet (particularly via mobile phones) to take the customer relationship away from the financial services providers and make third-parties such as merchants (i.e., Amazon or Walmart) or two-sided platforms (i.e., PayPal, Apple, Square or Google) far more relevant as consumers make choices to consume goods and services. Aiding the rise of fintechs is the fact that the younger generations (i.e., Millennials and Gen Z), are less wedded to the status quo and willing to alter their consuming habits to companies that are more trustworthy as advised by their peers and also might provide products and services that more closely align with their immediate needs (i.e., free online checking accounts, commission-free mobile stock trading, peer-to-peer payments or buy-now-pay-later loans).

While it's very difficult to precisely predict what the complexion of the Financial Services industry will look like in 20 years, in this report we've put together our view of the eight most relevant factors that will play a role in shaping the industry over the intermediate term – (i) Digitization and (ii) Embedded Finance are likely to be the largest front-end drivers of change impacting the consumer experience; (iii) Open Banking; (iv) Artificial Intelligence and (v) Blockchain Technology along with (vi) Cryptocurrencies and Digital Assets are important technological advances or protocols that have potential to be transformational in delivering automation, efficiency, and security as well as enable the changes on the back end; finally, (vii) Regulation and (viii) Investor Appetite for Growth (i.e. valuations) will play an undeniable role in influencing what succeeds and what doesn't.

Based on equity valuations of fintech companies relative to legacy Financial Services players (KFTX [KBW's Fintech Index] has consistently outperformed the market for the last five years), the investment community seems firmly in the camp that fintechs are likely to play a prominent role in the future of Financial Services. However, their exact role is still to be determined, in our view, and incumbent companies have their own set of advantages such as size and scale. We think the key to success for all parties is to be open to adapting and remaining open minded about the future versus being complacent.

A View from the Largest Incumbents on the Future of Fintech

"Worthless, due for regulation." Jamie Dimon has never appeared to be a fan of Bitcoin given the view of potential weaknesses and conflicts with anti-money laundering policies and the Bank Secrecy Act. That said, JPM management has had a healthy fear that fintech is an enormous competitive threat that could drive changing dynamics in the industry and shifts in market share. The firm has talent, scale and the resources to compete, but management believes the firm needs to act quickly and more creatively. As a result, JPM has one of the largest technology budgets in the industry north of $11B.

Technology is changing the rails for global corporate payments. Despite views of Bitcoin, blockchain-based technology is critical to JPM to develop a faster and more efficient global payments platform. The firm has developed JPM Coin which created a more efficient clearing mechanism to help clear intra-day party repo transactions. This technology provides digital real time settlement and facilitates cash flows and collateral. JPM Coin also uses blockchain-based technology to use a general ledger as a payment rail enabling JPM clients to move funds and solve cross-border payment hurdles.

Physical scale still matters, otherwise be a challenger bank. Chase remains a firm believer in physical branches, as the bank has been building branches in new markets using proprietary payments data for best locations across 48 states. However, given limited scale and acquisition opportunities, the strategy for Chase is different in the UK, as Chase has taken the role of a challenger bank in this market. Late in 2021, Chase launched a digital bank in the UK initially offering checking accounts but will later offer personal loans and mortgages. This product set will be complemented with its pending acquisition of Nutmeg, a leading digital wealth manager. Together Chase expects to have a strong consumer product set to compete digitally with legacy banks despite lack of a significant physical presence.

Goldman has a similar digital strategy through Marcus; however, instead of using its new digital platform to extend to new markets or augment existing business, Goldman started a new digital consumer business in an effort to diversify earnings away from volatile capital markets and its capital intensive private equity business. Given Goldman's lack of a valuation multiple and limited capital flexibility, acquisition options were limited. However, Goldman also believes it has a competitive advantage of starting from scratch with best in class technology rather than being bogged down with legacy technology and products. Over the past five years, Marcus has grown digital deposits to $100B with no branches and very small marketing or customer acquisition costs. GS has also leveraged technology toward wealth management and self-directed investment products, including robo advisory/asset allocation product.

AI is playing an increasingly important role. For JPM, "all new technology is built cloud - enabled, which allows immediate ability to access data and associated machine learning with virtually unlimited compute power". This is an advantage for the industry given banks' tremendous amount of data. JPM uses AI in fraud and risk, marketing, operations and trading. Goldman has also been successful implementing AI and operating on the cloud has provided low-friction access to technologies that allowed acceleration with several initiatives, including transaction banking and Marcus. In addition, using the cloud can help integrating acquisitions, as Goldman's pending acquisition of GreenSky provides a cloud-based infrastructure that is synergistic with Goldman's broader platform.

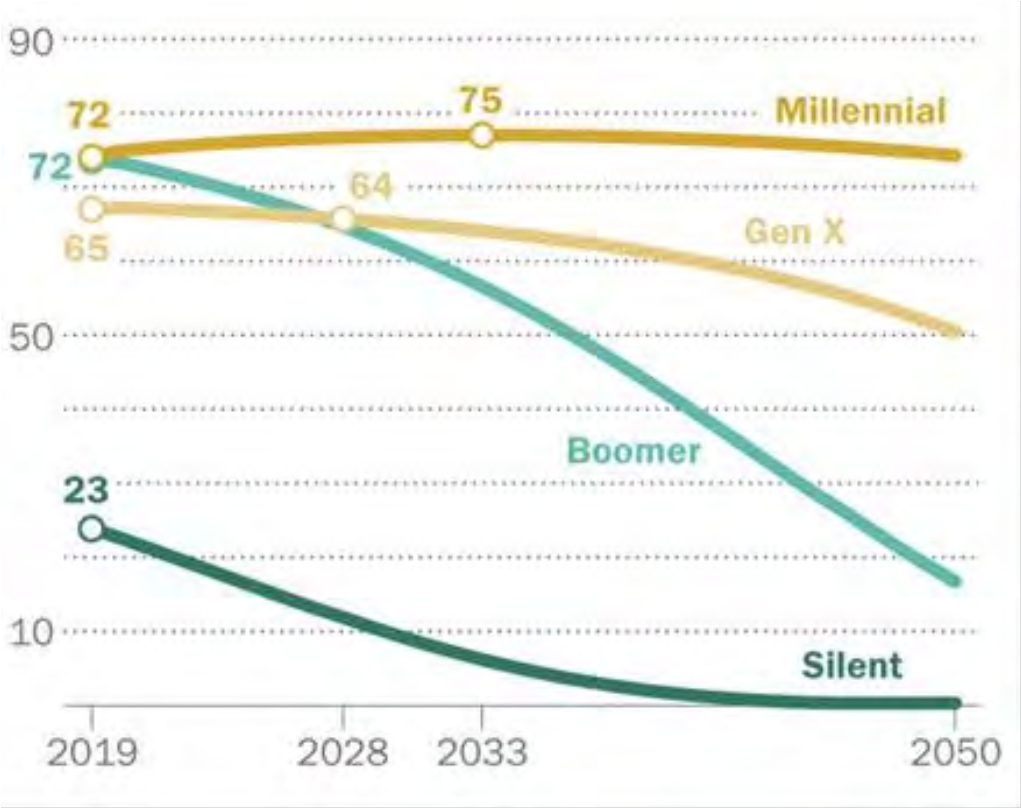
The Generational Shift

Millennials, Gen X, and Gen Z represent the largest generational demographics in the US today. The Great Wealth Transfer is ahead of us as the aging baby boomer population passes down their assets to the next generation, which is most likely to be millennials that are currently 25-40 years old. Estimates vary, but somewhere between $30 trillion (Accenture estimate) to $68 trillion (Cerulli Associates estimate) in wealth is likely to move between generations over the next couple of decades.

This will lead to significant growth in the purchasing power of a demographic segment that is mobile-first and more open to financial offerings from alternative financial service providers (e.g. Google, Apple, or PayPal) and this presents an opportunity for fintech startups or tech players that are looking to innovate in financial services.

Exhibit 2: Demographic Profile of Consumers are Changing and Incumbents Need to

Projected population by generation (in millions)



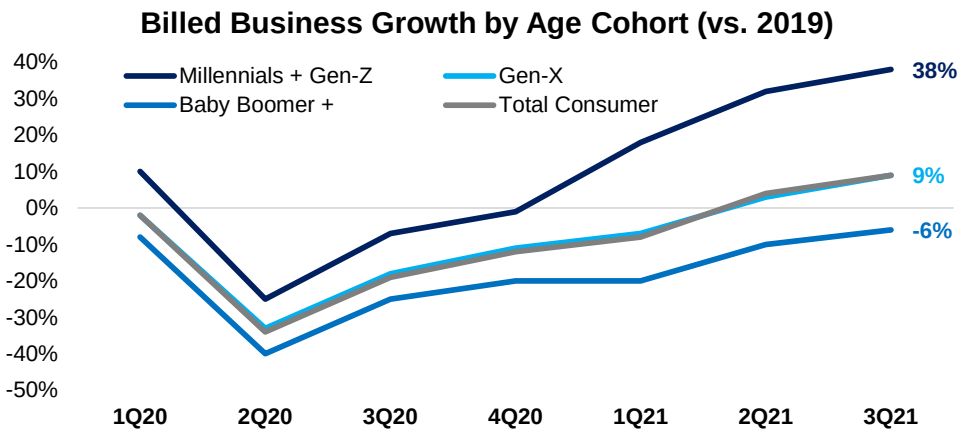
Source: Pew Research Center Tabulations of U.S. Census Bureau population estimates released April 2020 and population projections released December 2017.

Exhibit 3: Millennials' Share of Consumer Categories Is Expected to Grow Over the Next Decade

Source: Fundstrat

We think the jury is still out on whether millennials and Gen Z will make completely different personal finance choices in the long run, or if after accumulating sufficient wealth they will ultimately gravitate towards experienced larger financial institutions similar to prior generations. As a case in point, while much has been said about the propensity of millennial populations to stay away from credit cards, American Express in its most recent quarter saw the strongest volume growth coming from millennial/gen-Z cardholders (See Exhibit below). Ultimately, what is clear is the importance of a digital strategy to win over these younger customers and incumbents that want to be a part of this future growth potential have to act today and innovate their platforms and strategies to deliver the right digital experiences that this end market demands.

Exhibit 4: Millennials and Gen-Z Cohorts Are Seeing Strongest Volume Growth at American



Source: American Express

1. Digitization

Key Areas Explored in this Section:

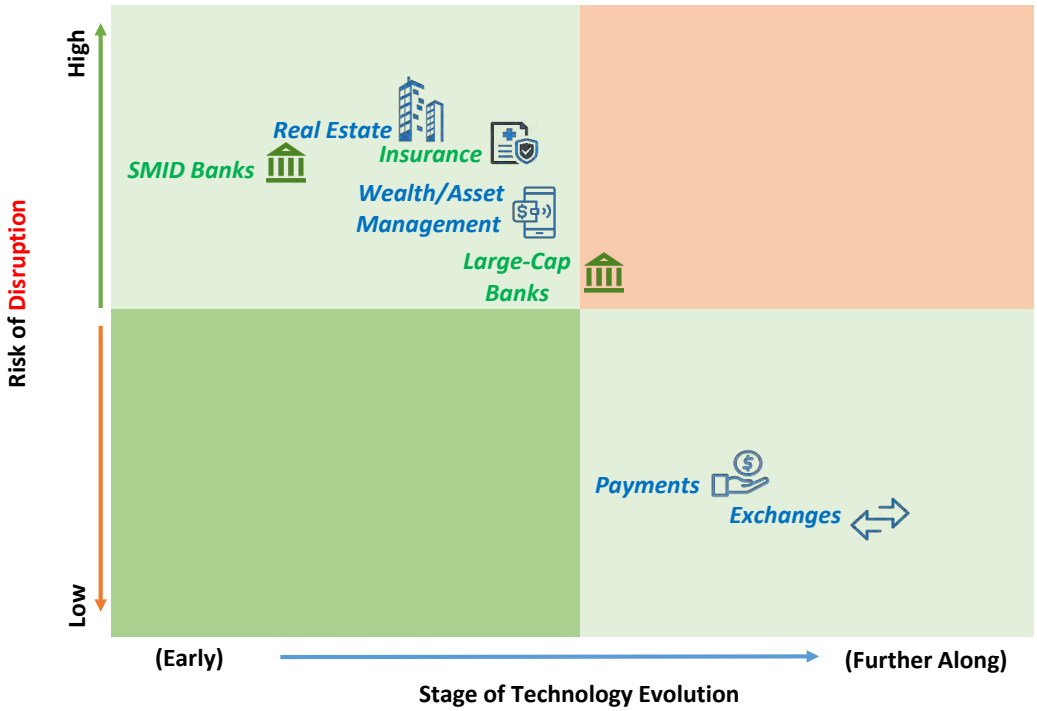
- ***Proptech***
- ***Digital Wealth/Asset Management***
- ***Exchanges***
- ***Banks***

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Digitization

Digitization is at the forefront of what is driving change in many industries, including the financial services industry. It has altered not only how we conduct our social lives, but also how we shop, how we pay and get paid, how we bank, and how we consume a broad swath of other financial services. Consumers have come to expect their financial needs being met with a click of a button and while the pandemic has accelerated digitization by leaps and bounds, there is a gap that exists between what consumers expect and what the industry is able to offer today. While some areas within financial services were early to digitize (e.g. Payments), others are only getting started (e.g. Real Estate Finance). Nonetheless, the trend towards digitization is happening across the board and will change the industry with potential for lessons to be learned from those segments that were early.

Exhibit 5: Mapping of the State and Risks of Digitization Across Financial Sectors



Source: KBW Research

Proptech – On the Cusp of a Digital Sea Change

The real estate sector is ripe for digitization and innovation, but remains in the early innings of technology adoption. Real estate is the largest asset class in the world, housing the global economy and its consumers. In the U.S. alone, it represents the largest component of GDP at 18%, and we estimate annual U.S. transaction volumes total $4.5-$6.5 trillion across both residential and commercial real estate. The real estate value chain is immense, highly fragmented, and powered by antiquated, largely paper-based processes. Further, capital allocations by both institutional and individual investors have increased meaningfully over the last decade including in both commercial and residential real estate. As a result, the real estate sector seems a prime candidate for digitization and adoption of broader trends in technology and innovation.

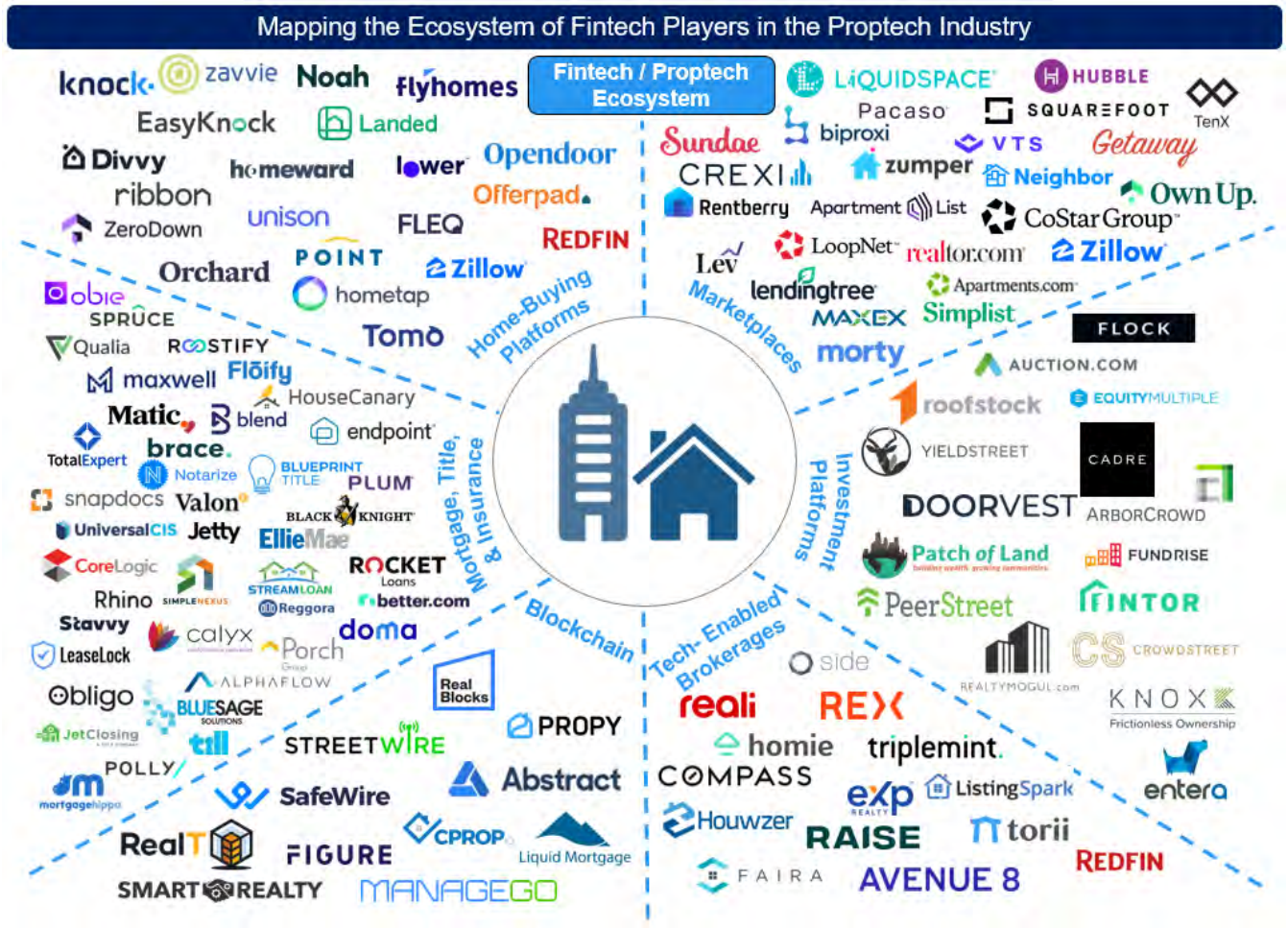
Despite this, the sector has largely lagged others in its digital evolution and not until recently have industry incumbents begun to reexamine their strategies, engage with proptech firms, and develop enterprise-wide digital playbooks to navigate this new era of innovation. As a result, ***we believe the real estate industry is on the cusp of an inflection point as it relates to technology adoption and broader innovation***.

Broader trends in technology such as the proliferation of "tech-enabled" and "instant" experiences have naturally spilled over into the real estate industry as technology and digitization have become table stakes for any business to compete in today's world. Demographic shifts have also been a driver as a younger generation has taken over leadership roles at real estate-related companies. In addition, the proliferation of mobile and cloud computing (super computers in every consumer's pocket) has opened up a litany of opportunities for digitizing the real estate industry. Finally, real estate has historically been a very profitable, high-margin business, so there has been less urgency to alter the status quo. However, technology is providing new ways to unlock value for stakeholders across the real estate value chain, driving more and more industry participants to embrace technology.

This ensuing value creation via moving from offline to online in turn creates network affects, which we believe could result in a steepening adoption curve for digitization across various real estate sub-sectors in coming years.

We highlight a handful of digital “megatrends” impacting real estate sectors below.

Exhibit 6: Mapping the Ecosystem of Fintech Players in the U.S. Proptech Industry



Source: Company websites and KBW Research

Digital Home Buying Platforms

The home purchase tends to be largest financial undertaking of most households/individuals. At the same time, the home buying process is very complex and onerous with high friction costs, uncertain execution, and lengthy transaction timelines. A growing list of companies have emerged with a range of business models that aim to provide more modern, seamless, and oftentimes fully-digital experiences across a range of home-related transactions. To-date, the service that has gained the most transaction has been the instant cash offer for sellers ("iBuyers"), while other permutations include modern home finance companies providing cash offers for buyers ("buy before you sell"), home seller concierge services, sale-leaseback and rent-to-own programs, and home equity co-investment platforms.

Longer-term, we see these digital home buying platforms on a potential collision course with traditional housing players (i.e. brokerages, mortgage originators) and other housing-related technology trends (i.e. digital mortgage and closing players) with the potential to create end-to-end, vertically integrated housing platforms that service all aspects of the homeowner journey.

Digital Mortgage, Title, and Escrow

One of the more opaque and onerous components of the home buying transaction is the mortgage origination and closing process. Coupled with the growing participation of millennials and gen-z consumers in the housing market, who are more demanding of tech-enabled and instant experiences, technology has increasingly become table stakes for key participants in the home closing process to remain competitive, including originators, title insurers, and appraisers.

While a painful mortgage closing process has become an accepted reality, industry innovators believe that an artificial intelligence, machine learning-based process offers a far faster, better, and affordable experience for consumers and industry participants. As "title and escrow" companies are essentially in the "mortgage closing" business, they have the unique advantage of being able to utilize technology to streamline this antiquated process.

To that end, both disruptors and enablers have emerged to capitalize on the opportunity to bring the mortgage and closing process digital across a range of categories, including tech-enabled mortgage platforms (Better, Rocket), software providers that streamline/automate workflows/processes (Black Knight, Ellie Mae, Blend, Roostify), disruptive title insurers (Doma), blockchain players (Liquid Mortgage, Figure), and digital real estate closing platforms (Qualia, Spruce, Snapdocs, JetClosing).

Online Real Estate Marketplaces

While the real estate industry has historically been a relationships-based business, the proliferation of online marketplaces in other industries has begun to spill over into real estate, providing digital portals to advertise and transact. To date, online real estate marketplaces have been predominantly focused on providing digital advertising and high quality lead generation for various stakeholders across the leasing, mortgage, and investment sales markets. Still, the shift to sophisticated online digital advertising remains very early days for the real estate industry.

At the same time, other permutations of online marketplaces have emerged that are focused on other areas in the real estate industry such as fully digitizing transactions (such as CoStar's Ten-X for CRE auctions, Roofstock for single-family rental property sales, and VTS for CRE leasing), as well as democratizing access to institutional quality real estate investment opportunities via online investment platforms (such as CrowdStreet, Fundrise, and Cadre). Thus far, these models have proven more enabling than disruptive. However, longer-term we see the potential for growing adoption of these platforms to result in disintermediation of certain incumbents.

Digital Wealth/Asset Management – Increased Competition for Traditional Advisors

As we noted earlier and reviewed in detail in our October 5, 2020, report, "Yogi Says, "The Future Still Ain't What It Used to Be," disruption in how financial advice is delivered and consumed are having profound effects on the wealth/asset management industry as increasing numbers of investors prefer or expect to have some element of investment advice, information, and interaction delivered digitally, whether it's fully digital via an online platform such as Wealthfront, Robinhood, or Charles Schwab, or some hybrid of online access and personal connection with an advisor.

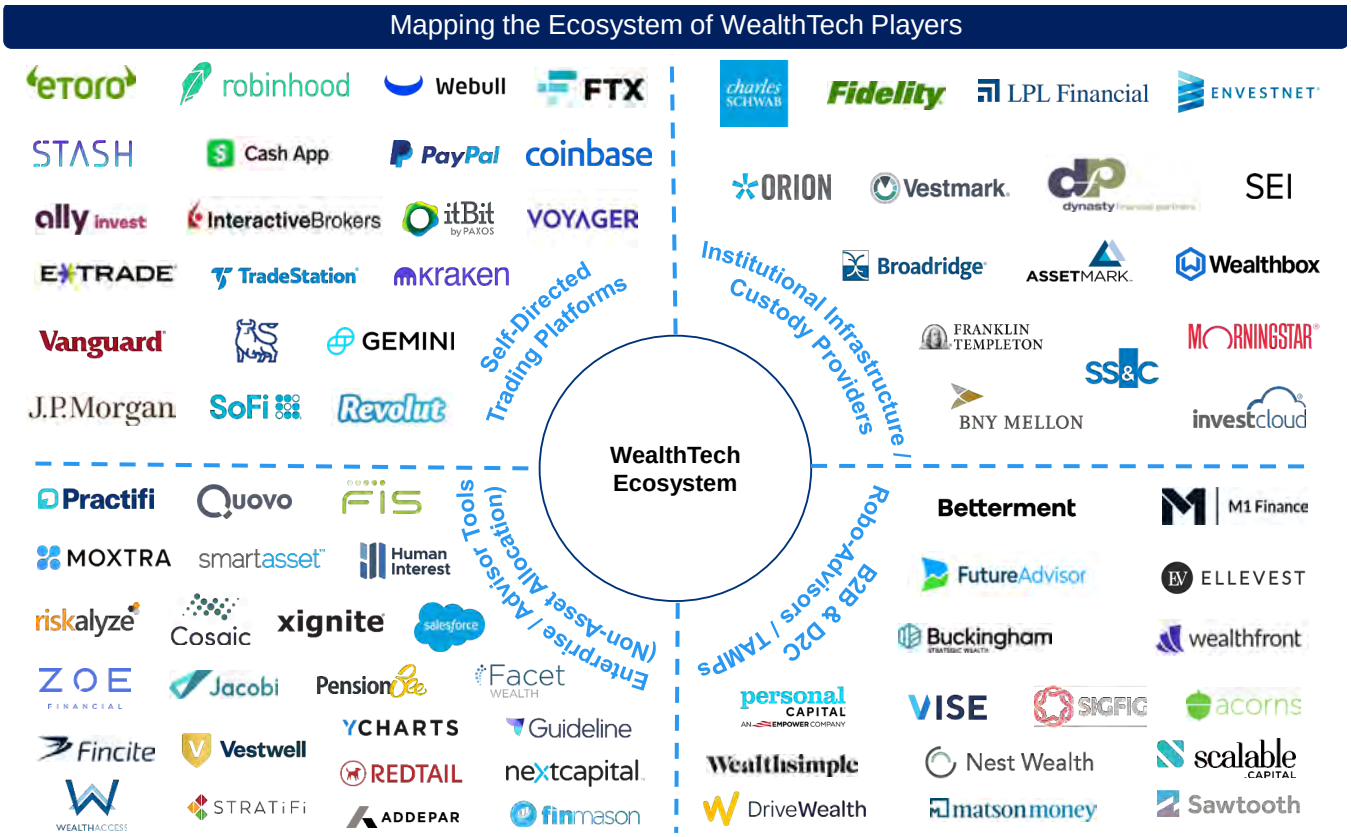
In essence, technology has driven down the cost of delivering stock trading as well as certain advice and investments services, particularly to younger, less affluent segments of the population. We expect the ease of use and level of products available to individual investors, on a self-directed basis, to continue to improve and be offered at extremely low costs. We also expect direct-to-retail apps to launch new and innovative services to fill in product or service gaps along the lower end of the wealth spectrum. A recent example of this would be not only to offer robo advice, but also to offer hybrid robo advice, which combines pure digital asset allocation with a personal touch of a financial planner.

This trend has increased pressure on traditional wealth advisors to transform their service offering as low-cost asset allocation and other services are more easily accessible to a wider variety of the investing public. More specifically, wealth advisors are offering more holistic wealth planning, tax efficiency, and other value-add services, which has helped to limit fee compression relative to providers further down the value chain. We foresee higher risk of digitization of financial advice in the mass affluent customer segment, where customer needs are simpler and mostly involving asset allocation. That said, as investors move up the wealth spectrum and have more complex needs, human touch becomes more important and price can become less important, as we think investors will always seek out quality advice, in addition to being willing to pay for differentiated investment returns.

Importantly, as we touched on earlier, technology has created more scalable tools that can bring sophisticated and automated asset allocation tools to the masses. However, this not include comes in the form of direct-to-retail robo-advisors, but also institutional turnkey asset management programs (TAMPs). It's important to note that advisors and wealth platforms are also embracing some level of automation / digitization in what used to be a primary job function (stock selection/asset allocation), as this now allows these advisors to spend more time both servicing their clients and prospecting for new ones, and in general, creating sticky relationships.

Further down the value chain, the automated focus on asset allocation has driven demand for low-cost ETF products that provide broad or targeted exposures, which can easily be traded and managed to create tactical asset allocations. This also pressured providers of investment products to offers their services at lower costs, in turn driving fee compression.

Exhibit 7: Wealthtech Ecosystem



Note: Many companies listed above could fall into other categories (e.g., SCHW in "Self-Directed Trading Platforms" and "D2C Robo-Advisors").

Source: Company websites and KBW Research

Exchanges – Fixed Income Markets Undergoing Largest Transformation

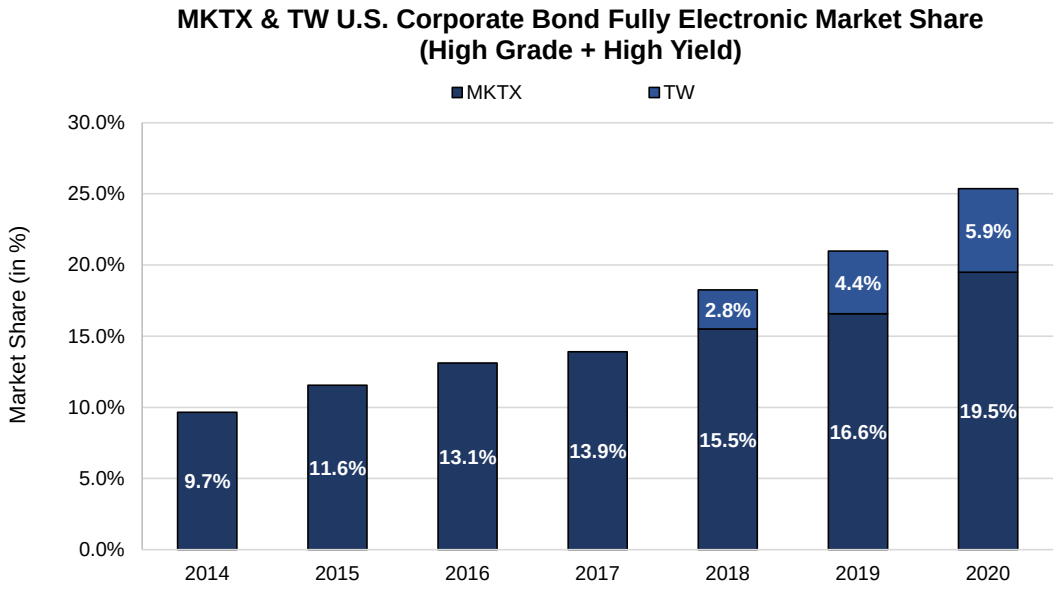
The exchange sector is relatively far along in the context of digitization, or more specifically applied to this business, adopting electronic trading and automation. For more traditional liquid markets, such as equities, futures, and spot FX, the shift towards electronic trading took place earlier, with the most meaningful transformation occurring in the early 2000s. There has also been significant investment into connectivity, execution speed, and new protocols to execute trades efficiently.

For less liquid markets (e.g. credit, fixed income), the digital transformation is still ongoing. These markets have traded primarily via voice execution/brokerage; however, new electronic protocol innovations coupled with cost pressures have helped to shift some of the volumes of more traditionally voice-brokered markets onto electronic platforms.

Companies such as MKTX, TW, and Trumid are among those helping drive this evolution, benefiting generally at the expense of traditional dealers. Today, electronic trading penetration of some of the more traditionally voice dominated markets are as follows: (1) U.S. high grade at ~35%, (2) U.S. high yield at 20-25%, (3) Eurobonds at ~45%, (4) U.S. Treasuries at 65%, (5) Munis at 10-15%, (6) Emerging Markets at ~10%, (7) Leveraged Loans at <10%, and (8) Interest Rate Swaps at 25%. We don't expect these markets to realistically reach 90%+ electronic trading (similar to cash equities), but we believe ***most of these markets can reach well over 50% electronic trading penetration over time***.

We don't necessarily view electronic trading adoption in these markets to mirror an "S-curve" type trajectory. Instead, we more view electronic adoption as a persistent, if not linear, trend that is continuously driven forward by a number of factors including technological innovation by trading platforms. We expect this trend to persist over the next decade across credit and fixed income markets, and believe U.S. corporate bond markets will likely reach a 50% electronic penetration within that time frame.

Exhibit 8: Fully Electronic U.S. Corporate Bond Trading Market Share (MKTX + TW)



Source: MKTX & TW Company Filings and KBW Research

As previously mentioned, the creation of new trading protocols has been a large driver of these market share shifts towards fully electronic trading venues. Such innovations include: anonymous all-to-all trading, auto-execution functionality for the buy-side, dealer algorithms, portfolio trading, and more. Ease-of-use, improved execution pricing, broader access to liquidity, and expense efficiencies are several reasons why this electronic shift has occurred in these markets, as well as why we would expect this adoption to continue going forward.

Companies such as MKTX, TW, and Trumid are among those helping drive this evolution, benefiting generally at the expense of traditional dealers.

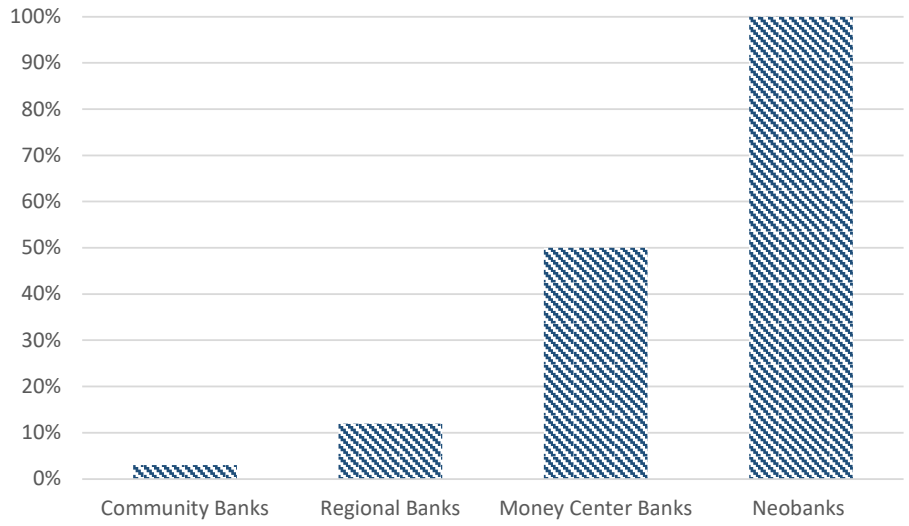
Outside of Fixed Income, Private Markets Could Also Evolve Towards Exchange-like Trading. Another asset class that is illiquid today and potentially ripe for "digitization" is private market share trading. The market currently operates with information asymmetries, and lack of a unified liquidity center for transacting private company securities. Many companies are working on solving this issue, which may help improve liquidity dramatically and increase private market trading activity on exchange-like venues. The demand for a solution continues to increase, especially given the length that companies are staying private and the growth in private company valuations. For example, globally, unicorns are now worth $3.4 trillion in aggregate, which has more than doubled year-on-year according to Crunchbase. In terms of the key players addressing these growing demands, Nasdaq Private Market is being spun out in a joint venture and partnered with a number of dealers in order to accelerate the growth of the business. Forge Global is also working to address this growing issue of secondary market liquidity, and the company recently completed a major acquisition of SharesPost to further this mission. Carta has also recently launched CartaX to enter this secondary market trading space.

Banks – Lots of Behind-the-Scenes Efforts, but Still a Long Way to Go

In an industry historically dependent on branches to open accounts and grow, the global banking industry still has a long road ahead towards matching its digitization capabilities to the desires of younger consumers. Significant efforts are underway, however, with banks allocating a growing amount of non-interest expense budgets towards technology innovation with the largest banks globally spending on average 15-20% of their total non-interest expense budget on technology. Based on company disclosures and KBW estimates, we peg that approximately half of incremental deposit accounts at the money center banks in the U.S. being opened by consumers are occurring digitally today, with that number dropping to less than 5.0% for the small and mid-cap banks (on average) and comparing to 100% for the digitally native challenger banks, such as Neobanks.

Exhibit 9: Consumer Digital Deposit Account Opening in the US; Still Ways to Go

Figures are estimated averages by KBW utilizing company documents and disclosures.



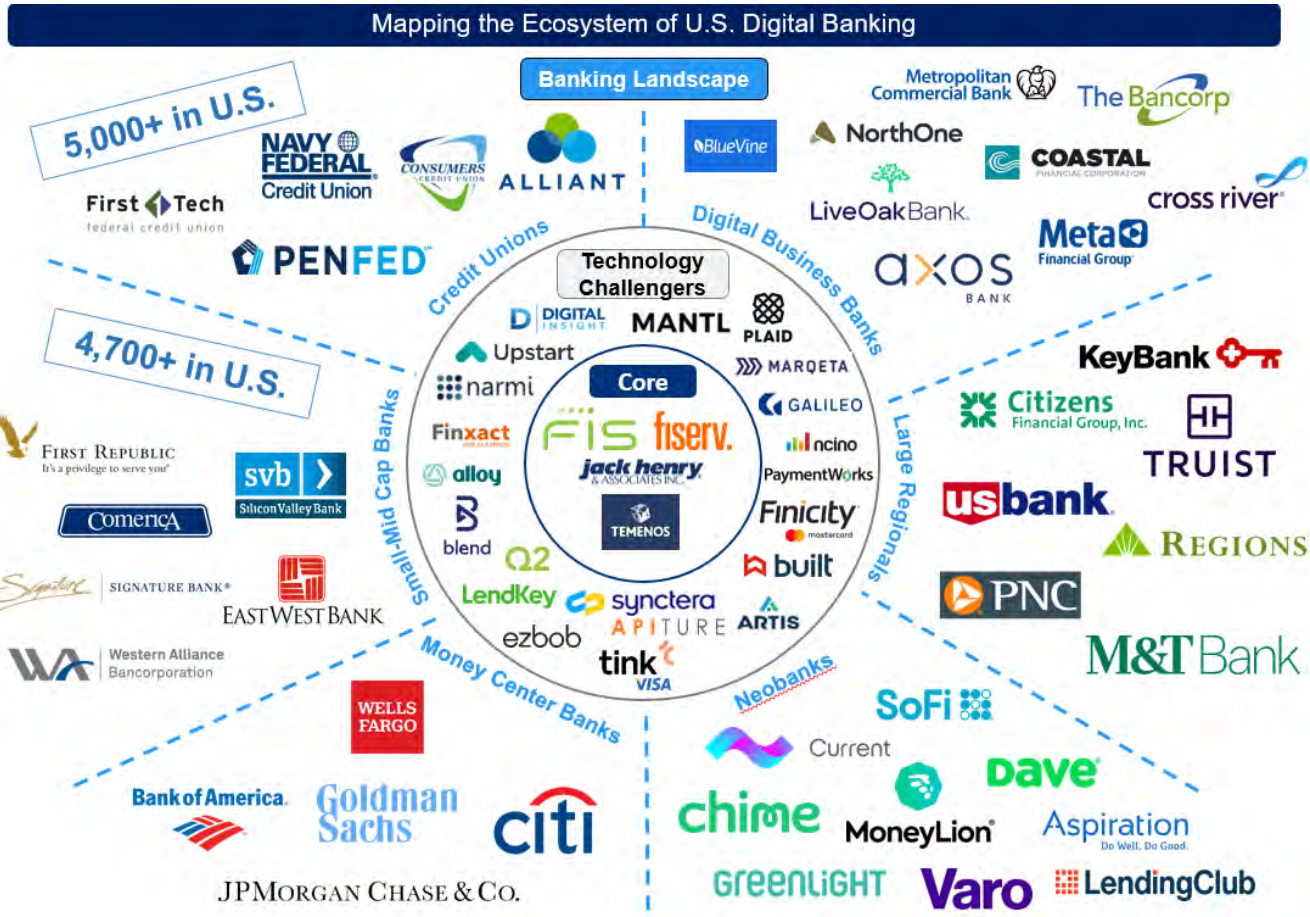
Source: Company Documents and KBW Research

The issue is rooted for banks in technology stacks that can be dated or slow to innovate, with the largest banks globally operating on core mainframe systems that can be over 50 years old (Barclays UK CEO commented that their mainframe system was 60 years old). In the U.S., an active M&A environment has left the largest banks with a patchwork of back-office systems in many cases, while smaller banks largely operate within an oligopoly of technology providers (Fiserv, FIS, and Jack Henry) who own over 90% of the market and historically provide limited differentiation.

In a conversation with banking software provider Temenos KBW conducted in early September, they disclosed that for the incumbent banking sector, most technology platforms spend 70% of cost on system maintenance, with just 30% on innovation. For digital challenger banks and new fintechs, the figure is often reversed with 70% being spent on innovation and just 30% on maintenance. This creates a challenging dynamics for the incumbents, particularly in the consumer banking space, where products are more standardized resulting in convenience and rate becoming critical elements in protecting or growing market share. Disruption has been less significant on the commercial or small

business side, although we believe this will accelerate particularly as fraud technology, particularly related to "Know Your Customer" and other anti-money laundering policies catches up to the current digital payment rails.

Exhibit 10: U.S. Digital Banking Ecosystem and Competitive Landscape



Source: Company Websites and KBW Research

2. Embedded Finance

Key Areas Explored in this Section:

- ***Insurance***
- ***Banks***
- ***Proptech***
- ***Payments***
- ***Digital Wealth/Asset Management***

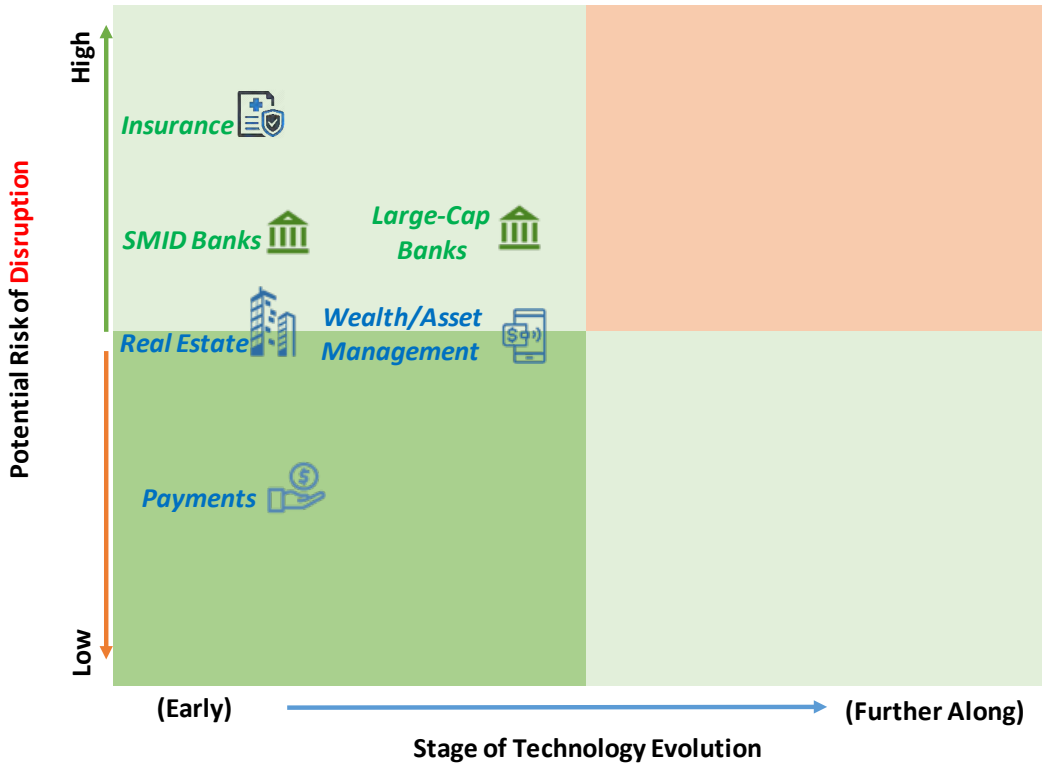
Embedded Finance

Embedded finance is the practice of integrating digital financial products and services into a traditionally non-financial business's service, product, or technology and this trend is potentially reshaping the distribution model for traditional financial services. Companies of all types – retailers, Big Tech, software providers, telcos, etc. – are starting to offer embedded financial services in an effort to expand and deepen their value proposition to their end customer segments. Some examples include digital wallets offerings by Big Tech, SMEs getting a checking account from their accounting software provider, software companies offering payments processing to their clients, and consumers getting a loan (e.g. BNPL) from a merchant.

It remains to be seen whether embedded finance has potential to cause wholesale dislocation among incumbents or if it is an avenue for the underserved segments of the population to get their financial needs met without relying on the traditional financial services industry. While there is risk of disruption, there is also an opportunity for some incumbents to collaborate and partner with new players to potentially broaden their distribution. E.g. some traditional banks have responded by partnering with fintechs through Banking-as-a-Service offerings.

Commonly referred to as the "Super App" concept, this term is coming up more and more in how companies of all shapes and sizes are talking about their long-term strategy and we have written about it from the vantage point of the Payments industry extensively (link). Here we focus on the insurance, banking, and proptech sectors where this trend could be quite influential.

Exhibit 11: Mapping of the State and Risks of Embedded Finance Across Financial Sectors



Source: KBW Research

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Insurance

The disappearance of insurance into the purchase of a product or service poses both a headwind to incumbents and insurtechs but also a significant opportunity to maintain or grow market share. Insurance drifting into the background while improving simultaneously is likely what every consumer wants. The necessity of insurance to grease the wheels of the global economy cements its place in the world as economies mature, but delivery of the product is inevitably shifting with how consumers want or can purchase their insurance. The technological capabilities to integrate financial products in a digital setting is laying a base for the potential of embedded insurance into everyday life.

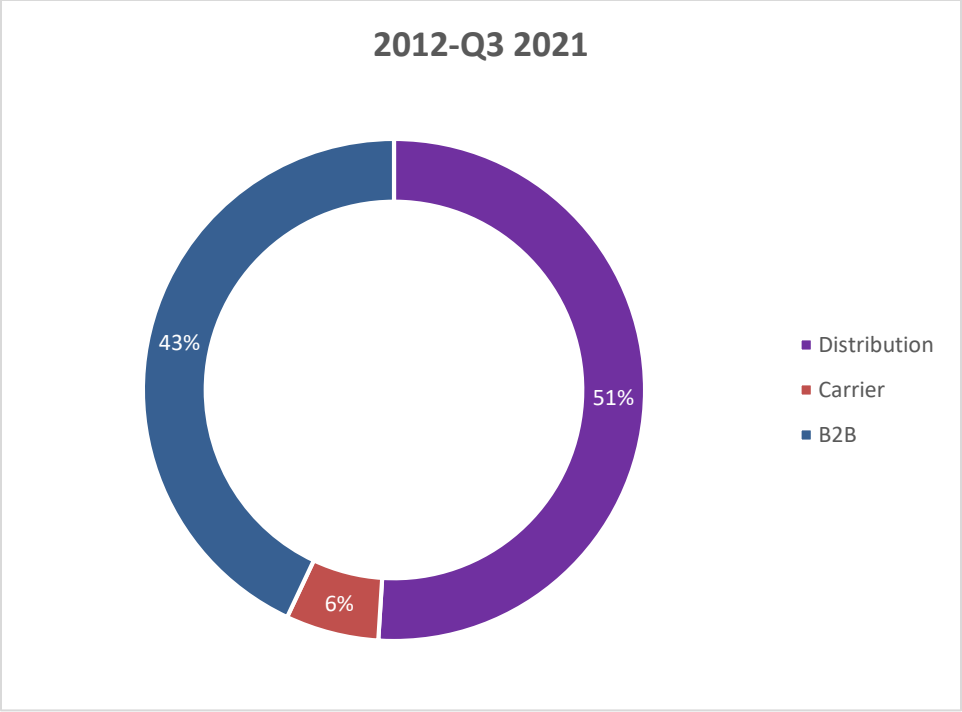
The embedded nature of the product should provide flexibility and efficiencies which in turn create a highly valued product at the consumer level that could extended beyond brand awareness or a focus on capital adequacy. Establishing meaningful commercial relationships can provide the ability to establish outsized “real estate” in the market as competition for desired and profitable business is not cannibalized by competition to price the best or spend the most to see reach the great number of consumers.

The sophistication of the insurance needed and the ability to combine the product into a subscription, recurring or one-time purchase, may be the barrier for growth in this specific sector. Embedded insurance is not a new concept, as product warranty and similar products have existed as physical, point-of-sale options for decades, but the market has traditionally been for single, lower-currency retail purchases.

In the first wave of insurtech, companies attempted to disrupt this market with post-sale individual product insurance, but traction struggled to gain hold, likely due to the mix of customer acquisition costs, understanding of risk selection, and providing a suite of product specific coverages that enticed the policyholder. But as the market has matured, the addition of further partnerships and understanding which market is ripe for expansion has shifted to understanding marketplaces to capture risk at its first point of sale while providing secondary market purchase as an additional feature.

As we wrote about earlier (link), these shifts in distribution may lead to a parallel changes in how premiums and revenues will look moving forward. The evolution of embedded insurance will likely move premiums from personal lines to commercial lines - the expansion of ride sharing services globally is just one notable example. This will require revenue capture, risk assessment and fee income to assessed different both internally and externally as growth and profitability decisions are being made.

Exhibit 12: Distribution has been a Consistent Leader in Funding and Source of Innovation for Insurers



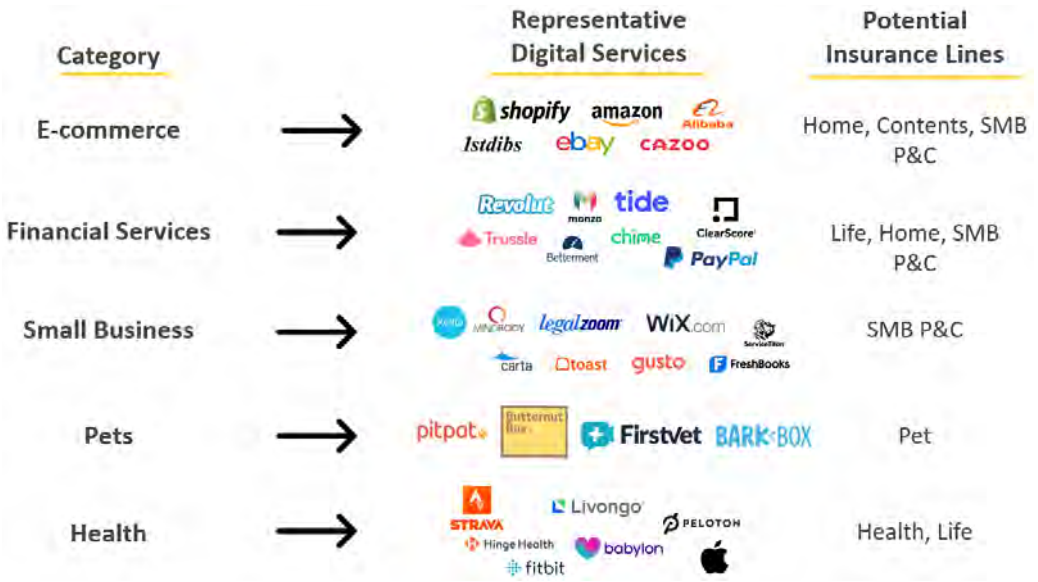
Source: CB Insights and KBW Research

Innovation in finance is creating an ecosystem that allows for low or no touch distribution opportunities.

There has been a shift in strategy for a handful of insurtechs that originally entered the space with a change from product delivery to technology platform and becoming the layer of enablement from the distribution engine.

As a negative utility business as a whole, the disappearance of the insurance product into the positive utility of being part of a desired sale, being insured as a result likely creates an overall more satisfying relationship with the policyholder experience. Removing the "need" that insurance generally carries for an experience which is usually negative when it is "used" likely creates an ecosystem for mass proliferation for those who are able to connect and pay claims. Essentially, "invisible insurance," is a net benefit for all parties involved when properly priced.

Exhibit 13: Embedded Finance Is a Reality Across Financial Products and Sectors



Source: Albion VC and KBW Research

The obstacle and potential negative for the insurers is the capital spent for the brand that has been built to sell a mostly commoditized product over many years. The nuances of insurer differentiation mostly vanishes to the end consumer with an embedded product - a very carefully crafted strategy and awareness that insurers have spent time (and often billions) on over the years. Additionally, independent agent business has been steady around 1/3 of business, much to the surprise of technology-focused newcomers and incumbents. Ruffling the feathers of this relationship is still sensitive to deploy capital into but a necessity for competitive growth. Expanding business-to-business can enable growing or maintaining a very stable and reliable piece of the distribution value chain. Navigating this in the medium-term can may prove difficult. Insurers will need to find the balance of technological capabilities and partnership development to secure the most stable and lucrative opportunities.

A positive, however, is a likely reduction in pricing sensitivity and shopping of policies on digital marketplaces. For example, with ROOT's recently announced partnership to offer embedded insurance with Carvana on a subscription basis. The cost of insurance ends up being a line item on the payment as opposed to being procured adjacent to the purchase of a car. This poses an opportunity to gain on both a reduction of acquisition costs and properly price risks without a need to compete simultaneously in a price-sensitive market. Clicking a button to add insurance is a benefit for all parties. We see the evolution of this space in car insurance to have first mover advantages for growth and rates as they can provide a track record of success and customer satisfaction as the market mature. In a challenging and competitive market, being able to embed should allow insurers to get adequate rates and reduce the shopping for rate in competitive marketplaces.

The ability to connect through APIs across ecosystems is growing to become a differentiator in insurance. The flexibility to be able to access expanding distribution channels in a repeatable manner should separate incumbents and be a significant driver of growth for insurtechs. This technological capability is an area where the incumbents have shown to be at a noticeable disadvantage today with speed of implementation and

relative costs to begin competing for meaningful business in embedded insurance. Being able to “create a playbook” that is repeatable and profitable should allow for rapid expansion of footprint in a digitizing world. As we highlighted in a recent conference (link), agility and seamless experiences are absolutely crucial as the industry is faced with rapid digitization and competition from both new entrants and incumbents alike.

Banks – $5 Trillion of Deposits at Stake over the Next Decade

Like most things fintech-related, the embedded finance movement is a global one, allowing entrance into the financial services world for many non-financial companies including some big brand names such as Amazon, Uber, Walmart, Google and many more. Embedded finance has the potential to significantly alter the competitive landscape of the banking sector, near-term primarily through banking-as-a-service arrangements giving non-bank brands the ability to utilize financial services and products under their umbrella to help maintain and grow their client bases. However longer-term, embedded finance is broader than just banking-as-a-service partnerships, in our view, and can selectively offer banks the ability to integrate their products and services into platforms where consumers and small businesses are allocating heavier digital traffic (relative to their mobile banking application).

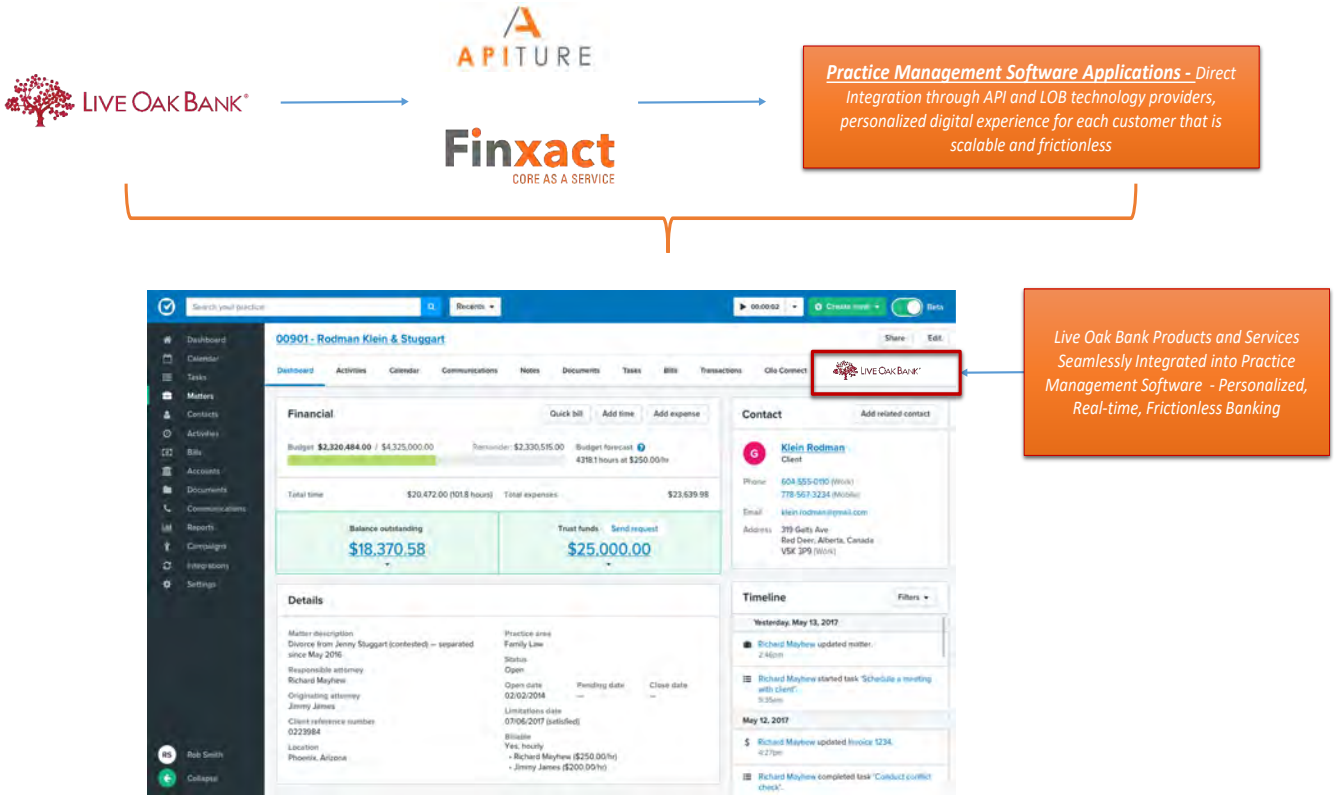
Exhibit 14: Banking Products Can be Repurposed and Sold by Non-banks

Source: CB Insights

The potential of embedded finance for banks is easiest explained through an example, where we will focus on US-based challenger bank Live Oak (LOB), who is in the process of evaluating an embedded finance strategy as a part of its digital business banking platform. In a slide deck from December 2018, LOB disclosed that practice management software is one of its targeted audiences for its embedded finance or API banking strategy. In this example, LOB would utilize its technology platform partners (such as software-as-a-service companies Finxact and Apiture) to integrate its banking application into the practice management software utilizing APIs. One of LOB's biggest lending verticals in its Small Business Administration (SBA) portfolio is its veterinarian practice, where the bank is the top SBA lender in the country and has tremendous brand recognition already. Veterinarians utilize practice management software applications to run their business (i.e., AVImark, IntraVet, Hippo Manager Software, ezyVet etc.), and by leveraging its status in the industry, we believe LOB can form partnerships with practice management software providers and integrate their banking platform directly into the application. This would create a real-time, frictionless connection between the bank and customer, in the convenience of the business owner's management application that it is using on a daily basis to run its business (i.e. heavier digital traffic).

Exhibit 15: How Banks Can Utilize Embedded Finance Principles

This is a conceptual illustration created by KBW; Actual partners and integration may be different and more complex



Source: Google Images, Company documents, and KBW Research

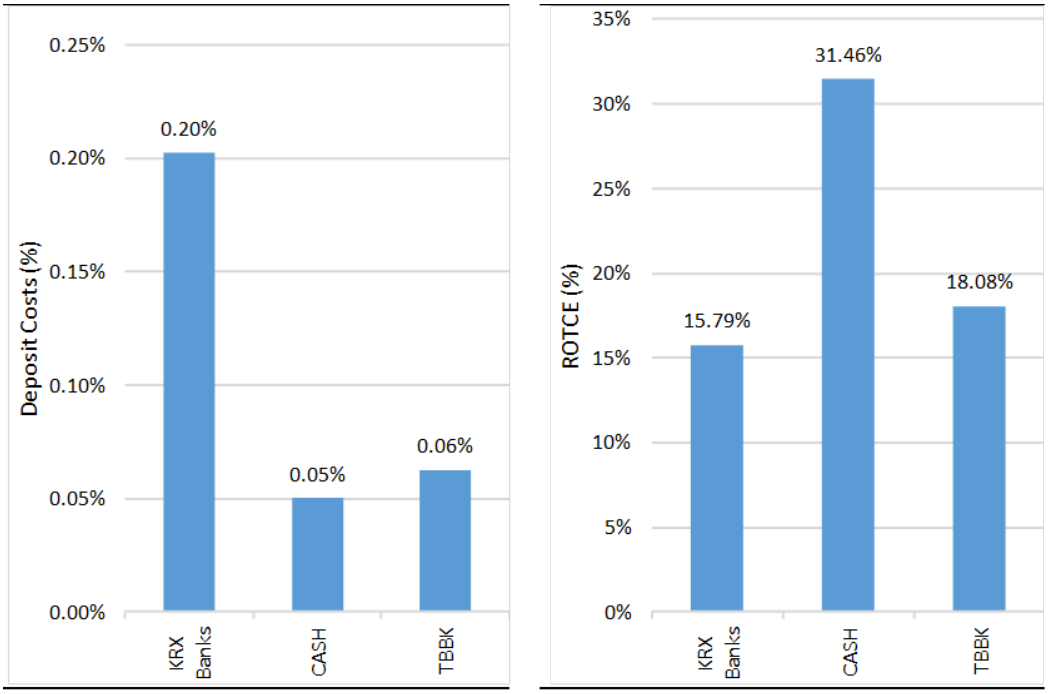
While embedded finance can present an interesting growth and market share opportunity for banks longer-term, near-term we expect a growing number of banking-as-a-service partnerships globally. Although embedded finance presents unique challenges and potentially added disruption to the sector, we believe banks should continue to have a critical role as an intermediary in this global economy, with bank charters and licenses carrying the safety and soundness of being highly regulated and well capitalized institutions (i.e. trust and stability). Bank charters and the corresponding regulation give non-bank partners access to banking products to offer on their respective platforms, most notably including FDIC-insured deposit accounts and access to payment rails through debit card issuance. We estimate there are just over 30 banks in the U.S. and 5 banks in the EU offering these types of partnerships and services today more broadly (and growing). Big tech brands in particular seem to be increasingly active in the space, with firms such as Apple and Uber already attempting to unbundle banking services through partnerships with licensed providers (Apple works with Goldman Sachs and Uber with GoBank, a brand of Green Dot).

The Banking-as-a-Service landscape in Europe is slightly different with little distinction between small and large banks given the absence of a Durbin amendment equivalent. Some large banks and neo banks are beginning to offer the technology and banking license part of the stack (e.g. BBVA, Standard Chartered, Starling). More banks are beginning to talk about this offering. Europe also has technology firms with banking licenses which are starting to make progress, often with far lower costs per account than the incumbent banks (e.g. Solarisbank, Vodeno).

The total addressable market related to embedded finance globally is constantly changing and growing at a rapid pace, although we don't think it's a stretch to believe this could be a $5 plus trillion market over the next decade. The largest banks in the world today have trillions of dollars of deposit market share, and open banking principles (discussed elsewhere in this report in greater detail) continue to promote consumers having multiple bank accounts and reducing friction around changing banks altogether. In the U.S. alone, JPM, BAC, C and WFC have approximately $10 trillion in assets, while the top five banks in Europe have a similar amount. Moving forward, we expect the number of banks involved in banking-as-a-service partnerships to continue to grow, with a greater number of banks exploring embedded financial principles to gain market share grow their brand awareness. While the sample set is somewhat small, early indications show that the economies of scale of embedded finance (including banking-as-a-service) can promote greater profitability for banks, which we believe could have positive valuation ramifications as this ecosystem continues to grow and evolve.

Exhibit 16: Small Sample Size, but BaaS Banks Generating Lower Cost Funding / Higher ROEs

Deposit cost and ROTCE data based on trailing last twelve months, representing an average figure for KRX.



Source: Company Documents and KBW Research

Proptech – Leveraging the Home as a Gateway to the Consumer

For the real estate industry, the concept of embedded finance is particularly relevant within single-family residential as a litany of services revolve around and are dependent on the home transaction, thus making the home purchase a gateway to the consumer for services providers. As such, embedded finance has existed in various formats across the residential housing sector historically.

Homebuilders

A prominent example is within the homebuilding industry, where firms such as Lennar (LEN) and D.R. Horton (DHI) operate captive finance and insurance companies to provide mortgage origination and title insurance services directly to homebuyers during the home purchase process. For example, over the last year, DHI's mortgage company handled approximately 65-70% of the financing for DHI's homebuyers.

As a focus on the consumer experience and tech-enablement have only increased in the housing and mortgage sectors, becoming table-stakes for any player to do business, a new race is underway to vertically integrate as much of the housing transaction as possible. This has led to several new models emerging across the housing sector, which aim to monetize the laundry list of high-value and, oftentimes, commoditized services related to the home.

Residential Brokers

In the residential brokerage space, many of the largest players have either a) built / acquired their own mortgage origination and title insurance firms, or b) formed joint ventures (JV) with third party providers, to offer these services directly to their customers. While attachment rate disclosures are not always consistent and comparable, we have seen higher attachment rates for title and settlement versus mortgage. We estimate the largest traditional brokerage Realogy had attachment rates of about 35% for title and 10% for mortgage in 2020. In comparison, the fast-growing brokerage Compass has given a long-term targeted national attach rate for title of 30%, while its mortgage JV was only just recently formed. Lastly, at the higher-end of these figures, tech-enabled brokerage Redfin has reported attach rates of 40-50% for title and 20% for mortgage in developed markets where those products and services are offered.

iBuyers

In the same ilk, the emerging iBuyers and other digital home buying platforms aim to vertically integrate the home buying transaction by offering buyers and sellers data-driven digital "solution centers" where consumers can sell a home with a few clicks online and also find their next home using the same platform. For example, Opendoor (OPEN), the largest of the iBuyers, launched Opendoor Homes Loans in late 2019, a tech-enabled mortgage platform for customers looking to buy or refinance a home. In addition, Opendoor acquired OS national in late 2019 to serve as the foundation for the company's in-house title and escrow services. Opendoor's in house title company provided title insurance services for over 80% of Opendoor home transactions that closed in 2020. Both home loans and title & escrow integrate seamlessly with Opendoor's broader one-stop-shop home buying platform.

"Hub & Spoke" Model - Marrying Software with a Services Marketplace

Another emerging approach to embedded finance within the real estate industry entails marrying vertical software with high-value services monetization. Two prime examples include Porch Group (PRCH) and Blend (BLND).

Porch Group provides vertical software to key home services categories such as home inspection, title insurance, loan officers, moving, and roofing, which allows these companies to better manage business operations, client relationships, and customer experience. Through these relationships, Porch also gains early and low-cost access to homebuyers, as well as unique data. In this way, Porch is able to gain access to high-intent consumers as much as 6-8 weeks in advance of their move date during a time when 71% of movers make major home service purchase decisions. This compares favorably to traditional lead channels where service providers typically gain access to homebuyers 5-60 days post-move via a USPS change of address. Porch uses this flywheel to generate B2B2C recurring services revenue by providing a digital moving concierge service for homebuyers. Through Porch's online homebuyer dashboard, consumers can arrange the purchase of various home-related services such as homeowners' insurance, home warranty, moving services, home security systems, TV and internet, and contractor/handyman services.

In another example, **Blend** provides cloud-based software to financial services firms to power the end-to-end consumer journey for any banking product. In addition, the company brings together an extensive partner ecosystem consisting of more than 2,200 technology, data, and service providers. Through a central marketplace, Blend provide its ecosystem partners with a critical distribution channel to reach consumers at the precise moment they are looking for products and services through Blend's financial services firm customers. In this way, Blend benefits from a substantial volume of high-intent consumer traffic with no incremental acquisition costs. In order to capitalize on this unique lead funnel of high-intent consumers directly, in 2021 Blend acquired Title356 to integrate the title, settlement, and escrow process further into its platform and develop a marketplace, which will give consumers and financial services firms flexibility to choose title insurance partners that provide services at competitive rates.

Payments

Within Payments, one of the manifestations of embedded finance offerings is the availability of point of sale short term financing, commonly referred to as Buy Now Pay Later, especially for ecommerce purchases. Buy Now Pay Later (BNPL) has seen strong adoption and growth during the pandemic driven by consumers shifting to online shopping and financial institutions pulling back on extending credit. The first wave of BNPL has come from fintechs such as Affirm, Afterpay, Klarna, and Sezzle, and their rapid growth has led to disintermediation concerns around the traditional credit card lenders and by association payment networks such as Visa and Mastercard.

Exhibit 17: BNPL Offerings Have Seen Strong Adoption and Growth

Source: FactSet and KBW Research

We don't think this is an imminent risk as the profile of a BNPL loan is very different from a credit card loan (i.e., BNPL is geared toward smaller dollars and shorter duration). Additionally, many of the legacy lenders have either created or are in the process of creating similar BNPL solutions and more importantly have both the funding and regulatory acumen that is critical to the sustainability of a lending product, and there are still question marks around this topic for the BNPL industry.

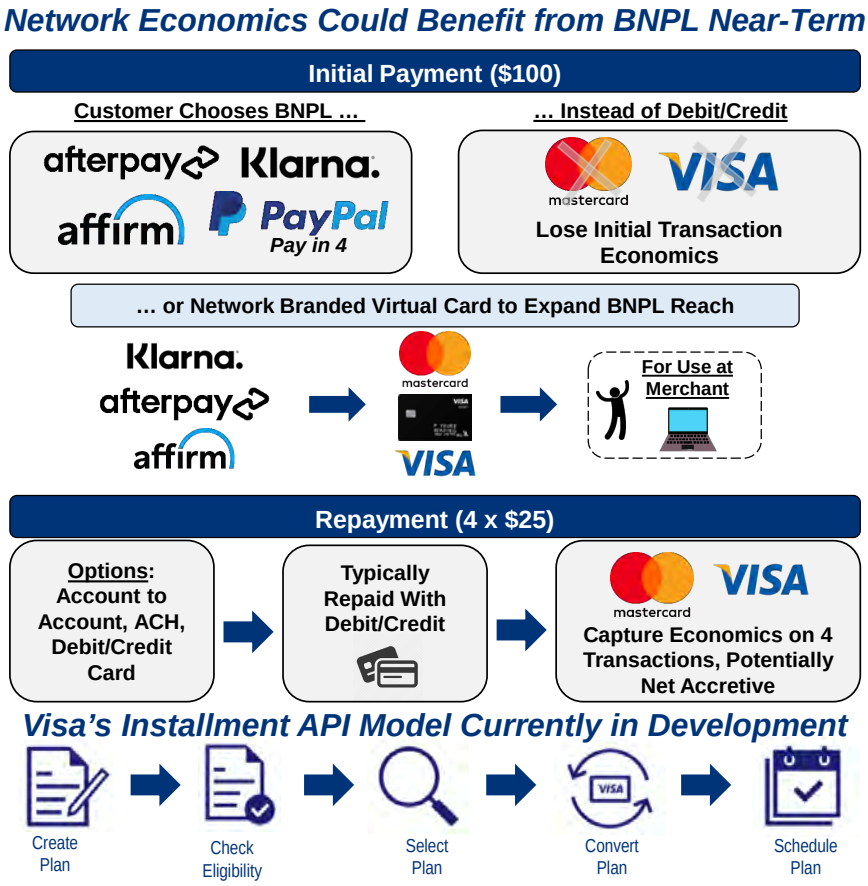
While we do feel that there is a market need for BNPL particularly for consumers that lack FICO scores or are averse to taking on large amounts of debt, we believe the market potential for BNPL is much greater outside of the US given the fairly wide availability of credit in the US today along with incentives for using a credit card.

Funding and regulation are two key areas that bear monitoring for the BNPL space. Many of the fintechs currently rely on securitization, lines of credit, and/or warehouse facilities to fund the outstanding balance, which may not be a sticky source of funding particularly during periods of market dislocation. The regulatory environment is also in the early innings as regulators are looking to understand how BNPL works and the potential associated risk, which included instances where the outstanding balance is not reported to credit agencies.

When it comes to the payment networks, they are playing a key role in enabling the success of many BNPL offerings by facilitating (i) merchant payments via virtual cards – e.g., when a consumer is approved for a loan in the Affirm app, the amount is loaded onto a Visa virtual card, which can then be used to make a purchase transaction at any Visa accepting merchant. This significantly enhances Affirm's reach without having to do direct integrations with merchants. (ii) Consumer repayments to BNPL players via credit or debit cards – e.g., the four monthly installments that consumer pay are being funded via credit and debit cards in the majority of instances today.

Both Visa and Mastercard are also in the different stages of rolling out BNPL/installment offerings to traditional issuers and fintech lenders, offering seamless integration and settlement capabilities through their core network. Notably, MA recently announced a BNPL program which will be available in the US, Australia, and UK, and include partnerships with Barclays US, Fifth Third, FIS, Galileo, Huntington, Marqeta, Synchrony Financial, and American Airlines, among others. Visa rolled out its installment product in Canada in partnership with Global Payments and Desjardins (a large North American financial cooperative) earlier this year.

Exhibit 18: Incumbent Names Enable BNPL and Stand to Benefit from Continued Adoption



Source: Company Filings and KBW Research

Digital Wealth/Asset Management – Brokerage Offering a Low Barrier to Entry

Payments companies, banks, and other "super app" creators (such as PayPal, Square, SoFi, and JPMorgan) continue to make a push into the digital wealth space, particularly via their introduction of brokerage and crypto offerings. The brokerage or crypto offerings from these firms are generally not as robust as "wealth-first" or "crypto-native" competitor offerings. However, the super app creators generally boast large existing user bases, and the addition of their wealth offering represents a way for these companies to capture more wallet share and financial activity from their core clients.

We continue to expect the entrance of new competitors into the wealth space especially as more firms begin to take this "super-app" type approach to being a one stop shop for all things financial to consumers. Another factor enabling his trend that can't be overlooked is that the difficulty of launching a wealth offering has declined meaningfully. This is mainly due to the outsourcing of trade clearing and execution to third parties such as Apex Clearing (or in some cases Interactive Brokers), and partner wholesaling firms such as Virtu and Citadel. On the crypto side, Paxos has made it simple and safe to add on a crypto offering and is powering the trading and custody of crypto for companies like PayPal and Interactive Brokers.

For existing wealth-focused platforms such as Schwab and Robinhood, we believe that this represents another source of competition, and therefore having a differentiated wealth offering has become increasingly important. This includes having product differentiation on options trading, advice solutions, margin lending, and other capabilities. We also think this trend presents an opportunity for these wealth-focused firms to begin to venture into other revenues sources. For example, moving into offering lending products, checking/savings products, branded credit or debit cards, all of which have meaningful revenue opportunities attached and can strengthen customer loyalty.

3. Open Banking

Key Areas Explored in this Section:

- ***Payments***
- ***Banks***

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Open Banking

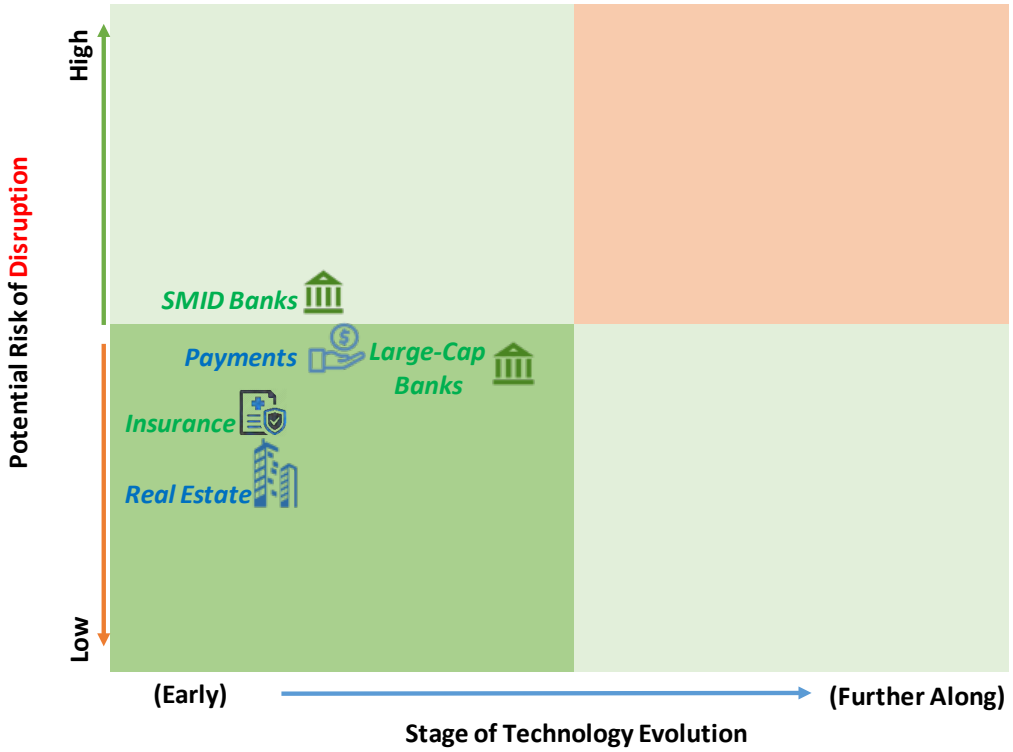
Open Banking allows third party developers to access bank customer data through open source technology and APIs, which can then be used to build new financial applications and services that sit outside but are plugged into the core bank infrastructure. Open Banking can accelerate financial services innovation giving consumers access to more choices and convenience to utilize third party solutions for their financial services needs.

In Europe, the move towards open banking is being led by regulation, i.e. the Payment Services Directive 2 (PSD2), which came into force in January 2018, which requires banks to open up their data to third parties with the consent of their customers. In the US, there is no regulation but the industry is nonetheless moving towards open banking, led by fintechs and consumer demand for innovative services.

The ultimate goal of open banking is to increase the portability of a consumer's financial data and increase competition so as to bring seamless access to the best of breed services and an enhanced end user experience. In many ways, Open Banking could be a key piece to the puzzle that eventually helps accelerate the concept of Embedded Finance (discussed under point 2).

In Payments, open banking enables fintechs to seamlessly offer account-to-account payments, potentially obviating the need for third party payment settlement/rail providers such as V and MA card rails. Factors that will ultimately drive adoption of open banking payments include cost benefits, convenience, and consumer preferences.

Exhibit 19 : Mapping of the State and Risks of Open Banking Across Financial Sectors



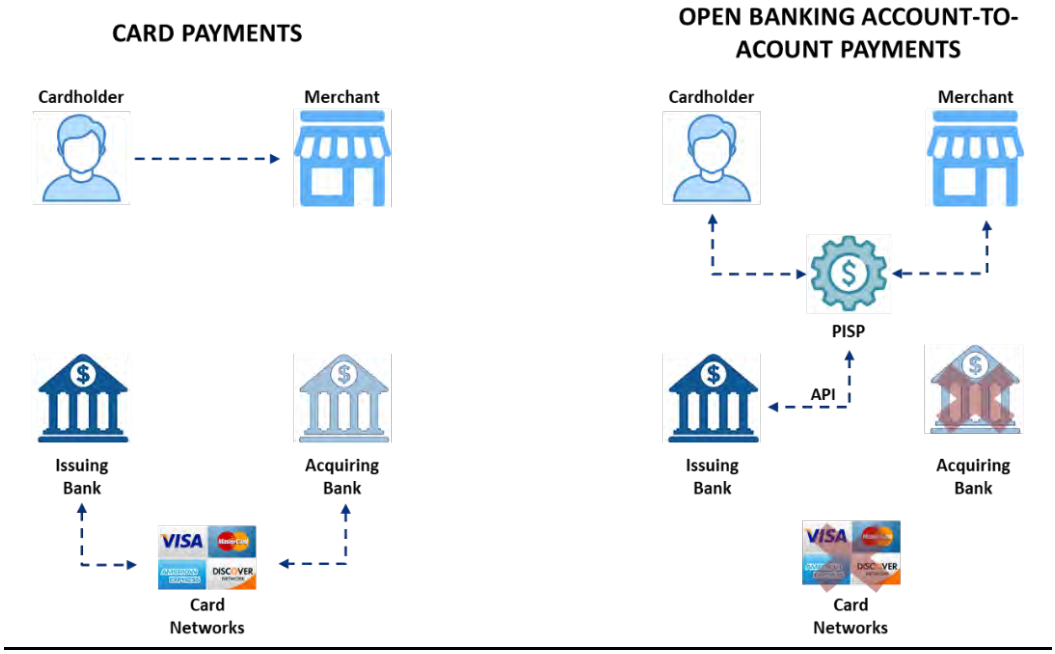
Source: KBW Research

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Payments – Not Just Risk, but Opportunity As Well

Within payments, the key risk from the proliferation of open banking account-to-account (A2A) payments is the potential disintermediation of the payment card rails (such as Visa and Mastercard) from the transaction.

Exhibit 20: Flow of Funds, Card Payments versus Open Banking A2A



Source: KBW Research

The question is whether Open Banking A2A payments offer significant advantages versus card-based payments to drive massive consumer and merchant adoption. We believe that the advantages of open banking payments are skewed in favor of merchants given the anticipated lower cost of acceptance, but it is potentially detrimental to the consumer value proposition offered by cards given a lack of rewards and chargeback protections. Moreover, while cost of acceptance is expected to be lower (particularly in instances of fixed transaction-based fee models), our understanding is that many A2A schemes today (e.g. GoCardless, Trustly) charge fees of 1-2%, which are not significantly different from card acceptance costs (particularly debit cards). In some instances, there are fee caps, which make A2A payment acceptance costs cheaper for higher ticket transactions.

While it is still early days, we believe that open banking payments will evolve differently in different regions, with potential for high barriers to adoption in markets like the US where consumer preferences are strongly entrenched in card payments, especially given rewards-based incentive structures. Culturally, US consumers are also less trusting of entities that they do not have a financial relationship with, and hence are less likely to share bank/financial information of any type. That said, there may be a place for open banking A2A payments for certain types of transactions that are dominated by checks today, such as rent payments, insurance, bill payments, etc.

The receptivity for open banking payments is likely to be higher in regions like Europe, where credit card payments are less entrenched, direct bank transfers are more common,

and consumers are already used to paying through online bank transfer schemes. Examples include iDeal in the Netherlands or Giropay in Germany. While adoption of open banking A2A payments may not come at the expense of card payments in many of these markets, given low penetration of card payments to begin with, it could adversely impact the growth opportunity that card schemes like V and MA have in many of these continental European markets.

The same may hold true in emerging markets such as APAC and LatAm where payments systems can potentially leapfrog from cash/checks to open banking driven digital payment experiences, thereby limiting the growth potential for global card schemes.

Exhibit 21: Advantages and Challenges of Open Banking Account-to-Account Payments

Source: KBW Research

It's Not All Risks for the Incumbent Payment Providers, but Potential Opportunities as Well

Although open banking A2A payments has the potential to be transformational in many ways, we believe that it is not a zero sum game. The incumbents have unique advantages such as scale and nearly universal reach, which could position them favorably to participate and compete effectively in open banking enabled payment opportunities as well.

Networks: Both Visa and Mastercard are building out what they call network of networks or multi-rail strategies, which include open banking infrastructure, applications and services, that will allow them to participate in the growth of open banking payments to tap into new and underpenetrated growth opportunities. Examples of where they could benefit from open banking A2A payments include new payment types such as B2B payments, or bill payments such as rent, which is dominated by checks today. Another example is Mastercard's Pay By Bank app application, currently available in the UK, which serves as an alternative to debit card payments. It's early days but given V and MA's vast experience in developing and scaling new payment solutions, and ability to be a one-stop shop for merchants, issuers, and consumers, we believe they are well positioned to participate in

the growth of open banking payments and for it to ultimately be a net positive to their growth potential, despite some risk of cannibalization of traditional card rails.

Exhibit 22: Multi-Rail Strategies Enable Ability to Partake In New Payments Flows

Source: Visa, Mastercard, KBW Research

Note: Visa acquisition of Tink still pending, announced June 2021

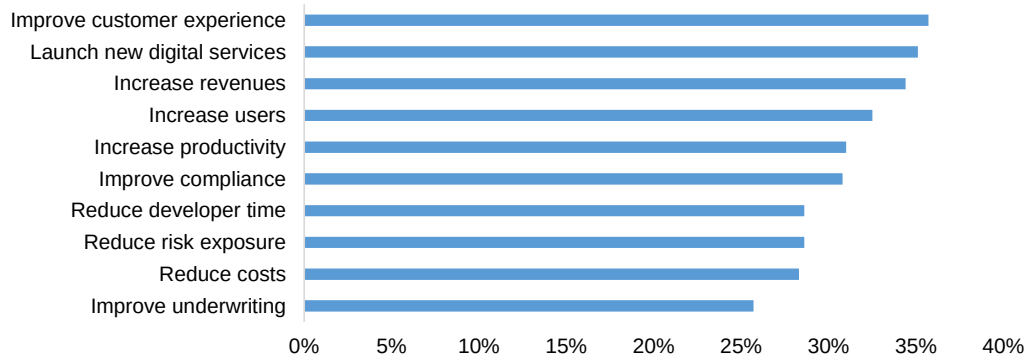
Merchant Acquirers: For merchant acquirers, open banking A2A payments represent another payment type that they have the ability to enable for merchants, similar to how they enable other alternative payment methods (APMs) today. To the extent that open banking payments accelerate the secular shift away from cash and checks by enabling new types of digital transactions, it could be a net positive for the merchant acquirer industry transaction volumes, albeit at lower economics than they may be able to extract with card-based payments. But as open banking allows the creation of many new Payment Initiation Services Providers, competition is likely to intensify further in an already competitive landscape. We believe winners and end game players in that scenario are likely to be those that are able to provide a diverse set of solutions through simplified integrations and at low costs as opposed to one-trick ponies that may start to lose relevance.

Banks – Key to Enhanced Customer Experience, but Revenue Potential Is Further Away

We have long been fans of Open Banking and its potential to transform financial services. Started in the UK, the principals are increasingly common across most major markets. For the Bank sector, the key benefits at this stage appear to be around data processing. Longer term, management teams still hope for increased revenues, largely from improving the customer experience, but this seems difficult to argue today.

Customers benefit from open banking: HSBC noted a 4x increase in new-to-bank customer loan approval rates using Open Banking compared with traditional credit checks and presumably new entrants would find a similar uplift. But the original goal of customers having seamless access to best priced financial products feels elusive, for now.

Exhibit 23: Open Banking Objectives



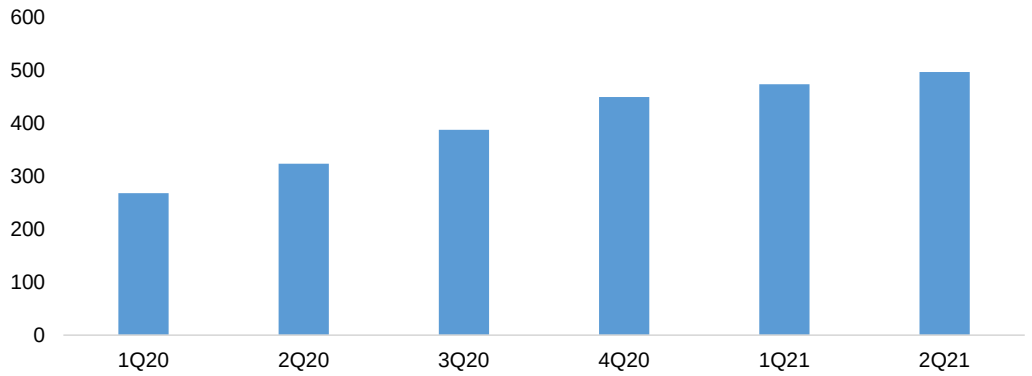
Source: Tink survey (308 respondents)

Revenues? Not Yet

So far there are very few examples of incremental revenue driven by Open Banking. UK customers, which were the first to experience open banking, generally expect free banking products. White labelling/ B2B product development has proved more interesting to date than B2C. Going forward, there will need to be more innovation and/ or greater collaboration with other sectors who can work together with banks and their data to provide real value added products.

Here there is potentially some good news, with the EBA noting almost 500 third party providers now part of the open banking infrastructure.

Exhibit 24: Number of Third Party Providers in Europe Is Still Increasing



Source: EBA and Tink

Aggregation

Aggregation is a necessary part of Open Banking's value creation, but it has much more to offer than just that. The insight generated from the data will be particularly valuable. For the incumbent banks, the ability to form a more holistic understanding of their customers will allow them to offer more personalized services, as well as create more cross-sell opportunities. Open banking also has the ability to completely transform legacy systems. At present many credit decisions (particularly in mortgages and auto finance) are still made based on manual processes, which results in long lead times.

Wealth Management

Open banking could help the mass affluent end of the wealth management industry also, giving greater insight into the broader financial picture of customers, helping aggregate pensions, life insurance, investment accounts and savings accounts into one place.

Underwriting

The focus at HSBC for example, has moved on from aggregation style products. Instead, HSBC has heavily integrated Open Banking into the lending journey with considerable success. For example, the vast majority of new-to-bank customers who apply for a loan with HSBC are not successful and that is because, in many cases, the data provided by credit agencies is not sufficient to prove that a customer is credit worthy. However, if they are able to provide HSBC with access to the data at their existing bank, the application success rate goes up by around four times. That makes a huge improvement on the return on investment from marketing campaigns and is a clear demonstration of the value of data. HSBC are already using Open Banking data to credit score customers for loans, mortgages and credit cards.

In Sweden, SBAB created a mortgage comparison app, which allows customers to compare mortgages and fees in the app. 8 out of 10 customers found they could get a better deal in a few clicks.

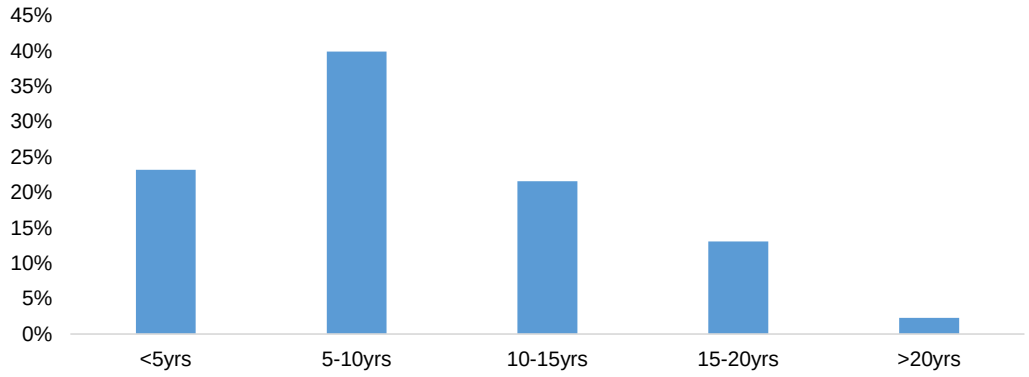
Cross-Over with AI and Embedded Finance

At its core, Open Banking leads to a much greater wealth of data. Being able to harness, structure and interpret this data will be crucial to success. We therefore see a cross-over in being successful in open banking with investment in AI and also in embedded finance. Being able to predict and anticipate customer needs and behaviors and deliver the product to them as part of their daily lives will be where banks succeed.

Open Banking Will Take Time to Mature

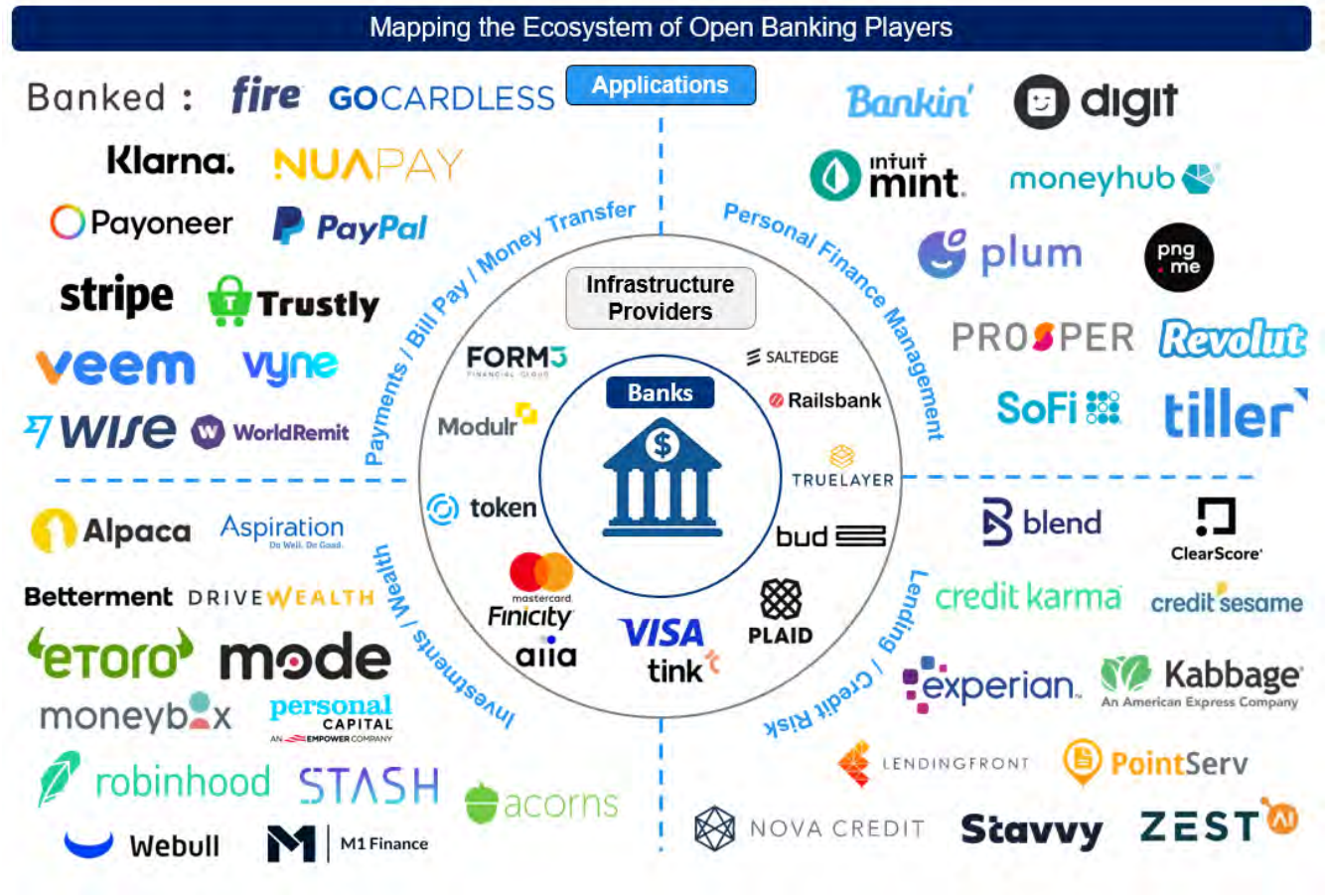
Open banking may take some time to fully realize itself – many executives think it is still a further 5-10 years before most open banking projects will be completed. A third of executives felt it was more than 10 years away.

Exhibit 25: Tink Survey Found that Most Managers Saw Progress Still Being Several Years Away



Source: Tink 2021 survey

Exhibit 26: Open Banking Ecosystem Across Specific Verticals



Source: Company Websites and KBW Research

4. Cryptocurrencies/Digital Assets

Key Areas Explored in this Section:

- ***Payments***
- ***Digital Wealth/Asset Management***
- ***Banks***
- ***Exchanges***

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

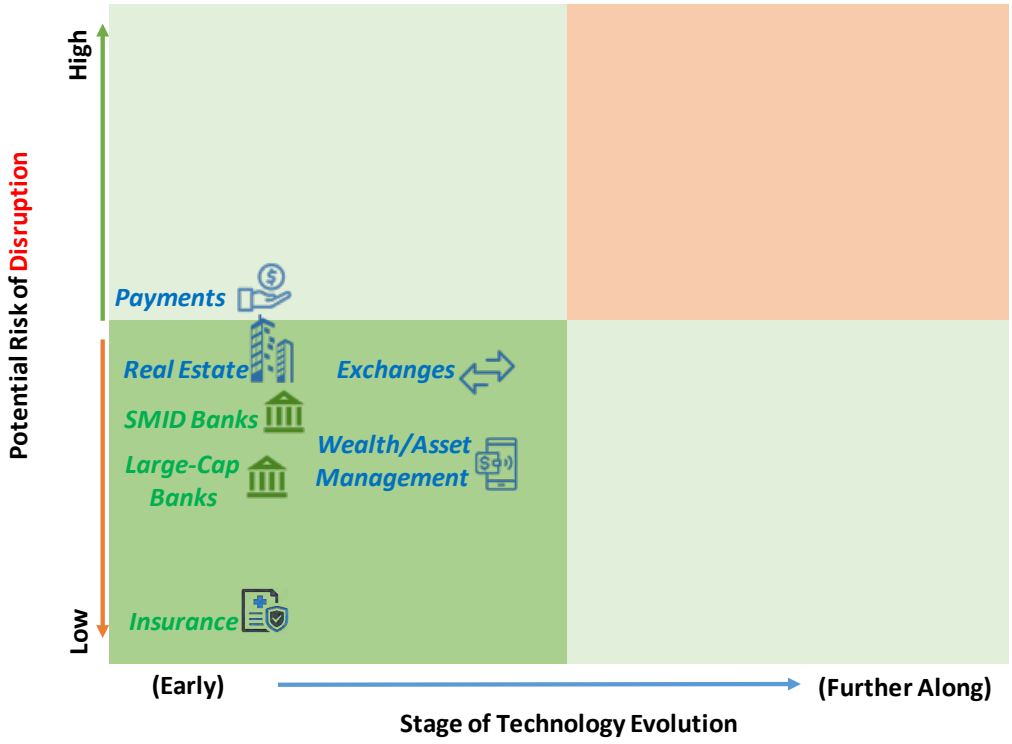
Cryptocurrencies/Digital Assets

Cryptocurrencies are digital or virtual currencies that are based on blockchain technology, i.e. a distributed ledger enforced by a disparate network of computers. The first blockchain-based cryptocurrency was Bitcoin, but there are thousands of cryptocurrencies today including stablecoins and central bank digital currencies (CBDC).

The cryptocurrency ecosystem is complex with implications across Exchanges, Custodial Services and Banking, Payments, and many other aspects of the financial services ecosystem. Movement of money today from point A to point B between consumers, businesses and governments involves centralized clearing agencies such as The Clearing House or the payment networks. In a decentralized ecosystem with cryptocurrencies, money could theoretically move freely across counterparties without the need for intermediaries. This could potentially mean a whole different ecosystem of service providers and different processes to complete financial transactions. One of the biggest challenges to reaching mainstream adoption will be an evolving regulatory landscape, which could slow innovation and uptake.

Several asset managers such as WisdomTree and Franklin Resources are waiting for SEC approval for new funds that invest in tokenized/digital assets and utilize blockchain technology. Similarly, many asset managers are looking at how, or if they should, incorporate cryptocurrencies into their asset allocation strategies and several have launched investment products designed to track cryptocurrencies.

Exhibit 27: Mapping of the State and Risks of Crypto/Digital Assets Across Financial Sectors



Source: KBW Research

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Payments – Regulation and Ubiquity Are Key Hurdles That Will Dictate Widespread Adoption

Although they have grown meaningfully in numbers and aggregate market capitalization, the biggest use case for cryptocurrencies today continues to be store of value. It is still early days and use cases are evolving, but at this point it's unclear how big a role they will ultimately play in payments, and the threat they pose to incumbent payments names.

What Payments Problems Are Cryptocurrencies Solving For?

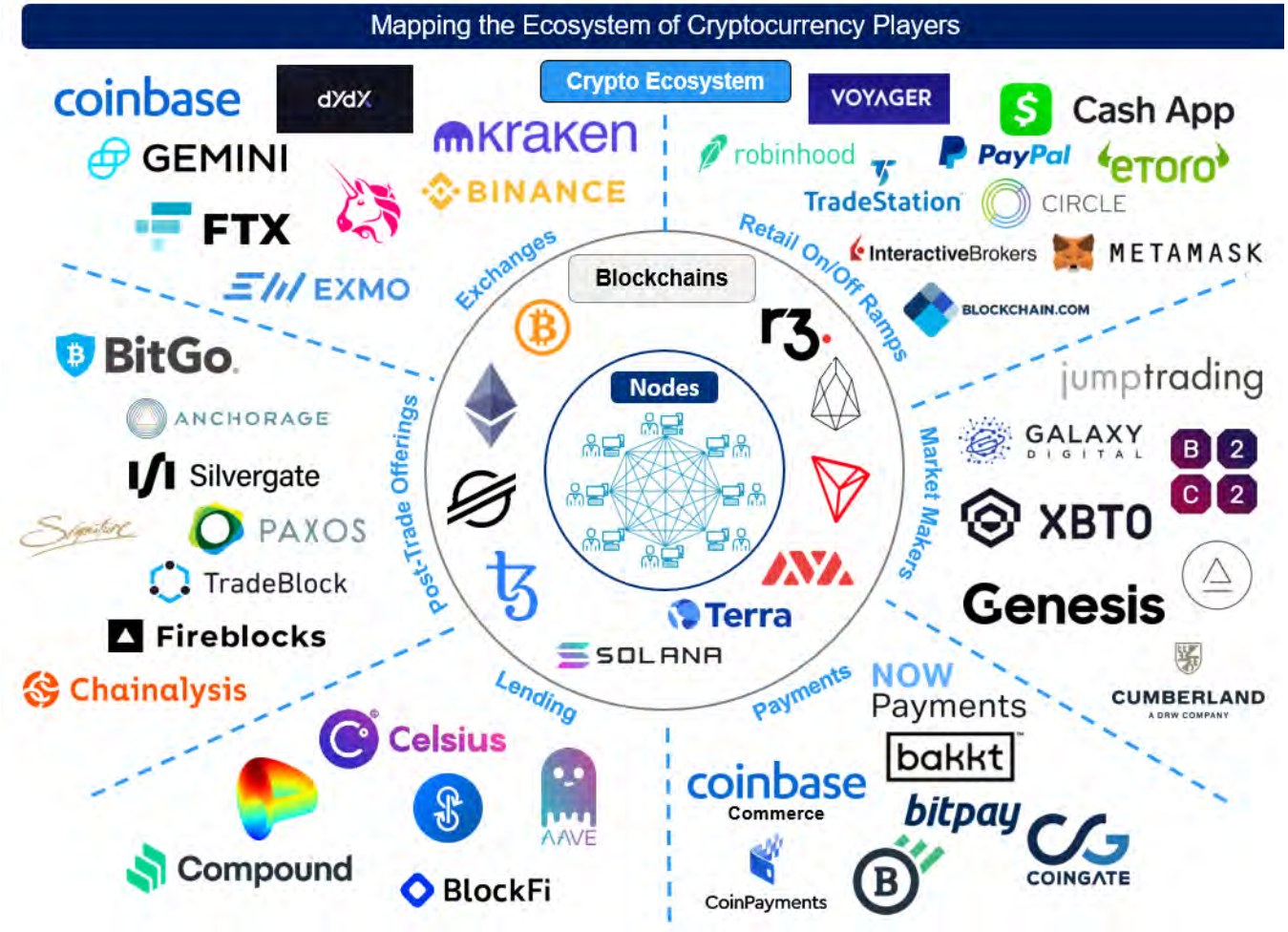
As we evaluate the advantages and limitations of cryptocurrencies compared to traditional payment systems, there are a few areas where we believe cryptocurrencies have potential to provide utility. These include (i) cross-border payments, where today's network of correspondent banks and other intermediaries make for an inefficient system from the perspectives of speed, costs, and transparency, and (ii) payments in hyperinflationary countries where political and economic instability have led to a crisis of confidence in the fiat currency and where cryptocurrencies could potentially make for a better (and sturdier) alternative. Examples include Argentinian Pesos or Yugoslavian Dinar.

In contrast, we struggle to see free-floating cryptocurrencies (particularly Bitcoin and the like) making up a large share of domestic consumer payments, particularly in developed economies. This stems from their general price volatility that makes them a better store of value or investment (similar to Gold) than a transactional currency. Also a lack of recourse for consumers for chargebacks and presence of fairly efficient digital payments ecosystems that exist in these economies today, create high barriers to adoption in our view.

It's worth noting that the rise of stablecoins, central bank digital currencies (CBDC) and blockchains like Ethereum provide potential for some of the current limitations of cryptocurrencies to be resolved. For example, USDC, a stablecoin pegged to USD that runs on multiple blockchains, solves for price volatility and lack of inherent value and could provide better utility as a payments method compared to Bitcoin. Likewise, the Ethereum blockchain supports decentralized applications (dapps), allowing developers to build out financial services which could solve for a plethora of use cases, with a payment attached to them. As an example, Ethereum can be used for self-executing contracts (also called smart contracts), where once the condition is met, it self-executes and delivers the payment in Ether to the counterparty. Many such transactions will however replace ACH and check transactions as opposed to retail consumer payments.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Exhibit 28: Cryptocurrency Ecosystem



Source: Company websites and KBW Research

Finally, regulation remains a key hurdle which will dictate whether cryptocurrencies will proliferate more meaningfully for payment transactions and what construct the cryptocurrency ecosystem will take on. Central Bank Digital Currencies (CBDCs) could potentially be a part of the solution as well which could compete with private cryptocurrency initiatives. Recently, the President's Working Group on Financial Markets published recommendations for the regulation of stablecoins. However, the chances of congressional action remain very low near-term, and so regulatory uncertainty is likely to persist for some time.

Opportunities and Risks to Incumbent Payment Providers

Assuming cryptocurrencies further mature and become widely adopted, the discussion shifts to whether incumbent payment names can add value in what would effectively be a globally decentralized closed loop system, with the extreme case being a complete shift to digital currencies, upending the current payments infrastructure and value chain. While money movement today involves centralized clearing agencies such as The Clearing House or Visa and Mastercard for card rails, a decentralized ecosystem would allow money to move freely across counterparties.

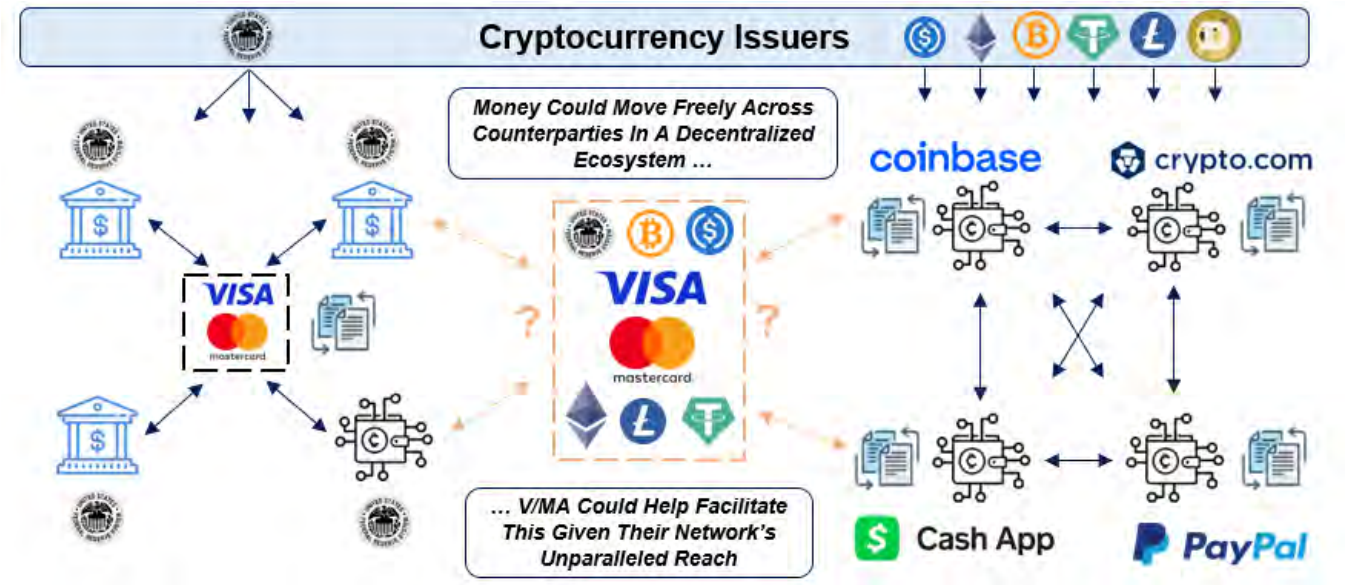
For more context, and using Bitcoin as an example, all that's needed to send a coin to another party is said party's public key, which can be easily put on a QR code. The rest is handled by an automated and decentralized network of nodes to validate transactions. This contrasts with traditional card transactions which contain sensitive information and must be sent over encrypted networks to be processed and authorized through multiple intermediaries. In its purest form, cryptocurrencies could cut out the processors and networks entirely, posing a disintermediation risk somewhat comparable to that of closed loop systems being built by Square and PayPal.

While technology behind cryptocurrencies is definitely interesting, as discussed prior, it's not yet clear whether enough utility exists to drive on-chain transactions at scale. This provides an opportunity for incumbent names to fill the gap with useful services. Some examples below:

Scale and Reach: The biggest hurdle to proliferation of any new type of payments technology is adoption and scale. The payment networks with their unparalleled reach, can solve for that. As we are seeing today, incumbent payment players are viewing cryptocurrencies as another type of payment rail or network that they are willing to enable and support in addition to the existing rails like cards, open banking, Visa Direct and Mastercard Send, etc.

Value Added Services: Chargebacks, security features, data analytics, etc. are some examples of services that can be layered on top of the pure payments rail in order to enhance its utility and Visa and Mastercard are well positioned to deliver these given their stronghold and experience in payment transactions.

Exhibit 29: Potential Role for Networks In A Crypto Environment



Source: KBW Research

Notable Examples of Current Initiatives

Networks: For now, Visa and Mastercard have taken the stance that crypto will serve as another payments rail or currency, and that they will enable and provide services tailored for the crypto community. For example, Visa and Mastercard are involved from the onset to make it easy for money to go into crypto exchanges using their credentials. Other services include partnering with exchanges to offer cards with crypto rewards. Notable

partnerships include Visa and BlockFi which have launched a crypto rewards credit card offering 1.5-2% in crypto rewards, and Mastercard's partnership with Gemini to offer a comparable rewards card. Visa also began supporting direct settlement of transactions in USDC in early 2021 and we expect Mastercard to do the same, with potential for additional cryptocurrencies added to their list over time.

Merchant Acquirers: Acquirers are also participating though the role they are predominantly playing today is that of enabling on ramp of cryptocurrencies by offering acquiring services to crypto exchanges. The next potential step could be to enable acceptance of cryptocurrencies at their roster of merchant clients, though that functionality is limited among the acquirers today. Digital players like Square and PayPal are playing more of a prominent role with cryptocurrencies with their digital wallets offering consumers the capability to purchase and hold certain cryptocurrencies. PayPal is also additionally enabling consumer to use their cryptocurrencies as a funding instrument for merchant transactions.

Revenue Opportunity Near Term, but Early Days to Determine Long-Term Impacts

The rising interest in cryptocurrencies and transactions to buy and sell cryptocurrencies are a net positive to the incumbent payment ecosystem in the near-to-medium term. All the initiatives outlined above from the incumbent payment players are incremental revenue opportunities that they stand to benefit from today. Many of these transactions are cross-border in nature or akin to an FX transaction, with potential for higher than average economics.

While the longer-term disintermediation risk bears monitoring, we believe it is too early to determine what the construct of a crypto-currency driven payments ecosystem would look like. We are of the view that the networks will likely have a role to play.

Digital Wealth / Asset Management – A New Investible Asset Class

Cryptocurrencies has created a new investible asset class and adoption by more traditional asset owners and investors, while growing, remains somewhat limited. According to 2020 survey by Fidelity, 91% of institutional respondents to a survey it conducted are open to the idea of investing in digital assets over the next five years, which allocations up to 0.5% although approximately 27% of survey respondents indicated they had already made some investments in crypto/digital assets, mainly through focused hedge funds, venture capital funds, the use of futures, or direct ownership of crypto assets. Price volatility, lack of a valuation framework and/or limited or little regulatory oversight have all been inhibitors to more widespread adoption.

Among retail investors, most ownership in crypto assets has been direct and traditional, regulated, investment products designed to tap into crypto demand, have had the most, but limited, traction outside the use in ETF form. Within the U.S. only futures based crypto focused ETF's have won regulatory approval as of this writing, although direct products are available in Europe and Canada, and while data is hard to come by, the overall level of assets flowing into crypto focused traditional investment products has been limited (Exhibit 34).

Exhibit 30: Growth in Crypto

Crypto YTD Flows by Asset (mms)	
Bitcoin	6,374
Ethereum	1,056
Other	1,290
Total	8,720

Crypto YTD Flows by Provider (mms)	
Grayscale*	2,461
ProShares*	1,241
Purpose	1,139
3iQ	1,025
ETC Group	962
21Shares	887
CI Financial	836
Other	712
CoinShares Physical	454
WisdomTree	58
CoinShares XBT	(1,055)
Total	8,720

Source: Bloomberg, CoinShares, KBW Research

*Note: Effective Date 10/29/2021. Data includes popular ETPs, mutual funds, and OTC trusts referencing bitcoin, ether and other digital assets.*Traded in the U.S.*

That said, the growth of the asset class has given rise to the growth of investment managers dedicated to the asset class such as Galaxy Digital and a small number of more traditional investment managers, such as Fidelity, have built the infrastructure to handle institutional demand for crypto/digital investing, and we expect that dedicated investment strategies, or incorporation of crypto assets into traditional strategies, such as Victory Capital's recent launch of the Victory Hashdex Crypto Nasdaq Index Fund, which is a privately offered fund for qualified investors, could accelerate, although a stronger regulatory framework and greater confidence in the safekeeping and custody of assets will help. Also, a dampening of asset price volatility would help as well.

While in its infancy, we see the long term potential for tokenization to create new asset classes and investment products and strategies, particularly around illiquid assets. While numerous regulatory and operational hurdles would have to be overcome, several asset

managers such as WisdomTree and Franklin Resources are waiting for SEC approval for new funds that invest in tokenized/digital Treasury and Money Market assets and utilize blockchain technology. WisdomTree, for example, believes that tokenization and blockchain technology could be the next investment product technology to disrupt the ETF business.

Banks – Increasing Involvement Likely as Regulatory Environment Shifts

The global banking sector has very little involvement with the cryptocurrency ecosystem today, most notably due to unique challenges and concerns pertaining to know your customer (KYC) and anti-money laundering (AML) regulations that banks must adhere too. Overlap of the banking and cryptocurrency ecosystems today is largely related to two themes, 1) cryptocurrency trading platforms for customers within mobile-applications (i.e. multiple incumbent and neobanks offer the ability to buy and sell cryptocurrencies on their platforms through third-parties), and 2) banking / payment infrastructure for institutional-related crypto platforms such as exchanges, investors, miners, and stablecoins. In the U.S., the two largest banking infrastructure providers to institutional cryptocurrency participants on Silvergate Capital (SI) and Signature Bank (SBNY), although Customers Bancorp (CUBI) has also begun targeting this segment while some of the larger banks do have one-off crypto clients (i.e. JPM banks Coinbase [COIN] and Gemini). In Europe, there are even fewer banks exposed to this unique ecosystem today, with most of the largest banks focused on blockchain use cases and a couple smaller challengers, such as Revolut, allowing crypto trading on their mobile application. .

The regulatory environment in the cryptocurrency ecosystem is still very uncertain and raw, with our broader expectation for regulation around cryptocurrencies, such as stablecoins, to evolve and change dramatically over the next few years. While recent U.S.-based commentary suggests that cryptocurrencies could be classified as securities and thus regulated by the SEC, stablecoins are a bit more challenging to classify given their payments use-case potential and in theory stable value. The President's Working Group on Financial Markets (PWG), in tandem with the FDIC and OCC, published its regulatory oversight recommendation paper regarding stablecoins in early November, with the report calling for immediate congressional action to put laws in place including that the issuance of stablecoins be conducted by chartered banks. . While we don't expect any immediate legislation given the complex political environment, this view point seems to be picking up some steam more broadly, with crypto firms such as Circle, the issuer of the USDC stablecoin, citing in their SPAC merger materializes their desire to potentially pursue a bank charter. Silvergate Bank has also announced a partnership with Diem USD, where Silvergate will serve as the stablecoin issuer, with the bank in the process of getting regulatory approval from the Fed (its primary regulator) before the Diem project launches. In Europe, the regulatory field is even more scattered, which we think could limit bank involvement outside of blockchain use-cases, which we discuss later in this report.

Overall, despite near-term regulatory headwinds, we still anticipate seeing growing bank involvement in the cryptocurrency ecosystem which is somewhat ironic considering that crypto currencies and blockchain were initially suggested to be outlets to disintermediate banks in the future. As greater regulatory clarity is realized, we think bank's will increasingly look towards crypto themes such as stablecoin issuance, crypto trading, crypto-customer banking and others to drive customer and revenue growth in a rapidly growing segment. Near-term, we expect the focus to be more so on crypto trading and blockchain, with recent examples being Morgan Stanley offering its wealth management clients access to bitcoin funds, JPM creating a blockchain business unit called Onyx, focused mainly on payments, and BNY Mellon revealing its intentions to offer digital asset-based services to its asset management clients. Additionally, Deutsche Bank has citing a desire to develop a fully integrated custody platform for institutional client's digital assets, in addition to supporting trading activity while Goldman Sachs has restarted its cryptocurrency trading desk and has plans to deal bitcoin futures and non-deliverable forwards for its clients.

CBDC: Central Bank Digital Currencies

There is no certainty that a major central bank will launch a digital currency. It is even less certain what form that may take. However, we have noticed an acceleration of policy papers on the topic in recent quarters and in Europe the speeches and papers certainly seem to be indicating that this is a question of when rather than if.

We believe it is very likely that a major central bank will launch a CBDC in the coming years although to be fully scaled may take time. Sweden's Riksbank is among the most advanced on this policy within Europe and globally. The Bank of England and the ECB are trying to catch quickly, however. China remains leagues ahead of the western countries and the Central Bank of the Bahamas has already successfully launched its Sand dollar. Other Caribbean countries have followed.

The BIS has published a paper which aims to co-ordinate policies from several of its members (the Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors of the Federal Reserve and Bank for International Settlements). Meanwhile, China is ploughing ahead with its program, which is tellingly separate to the BIS group.

Much remains to be decided, especially on the technology backing it, the balance between privacy versus security and what role, if any, the banks or other intermediaries should play in a digital euro.

Central bankers are determined that any CBDC should not harm monetary or financial stability. There has also not been any suggestion that cash would be withdrawn from circulation, quite the opposite. Privacy is signaled as being paramount to fulfil the "trust" element of money, but is distinguished as being different to anonymity. The Bank of England laid out a series of challenges that it is mindful of, in an October 2020 speech: technology should not dictate policy, CBDC does not have to use distributed ledger technology and it should avoid a closed loop system.

> *"A minimalist criteria would be that digital currencies, whatever their form, should "do no harm" to financial and monetary stability. By that, I do not mean these innovations should not cause some disruption to existing players and products - that is in the very nature of innovation and competition."*- Bank of England Chief Economist Haldane, "Seizing the Opportunities from Digital Finance" 18 November, 2020

In January 2021 (link), we tried to provide some perspective on what this may mean for the commercial banks in Europe and their shareholders. Our conclusions remain intact: we see risks from higher funding costs and a higher ongoing liquidity cost, and risks to financial stability. Thankfully these have all been identified by the central bankers exploring the idea. Whether they can be mitigated entirely is another question.

We believe a CBDC risks further hits to bank profitability. The biggest drag on profitability is from holding more liquid assets with a negative carry, but even with the recent rise in EUR rates (albeit not as great for USD rates) means that the drag is still likely to be c.10% of profits in our view.

In a crisis, we always see some forms of flight to safety within the sector. The stronger banks receive deposits at the expense of weaker banks and covered bonds tend to see

spreads narrow and unsecured spreads widen. This all makes sense. In the world of CBDCs, depositors would have the further choice to convert deposits into central bank digital currency. In theory customers can do this with physical cash today. However, the ability or demand to withdraw EUR100k in cash today is costly from a storage perspective (i.e. day-to-day, but also to protect against theft). This raises the implicit cost of taking such actions. A CBDC gets around many of these downsides.

Below, we run some calculations on a possible hit to NII and/or profitability from this simple exchange of cash/bank deposits for CBDC.

Exhibit 31: Top-Down Estimates of the Impact of a CBDC on European Banks (EURmn)

Population (mn)		**340**		
Limit/head		3,000		
CBDC demand (bn)		1,020		
Hhold cash		703		
Hhold current accounts at banks		**4,714**		
Step 1: Banks replace funding through issuing bonds/term deposits				
Population reaction:	from cash	0%	50%	69%
	from bank deposits	100%	50%	31%
Affected current account deposits		1,020	510	317
Cost % (higher 5yr bond/savings rates)		-0.50%	-0.50%	-0.50%
Cost EURbn		-5.1	-2.6	-1.6
Step 2: Banks hold more deposits in liquid assets				
% extra current account deposits held in liquid assets		15%	10%	5%
Affected current account deposits		707	471	236
Negative carry		-0.20%	-0.20%	-0.20%
Cost EURbn		-1.4	-0.9	-0.5
KBWe hit to NII		*-4%*	*-2%*	*-1%*
KBWe hit to PBT		*-7%*	*-4%*	*-2%*

Source: KBW Research

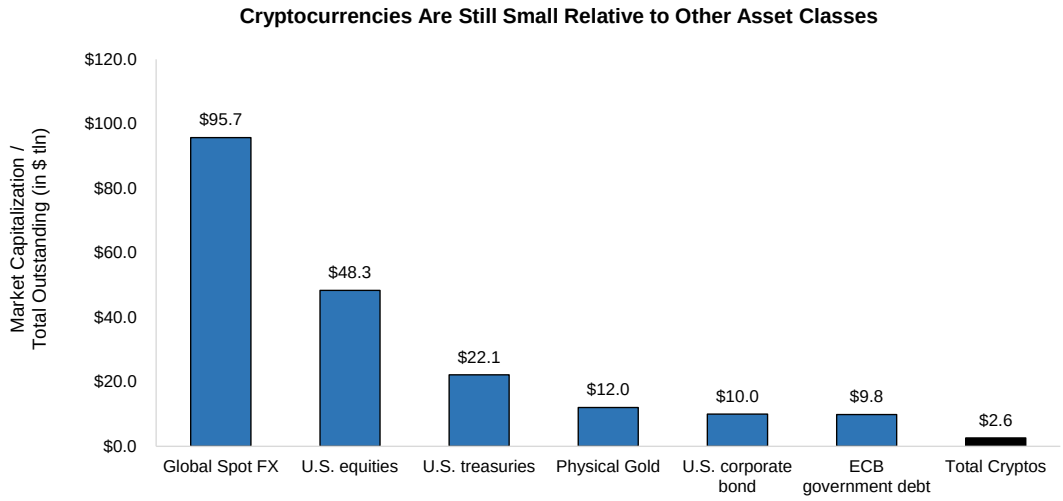
Exchanges – A Significant Opportunity for Crypto-Native Exchanges; Although Incumbents Could be Positioned to Compete More Directly Once Regulation Becomes More Clear

The Rise of Crypto Exchanges

Bitcoin may have brought cryptocurrencies and the blockchain into the mainstream, but there has also been significant growth in Ethereum and other cryptocurrencies with Bitcoin now only representing 40% of total crypto market capitalization (down from 85% in 2016). With a growing number of meaningful cryptocurrencies (roughly 90 cryptocurrencies with market capitalizations >$1 bln) and with aggregate crypto market capitalization increasing to and hovering near $2 trillion, so has the need for sophisticated cryptocurrency trading tools and exchanges. This growth has given rise to a number of large crypto-native exchanges, including Coinbase (COIN), Kraken, Binance, Bitstamp, FTX, and itBit, among many others. As the crypto universe continues to expand and as more assets are issued on blockchains over time, this likely represents a growing trading/volume opportunity for crypto-native exchanges.

Additionally, institutional adoption of crypto, particularly in 2021, has sparked the need for more institutional-grade tools. Therefore, many crypto exchanges have also built out institutional custody offerings, prime brokerage offerings, and derivatives functionality (in international markets), and therefore are touching many more parts of the trading value chain than traditional exchanges.

Exhibit 32: Crypto Market Cap Compared to Other Assets



Note: U.S. corporate bond is as of June-21, U.S. treasuries is as of Oct-21, U.S. equities and ECB government debt is as of Sep-21, Gold is estimated as of 2019-end using spot prices as of 11.17.21, Spot FX is as of 2020-end, and Total Cryptos is as of 11.19.21.

Source: CoinMarketCap, SIFMA, and KBW Research

More Direct Competition between Traditional Exchanges and Crypto Exchanges over Time?

Most of the traditional U.S. exchanges have been somewhat reluctant to directly enter and compete in spot cryptocurrency trading, mostly citing a lack of regulatory clarity at this point in time. We agree that regulators are playing catch-up and might be years behind the innovation that's occurring in the crypto market. However, given the significant growth in this market, especially over the past 18 months, we believe regulators are now spending more time thinking about how to address/implement regulation of this market, and we expect more regulatory rails to be put in place over the coming years. This could lead to more traditional exchanges entering the crypto trading market over time as a more stringent regulatory framework is established. There is already some positioning ahead of this (And growing comfort around entering this sector), as Cboe recently announced the acquisition of ErisX, which marks the first traditional exchange to attempt to enter the digital asset trading space directly.

Acquisition is one way to enter this space. Additionally, if certain assets are tokenized in the future (take equities, for example), this could lead to crypto native exchanges registering with the SEC and possibly competing directly with traditional exchanges for this trading business. We don't think this is a near-term event in the U.S., but cannot rule this out as a possibility. Such a scenario could also have implications for competition with traditional brokerages, as we believe Coinbase's long-term business model likely more closely resembles a broker (such as Charles Schwab) rather than an exchange (such as Nasdaq). In our Coinbase initiation (found here), we even suggested that many integrated crypto exchanges may be forced to separate their business lines longer-term due to regulation, and these companies would likely retain the higher-value segments (which is likely the portion closest to the end customer).

With respect to crypto derivatives trading, Coinbase recently registered as a futures commission merchant (FCM), which we believe is intended to give its clients access to the regulated U.S. futures markets (specifically for Bitcoin and Ether futures). So, for the moment, it seems that some crypto exchanges are partnering with, rather than competing against, traditional derivatives exchanges. However, this is not true when looking at crypto exchanges more broadly, as most of crypto derivatives activity occurs outside of the U.S., and therefore, not on CME's U.S. futures exchange where institutional, and now retail-sized Bitcoin and Ether futures are traded. Many crypto exchanges globally offer derivatives products, and many clients/trading firms are global in nature and elect to interact with those international liquidity pools. Over time, if institutional adoption continues to grow dramatically, it's likely that more liquidity will migrate to highly regulated venues. CBOE appears to be positioning for this potential reality alongside its recent acquisition of ErisX. This also presents an opportunity for highly regulated traditional derivatives exchanges, but could also present more competition from crypto native exchanges as well.

5. Blockchain Technology

Key Areas Explored in this Section:

- ***Digital Wealth/Asset Management***
- ***Proptech***
- ***Banks***
- ***Exchanges***

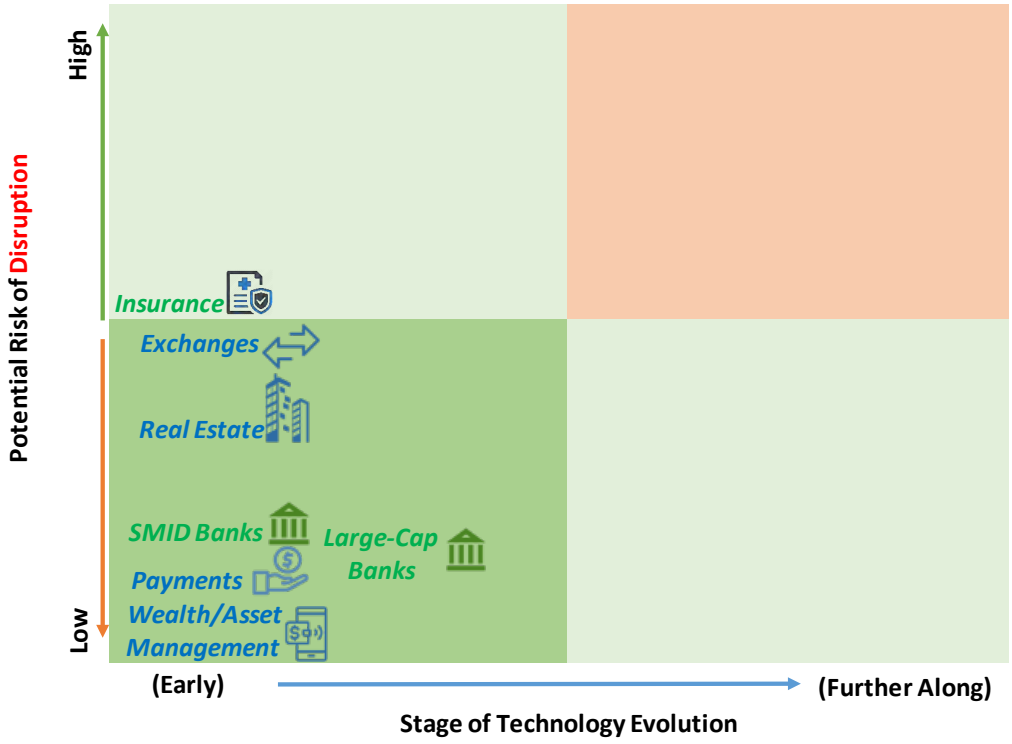
Blockchain Technology

Although it is the underpinning of cryptocurrencies like Bitcoin, the concept of blockchain technology is much wider than just cryptocurrencies. At its root, it is a system of record keeping or database, which has an irreversible timeline of data, making it difficult to change, hack, or cheat the system.

Blockchain technology can digitize and streamline many processes involved in financial services with increased transparency, lower risk, decreased processing times, and lower capital requirements. An example includes authenticated documentation and KYC/AML with real time data verification, which could have implications across several banking and lending-related functions. Another example is automated claims processing with the use of smart contracts, which could potentially revolutionize the insurance industry. Regarding market structure, the technology could eventually allow for real-time settlement of executed transactions.

Adoption is still in the very early stages but blockchain technology could be instrumental in driving cost efficiencies and streamlining processes across various facets of the financial services industry.

Exhibit 33: Mapping of the State and Risks of Blockchain Technology Across Financial Sectors



Source: KBW Research

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Digital Wealth/Asset Management – Attractive Cost Savings Potential but Many Roadblocks Near-term

Blockchain has the potential to create new ecosystems for the recordkeeping, settlements, transfer, and distribution of financial assets as it removes friction costs in the system, drives down transaction costs, and has the potential to speed settlement.

Most notably in our view, it has the potential to create new distribution outlets for investment services and can create new ways to deliver existing asset classes and investment strategies. For example, the tokenization of liquid and illiquid assets creates new investment wrappers for existing strategies and new, and potentially more efficient and cheaper ways to custody investment products. Tokenized investment products can be held in wallets, for example, instead of having to be custodied by third parties, and WisdomTree is already working on developing its own digital wallet.

It also creates the potential for new wrappers as investment products can essentially become tokens. WisdomTree for example had filed for the WisdomTree Digital Short-Term Treasury Fund, while Franklin Resources has filed for the Franklin Blockchain Enabled US Government Money Market fund. Both of these products, which are essentially proof of concept products, look to use the blockchain to tokenize existing asset classes and investment products that can be delivered via a new eco system.

This same tokenization product can, in theory, make illiquid assets liquid and tradable. Tokenizing, for example, an office building so that its ownership can be more widely dispersed in smaller units is one way in theory the blockchain and tokenization can make the illiquid, liquid, and democratize asset ownership. That said, we believe there are numerous roadblocks, from having the appropriate regulatory and legal regime in place, to concerns over asset or wallet safety.

Proptech – Complex Value Chains Make Theoretical Blockchain Use Cases Abound, but Practical Application Is Evolving

To-date, practical application of blockchain to the real estate industry has been somewhat limited, partially due to the sector's slow pace of innovation (including the belief that wide-spread adoption is needed in order to enact change), regulatory burdens, high complexity across various products/markets, as well as credit risk.

However, theoretical use cases abound as blockchain technology can be applied to virtually any aspect of the real estate value chain that involves transactions between two or more parties. For example, smart contracts can be utilized to authenticate all parties to a real estate transaction, such as a buyer and seller, borrower and lender, sponsor and investor, landlord and tenant, or property manager and vendor. In this way, the need for third-party verification is eliminated and the verified identities of the various parties are used seamlessly throughout the remainder of the transaction process, significantly reducing transaction timelines and instances of fraud.

Exhibit 34: Select Uses of Blockchain Technology in Real Estate

Property sales	Title assignment / insurance	Investor/tenant identification
Payments	Renters insurance	Tokenization (i.e., partial ownership interests in assets)
Leasing	Title and land registries	Global property searches

Source: KBW Research

The most common applications of blockchain in the real estate industry to-date, though still limited in adoption, have been in the residential housing market, specifically in the areas of mortgage origination and the title/closing process.

The residential mortgage market is defined by a highly complex value chain across dozens of counterparties; manual, paper-based process; and redundant workflows/verifications. This results in high costs, long timelines, high instances of human error, as well as fraud. Within the mortgage origination process, blockchain can be used to record, share, and exchange relevant data related to a mortgage loan automatically and replace existing manual processes, particularly in the area of borrower data verification (income, credit, employment, etc.), as well as loan data validation and ensuring the integrity of closing documents. The resulting efficiencies can be passed along to the end consumer in the form of time and cost savings.

Blockchain technology can also be applied across several post-close areas of the mortgage market including loan purchase, servicing, securitization, and secondary market trading. As discussed in an April 2021 white paper authored by Redwood Mortgage Trust (RWT), blockchain technology can be used to create digital assets backed by individual mortgage loans, allowing all transactions over the life of a loan to be tracked. This in turn can facilitate document tracking, data memorialization (such as borrower, property, loan, and originator information), payment tracking, and secondary market securitization transparency. Additional use cases could include real-time payments, trading, and settlement, as well as fractionalization.

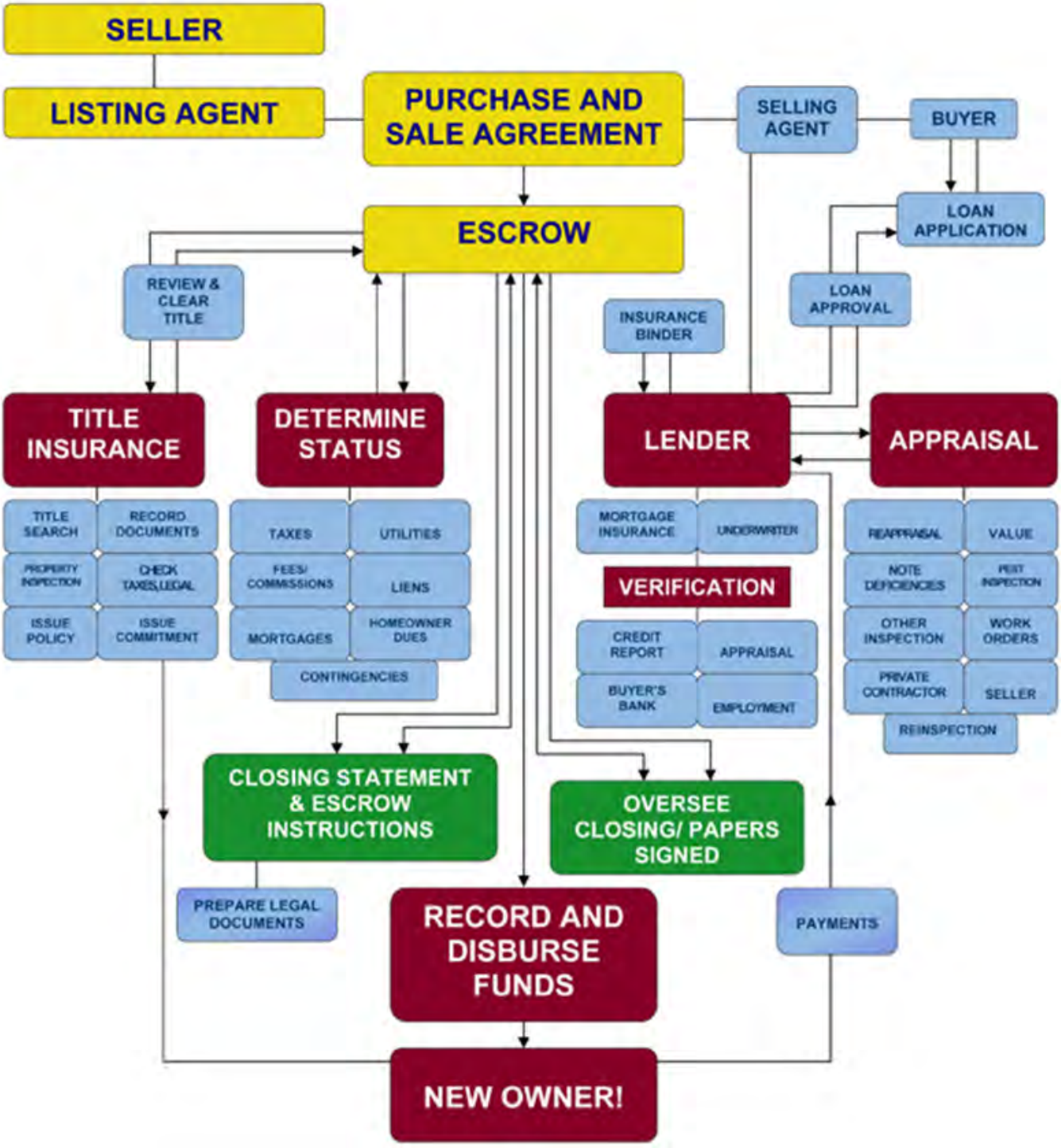
Liquid Mortgage, a proptech startup founded in 2018, aims to capitalize on this opportunity by using blockchain technology in the mortgage market to increase transparency and efficiency in loans and securitizations. The company was recently issued a patent for "Decentralized Systems and Methods for Managing Loans and Securities," which covers: the creation loan-backed digital assets, multi-signature loan-level blockchain accounts, lender portfolio accounts to hold loan-backed digital assets, borrower payment information and distribution mechanics, and loan balance management. Through this decentralized system, Liquid Mortgage aims to make debt markets more efficient and transparent, while lowering overall ecosystem cost

Title insurance also seems another low-hanging fruit opportunity for blockchain application considering the industry's concentration (with the top four players holding approximately 80% market share), high redundancies (with a title search being necessary for any home finance transaction), historically low losses (typically 5-10%), and high costs for consumers (the typical total cost of a title insurance policy is about 0.5% to 1% of the purchase price, according to American Land Title Association). Title insurance is a requirement any time a home is financed and protects lenders and borrowers from problems with respect to the underlying ownership (or "title") of the home, including any liens (such as for unpaid taxes or contractor work), an improperly recorded deed, or an unknown heir.

In theory, moving title data to a blockchain ledger (a centralized or decentralized database) could significantly improve the ease of the title search process, resulting in near-instantaneous title underwriting and even lower losses. However, at KBW's 2021 Title Day, while participants (which included FNF, FAF, and STC) noted they are monitoring and researching blockchain, none see it as an immediate threat or opportunity. While acknowledging that the application of blockchain to title makes sense, the firms noted there are implementation problems, mainly how to aggregate huge, disparate historical data sets. Rather, the companies noted they are largely focused on artificial intelligence (AI) and machine learning (ML) to improve underwriting accuracy/efficiency and the customer closing experience.

So, while application of blockchain to the title insurance industry has been limited in scope to-date, several industry participants have explored pilots for practical use cases. First American (FAF), a leading provider of title insurance and settlement services, announced the launch of a shared blockchain system to improve the title production process in 2018. The system is intended to exchange data on prior title insurance policies between underwriters, with Old Republic (a top four title insurer) being the first to agree to participate. According to First American, each policy included in the blockchain system will be "coded with a unique identifier by property, streamlining the search process and increasing the accuracy of searches for prior title insurance policies." In addition, Radian (RDN) announced the launch of a blockchain-backed title insurance offering in several states in September 2021 through its in-house title platform, titlegenius. While details are limited, Radian notes that through titlegenius homebuyers can access a blockchain-enabled online portal that empowers them to shop for and save on title and closing services directly.

Exhibit 35: Complex & Redundant Home Closing Value Chain



Source: Bright Title & Trust

Banks

Blockchain ledger technology is still largely in the experimental stages for the global banking sector as a whole, with mostly the largest banks allocating resources towards exploring possible use cases which we expect will move down-stream to the smaller banks over-time. Areas of potential disruption / improvement related to blockchain innovation that stand out to us include payments (B2B, P2P, cross-border etc.), fraud prevention including digital identify verification, loan syndication and securitization, financial instrument issuance and back-office efficiencies, such as accounting. Payments have been the most heavily impacted sphere of interaction to date for banks utilizing blockchain, with several U.S. based institutions creating closed-loop, blockchain based real-time payment networks for institutional clients (including Silvergate, Signature and Customers Bank), while JPM has created the JPM Coin, in an attempt to enable deposit accounts on a blockchain ledger to make instantaneous payments utilizing these digital tokens.

Blockchain represents an interesting technology for bank incumbents, who are constantly searching for ways to reduce cost to support growing innovation budgets. In the U.S., branch closures accelerated at the onset of the pandemic, although longer-term bank's cost infrastructure is still way too burdensome to match the pace of fintech innovation. Blockchain can potentially help close the gap, in our view, as a reduction in fraud and cybercrimes, in addition to reduced fixed costs pertaining to common actions such as loan securitization and financial instrument issuance could help banks re-allocate more monies towards their innovation budgets while not sacrificing profitability and capital generation.

JPM has already created an entire business unit dedicated to blockchain, Onyx, analyzing how the blockchain ledger could improve the efficiency and capabilities of its business. While HSBC has selectively used blockchain-based settlement to issuance bond securities. According to German fintech firm Cashlink, using blockchain technology can save 35 percent of the costs associated with issuance over the life of the bond, by simply automating processes such as email communication and manual updating of bond documentation. Firms in the U.S. such as Tassat and Figure are currently serving as blockchain enablers for banks, with Tasset focused on its B2B digital payments platform that is built on a blockchain ledger (used by Signature Bank and Customers Bank) and Figure recently announcing a partnership with NYCB to utilize blockchain to improve the loan securitization process amongst other potential use cases in the future.

Exchanges

Application of Blockchain for Post-Trade Services in Cash Trading

As mentioned above, Blockchain is a distributed and trusted ledger, which enables the instant transfer of digital assets and provides a transparent, immutable view of transaction history. This has clear implications for the future of financial transactions including for the settlement of those transactions. To use the U.S. cash equities trading market as an example, traditional exchanges only function as execution venues (matching trades), with those trades cleared and settled by the NSCC and the DTC, respectively. The DTC essentially holds the final record of which member owns which stock, with final trade settlement occurring on a T+2 (day) basis. The clearinghouse specifically requires clearing members to put up capital to ensure the trades settle (fiat and equity movement), and therefore the clearinghouse is managing counterparty risk for this two day period. If this infrastructure was recreated today, the DTC settlement system (which is currently a centralized database) could theoretically be replaced with blockchain technology. However, this alone would not eliminate counterparty risk and the need for clearing and clearing capital, as fiat is still being transferred. Both legs of this transaction (equities and fiat) both would need to exist on the blockchain in order to instantly settle transactions and eliminate the need for clearing. In our view, a future of blockchain settlement (potentially nearly instant) for both cash and equities is likely, but one that could be quite far away due to no imminent plans for a central bank digital currency. However, more regulation of stablecoins could help pave a path for their use by more traditional financial institutions, and also help make instant settlement a reality for asset classes where it's desirable (equities would not be at the top of that list, however). The company that is furthest along in bringing blockchain technology to equities settlement in the U.S. is Paxos via their Paxos Settlement Service.

We don't anticipate this will be disruptive to U.S. cash exchanges, as they mostly operate the matching of a transaction and don't own the post-trade infrastructure. However, in Europe, DB1 and ENX both own post-trade infrastructures for cash equities called CSDs (Clearstream and Monte Titoli). Clearstream also operates a very large ICSD which custodies and settles Eurobonds. We think these businesses have more clearly identifiable "disruptive" risk from blockchain technology over the long-term. However, these operators will likely have a long lead time to adapt their business models, with DB1, for example, already testing settlement solutions (e.g., FundsDLT).

While we used cash equities as an example for how blockchain could be implemented to replace post-trade infrastructure, there may be far greater needs for post-trade efficiency in transactions of more illiquid instruments (such as leveraged loans). Settlement times can be very long (over two weeks) and involve manual processes, and therefore blockchain might more clearly provide efficiencies here versus for more liquid instruments with shorter settlement cycles. We see no direct impact for the exchanges here, but implementing blockchain here could provide some capital efficiencies for the financial industry more broadly. It's also possible, longer-term, that if traditional illiquid assets (such as certain fixed income instruments) move to being issued on blockchain, there may be better and more automated tools that are created to find trading partners or the other side of the trade (as this may be identifiable if assets are issued on-chain). However, we note that counterparties would likely want to keep their anonymity, which is a key consideration for implementing blockchain technology in financial services more broadly. Some examples of

companies attempting to create DLT-driven efficiency solutions for capital markets infrastructure outside of cash equities include Axoni and Figure.

DeFi Developments – Decentralized Exchanges

Decentralized finance (DeFi) is a nascent but strongly growing sub-segment of the cryptocurrency ecosystem that broadly aims to eliminate intermediaries. Decentralized exchanges (DEXs) are one of the most significant innovations in DeFi to date. DEXs allow peer-to-peer trading of cryptocurrencies without a centralized exchange infrastructure or reliance on a handful of large market making firms.

The major innovations that allow DEXs to operate in a decentralized fashion are liquidity pools (LP) and automated market makers (AMM). In layman's terms, these essentially allow for the crowdsourcing of market making functionality that occurs on centralized exchanges. It allows any user to provide pooled liquidity for a specific trading pair and then generate passive fees dependent upon 1) their proportional contribution to the overall liquidity pool, and 2) the trading volume of that pair. There are several types of these exchanges; however, DEXs utilizing a Constant Product Market Maker (CPMM) model like Uniswap are the most prevalent today.

DEXs and DeFi more broadly are fascinating because they essentially allow for relatively efficient peer-to-peer exchange of liquid digital assets, with no custodian or centralized entities. There are big question marks as to how or if DEX mechanisms would ever function in a highly regulated traditional finance environment (with strict KYC/AML regulations), so this is more of a conceptual risk at this point. However, this is a very interesting concept that could continue to evolve rapidly and become a clearer competitive risk to the centralized exchanges over a longer period of time. Despite this, uptake of this technology in traditional finance will likely be limited near-term (and slow moving) due to the regulatory concerns noted above.

Derivatives Clearing / Exchanges – Blockchain Poses Less Risk than for Post-Trade Services of Cash Instruments, but Long-Term Questions Remain

Derivatives exchanges, such as ICE, CME, and DB1, have such wide competitive moats due to owning the clearing of their derivatives futures products in conjunction with the execution venues. As long-dated open interest is built up in the clearing house, this creates significant switching costs for users and therefore, economics have rarely been successfully competed away. It's the clearinghouse's job to manage risk during the life of that derivatives contract, and it is a highly regulated function that received a stamp of approval from regulators post-financial crisis. While blockchain allows cash product settlement to become nearly instantaneous, that is not possible with derivatives clearing because there is counterparty risk that inevitably needs to be managed over the life of that derivatives contract. Therefore, we see the near to medium term risk of disruption from blockchain to ICE/CME/DB1's futures businesses as low and much lower than that of cash products. In the near term, there are other efficiency tools that could be more impactful for derivatives, and companies such as Capitolis and OSTTRA (CME JV) are working on driving these solutions forward today.

However, we believe blockchain will likely have a material impact (over the next 20-30 years) on the transaction of all assets, so it would be unlikely that there would be no impact

on derivatives exchanges/clearers other than giving them more underlying assets to create derivative products upon.

Our view is that when/if central banks adopt blockchain (or provide a backstop for stablecoin usage), and all underlying assets become tokenized or issued on-chain (again, this is very long-dated), there would be room for some level of disruption for derivatives clearinghouses as well. This is largely due to the fact that, in this environment, it may be possible through programming to have instantaneous tracking of all exposures (and leverage) for every individual market participant at all times. The function of derivatives clearers is managing counterparty risk, and it's possible that this could become completely automated via code at some point. It may still be performed, however, by regulated centralized entities, so the impact here is uncertain. We also note that regulation here is quite intense, and this would play a factor as well. Overall, we view near and medium term risks for a material change to the derivatives clearing industry as low.

6. Artificial Intelligence/Automation/Data & Analytics

Key Areas Explored in this Section:

- ***Insurance***
- ***Proptech***
- ***Digital Wealth/Asset Management***
- ***Banks***
- ***Exchanges***

Artificial Intelligence/Automation/Data & Analytics

AI encompasses an array of different technology applications or tools such as predictive analytics, machine learning, virtual assistants (or chatbots), robotic process automation, natural language processing, etc. Consequently, it also has a wide range of applications in the financial industry ranging from automation of processes to data analytics to risk management/fraud detection to quantitative trading, among many others.

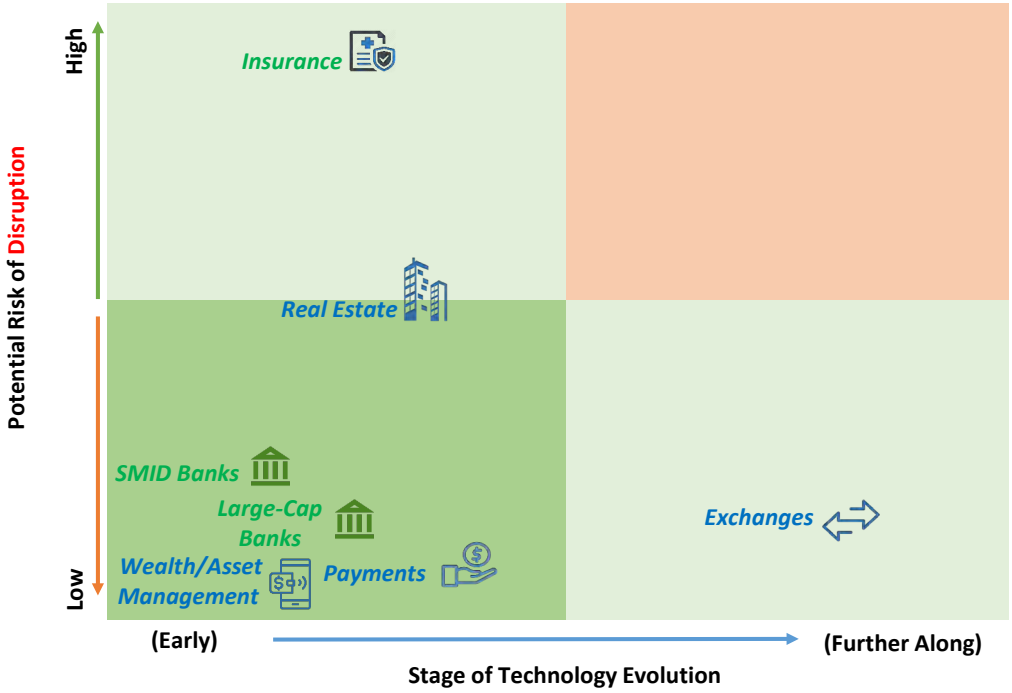
On one end of the spectrum, AI technologies like chatbots are being used to replace human customer service interactions. These are being widely used by incumbents today to drive efficiencies in their processes and reduce overall cost of operations. A more advanced use of similar technologies is to make product recommendations without human intervention, which can be game changing in certain industries such as Insurance. Insurance companies employ thousands of agents whose value-proposition to sell insurance policies is critical to the businesses and the use of AI by fintechs create competitive challenges for the incumbents until they have figured out how to re-tool themselves. Similarly, robo-advisors are shaking up the investment landscape as AI-powered platforms can automate asset management, thereby eliminating the need for financial advisors from the investment process. Meanwhile, AI also powers automated trading strategies across asset classes, while also helping identify malicious trading activity.

Within Asset Management, Data and analytical tools have long been used to develop and executive quantitative investment strategies, and AI tools are increasingly being used to sift through the large volume of data that is being collected in order to find alpha generating investment ideas on traditional strategies, or to help understand a company's ESG compliance and standing. AI and data analytic tools are increasingly being used in marketing and distribution initiatives to create more targeted and cost effective strategies.

Ultimately, AI is offering unique cost and revenue opportunities and companies (fintechs and Incumbents) that are at the forefront of adopting such technologies are likely have inherent competitive advantages.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Exhibit 36: Mapping of the State and Risks of Artificial Intelligence, Automation and Data Analytics Across Financial Sectors



Source: KBW Research

Insurance

Sitting on top of trillions of data points creates the opportunity of augmentation with the advancement of artificial intelligence. Artificial Intelligence, in its many forms, is currently being deployed across the industry and value chain with distinct use-cases. These capabilities are live and augmenting the industry from customer lead generation for agents or direct placement, connecting seamlessly to brokers for improved speed to market, risk selection to account selection, to back-office processing to fraud and ultimately across claims and everything else in between. The insurance industry has been touted as slow and not responsive over the years, but when lifting up the hood the known ways to improve every piece of the experience is happening daily across the infrastructure.

Nearly every insurance company globally has implemented artificial intelligence in some way, but the sophistication and scaled capabilities is what is differentiating incumbents and new entrants into the market. The largest gap, and likely something insurtechs are learning as they mature, is how to truly understand risk at scale with real, individualized data. Collecting data is the first piece of the puzzle, but how the pieces fit together to move away from market results is what will be truly differentiating in the medium term.

Advancement in artificial intelligence will bring advantages to those who have the data. "Disruption" in a commodity-like personal lines insurance will likely be a company-specific detriment rather than an upheaval of the industry. The data advantage incumbents, such as PGR and ALL, have over entrants like LMND and ROOT is how much data they already have to attempt to glean insights from. Though built on tech from scratch with a mindset towards cutting-edge data and analytics, understanding and sifting through anonymized market data and short-term real driving records is a disadvantage to real claims information from geocoding up through portfolio analytics. Scaling the book to incorporate real-time claims information in a meaningful way is still years away for new entrants, but adoption and ability to glean insights faster as growth occurs will likely be a plus for those who are able to meet lofty expectations.

Implementing artificial intelligence is additionally being focused on third-party data sources to strip out costs and improve thoughtful assumption of risk across product lines. The ability to manipulate and standardize loss runs, scrape 1000s of websites for automated data ingestion, and using computer vision to analyze property risks are only some of the necessary tools that insurers need to piece together to continue to compete for the most desirable customers, particularly in agent- and broker-based business. Integrating and scaling these types of AI-driven efficiencies for underwriters allows for the ability to move from quote to bind faster and most efficiently, particularly in middle to large market commercial insurance products where digitization is still about enablement.

One area with great potential is in the cost-heavy and human-dependent small commercial insurance business. Integration of artificial intelligence tools – whether through partnerships or built in-house – should allow for pricing and distribution to occur with more robust data and at a quicker pace. The ability to automatically score multiple data points, such as structure type, building material, flood zone, crime risk and business type, in seconds is beginning to gain traction. The local agency and broker distribution is still dominant and the advancements in auto filling applications and submissions while structuring loss runs at the same time is beginning to separate market participants. With automation across the "sales" process, insurers can focus on specific metrics that work

best for their long term strategy, whether it be growth through increased submission flow and quoting, account and risk selection, or pure reduction in acquisition costs.

When there is data, there is a way to write risk. There has been specific interest and attention on ways to do insurance cheaper, better and faster. What is often lost is how insurers are leveraging artificial intelligence to take a both offensive and defensive approach, particularly in larger accounts. Startups and incumbents have begun allowing insurers to look at their casualty books with an eye on catastrophe tail risk, in an entirely different light. Property models have existed for decades, but getting granular, modeled risks or entire portfolio analytical reviews are creating ways to potentially write risk profitability that could have been left unquoted previously without as much information. Avoiding the next asbestos is everyone's goal, but certain exclusions may mean an inability to win or renew profitable business a competitive environment. Understanding that topline risk may never trickle down to a certain policy could allow for looser terms while understanding there is no change in risk assumed.

Artificial intelligence and automation is not only for the front-end and top-line expansion. The biggest piece of the combined ratio has staggering potential for improvement. Across sectors, claims and related expenses account for the most volatile and largest part of the insurance experience – for both insurers and insureds. Tackling fraud has been top of mind and there has been notable investment and advancements, particularly in auto and workers compensation. This is one way to remove loss from the equation another is to automate and assign risk in a more thoughtful way to leverage the necessity of humans to be an integral piece of the process. Utilizing intelligent process automation and related technologies in the assignment of losses and loss-related communications creates a more ideal customer experience and likely total losses and adjustment expenses efficiencies at the same time. Being able to route FNOLs or adjuster documentation and similar processes to either be paid directly, examined more carefully, or flagged or expert review reduces time and unnecessary expenses. Not every claim is significant and stripping out paper and human intervention produces positive results for a multitude of parties.

Proptech

Real estate is the largest asset class of the word, touching every aspect of consumers' lives and housing the local businesses and global corporations that power the world's economy. At the same time, real estate ownership has become increasingly institutionalized, driving investors, owners, occupiers, and consumers to demand greater data transparency, standardization, and sophistication to empower decision making and enhance returns.

As a result, real estate is a natural beneficiary of recent advancements in big data, predictive analytics, artificial intelligence, and machine learning. The aforementioned trends have theoretical applications across every aspect of the real estate value chain, with notable examples including investment underwriting, investment management, leasing, and asset management.

It is no secret that real estate generates massive repositories of data, including from such sources as occupants, owners, investors, and capital markets and leasing transactions. In many ways, data serve as the necessary foundation that powers other technological innovations impacting real estate. The challenge, however, has been how to accurately and efficiently mine these data, organize them, and generate actionable insights.

As other industries, such as financial services, have embraced data and information sharing, real estate has lagged. According to a 2020 Altus Group survey of 400 CRE executives, 46-47% of respondents believe that AI, machine learning, and predictive analytics have the potential for significant cost savings and operational efficiencies while another 39-43% believe they will create major disruptive impact for the industry.

But what has inhibited the real estate industry's adoption of data "best practices?" Real estate has historically been an opaque industry due to private, unsophisticated ownership. This has led to unorganized and non-standardized data with minimal transparency or information sharing. According to the aforementioned Altus Group survey, some of the biggest impediments identified to collecting or utilizing data more effectively to drive decision making include: regulatory requirements around data collection (59% of respondents), lack of internal expertise/capability (52%), and lack of normalized data formats (48%).

In recognition of this opportunity, a number of companies have formed with the goal of revolutionizing the industry's use of data, including aggregation, organization, and application. At the same time, other firms are putting data to practical use via artificial intelligence and automation applications to bring efficiencies to various aspects of the real estate value chain.

We touch on a few prominent examples below.

Commercial Real Estate

Information

- **CRE listings**: In contrast to the role of multiple listing services (MLSs) in residential housing market, CRE lacks a centralized source of listings information. As a result, players like CoStar (CSGP) have aggregated data on the U.S. CRE stock to facilitate the exchange of leasing and investment sales information.

- **Property information**: Numerous players have attempted to aggregate libraries of data covering varying types of CRE information including leasing and investment sales comps, rents, tenant stacks, and vacancy. Relevant players include CoStar, CompStak, Reonomy, VTS, and Real Capital Analytics.

Benchmarking

- Progress with respect to benchmarking in the CRE industry has been slow, partly the result of limitations and hesitancies around information sharing. Further, real-time or near-real time data is also an important perquisite to ensure accuracy and relevance.
- Still, several providers of performance benchmarking tools exist aiming to serve different areas such as Real Capital Analytics/MSCI for property indices, RealPage for multifamily operating performance, and STR for hotel benchmarking.

Investment Underwriting

- AI and machine learning have practical applications to CRE investment underwriting by leveraging historical data repositories to optimize asset investment selection and predict asset performance. For example, Skyline AI (recently acquired by JLL) utilizes artificial intelligence technology and proprietary machine learning models to gain a competitive advantage in the origination and analysis of real estate opportunities.

Data Management

- Considering real estate firms themselves are primary sources of data, owners and operators are faced with the struggle of accurately mining this internal data, organizing it, and combining it with external data providers. One proptech firm capitalizing on this opportunity is Cherre, whose platform seamlessly connects all disparate real estate data into a single source of truth, empowering companies to instantly explore all their connected data for immediate and actionable insight.

Exhibit 37: Cherre Data Management Platform

Source: Cherre

Location Intelligence & Analytics

Real estate fundamentals are powered by building occupants, consumer behavior, and local economic trends. It is therefore valuable for real estate tenants, owners, and managers to understand the behavioral and movement patterns within and around their

assets. In recognition of this need, several technology firms have emerged offering location intelligence and workplace analytics to better understand consumer foot traffic and building occupancy trends.

- **Location analytics**: Placer.ai collects geolocation and proximity data from devices that are enabled to share that information by their users in order to provide valuable insights for property owners and tenants. Similarly, Buxton provides consumer analytics by using GPS data and proprietary processes to identify and report on the types of consumers visiting an area, where they come from, and visit volumes for selected time periods.
- **Workplace analytics**: Companies such as VergeSense and Density provide workplace occupancy data and analytics using sensors to help companies better understand their employees' preferences and movement patterns, improve office design and layout, and measure and benchmark building occupancy performance.

Housing and Mortgage

Information

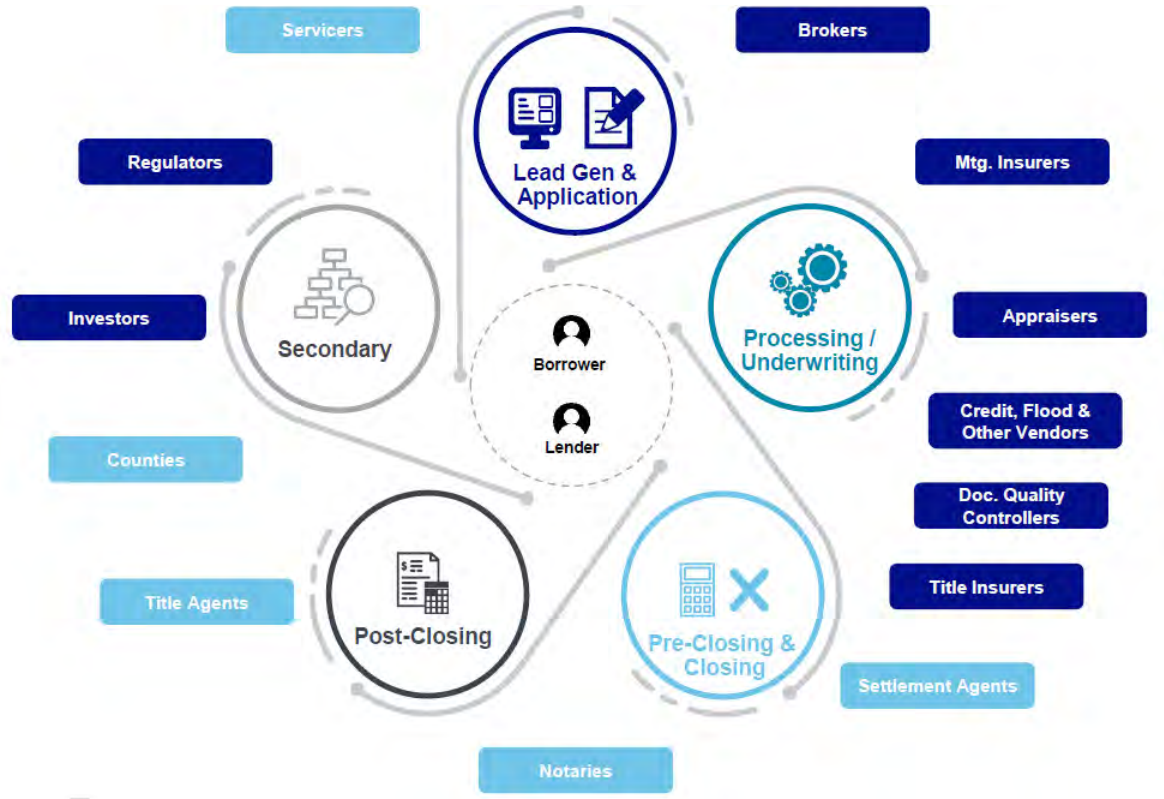
As one of the largest individual assets classes in the world, the U.S. housing market (valued at $36 billion) generates massive amounts of information, while ancillary workflows surrounding the housing market, such as mortgage and insurance underwriting and secondary mortgage market trading, command the need for high quality data and analytics. While much of the raw data surrounding the U.S. housing market is available through public records, there is still a need for sophisticated aggregation and cleaning of such data to make it more easily consumable and practically applicable to various industry stakeholders and their workflows.

Relevant players include CoreLogic, Black Knight, ATTOM Data Solutions, First American Financial, Fidelity National, and Zonda.

Mortgage Origination

Considering the high cost, burdensome regulatory requirements, redundant workflows, and numerous counterparties to a mortgage transaction, data, AI, and automation, have compelling applications for various components of the mortgage origination process to reduce costs and pain points for both consumers and lenders.

Exhibit 38: The Mortgage Origination Process Is Complex



Source: ICE/Ellie Mae

Loan origination systems, such as Black Knight's Empower or Ellie Mae's Encompass, automate the full mortgage origination workflow for loan officers, saving time and money for lenders during the origination process.

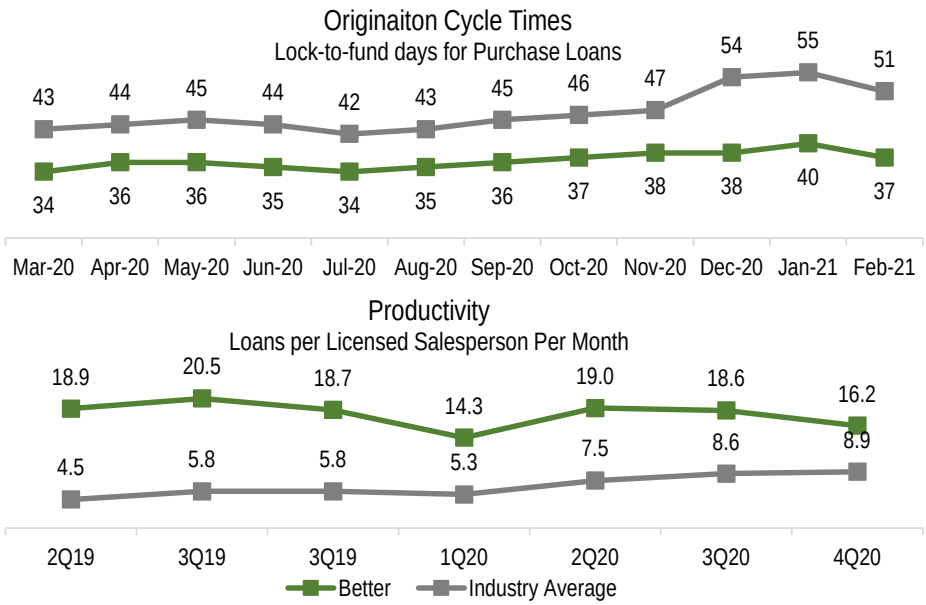
Consumer-facing point-of-sale platforms, such as Blend's white labelled software, provide consumer with a user-friendly online portal to prequalify and apply for loans and also automate the borrower data verification for loan officers. These platforms improve customer experience and increase the competitiveness of lenders in a world where consumers demand tech-enabled experiences.

In addition, **Black Knight's Optimal Blue** real time marketplace allows various mortgage counterparties to exchange real time pricing and eligibility requirements to accurately underwrite and price loans in order to be efficiently sold on the secondary market.

Black Knight's AIVA is an artificial intelligence virtual assistant that reads, comprehends and draws conclusions based on context to mimic cognitive thinking and build expertise over time. This scalable solution helps deliver operational efficiencies to reduce turn times and origination costs by automating many of the task-oriented and repetitive manual functions that lenders manage every day and accelerating the speed of processing.

Finally, **tech-enabled direct mortgage lenders**, such as Better, utilize data-driven platforms to offer customers lower rates and operate with lower labor costs (57% lower for Better versus industry average) and greater efficiency (16.2 average closed loans/month for Better versus 7.1 industry average).

Exhibit 39: Better Origination Metrics versus Peers



Source: Company reports

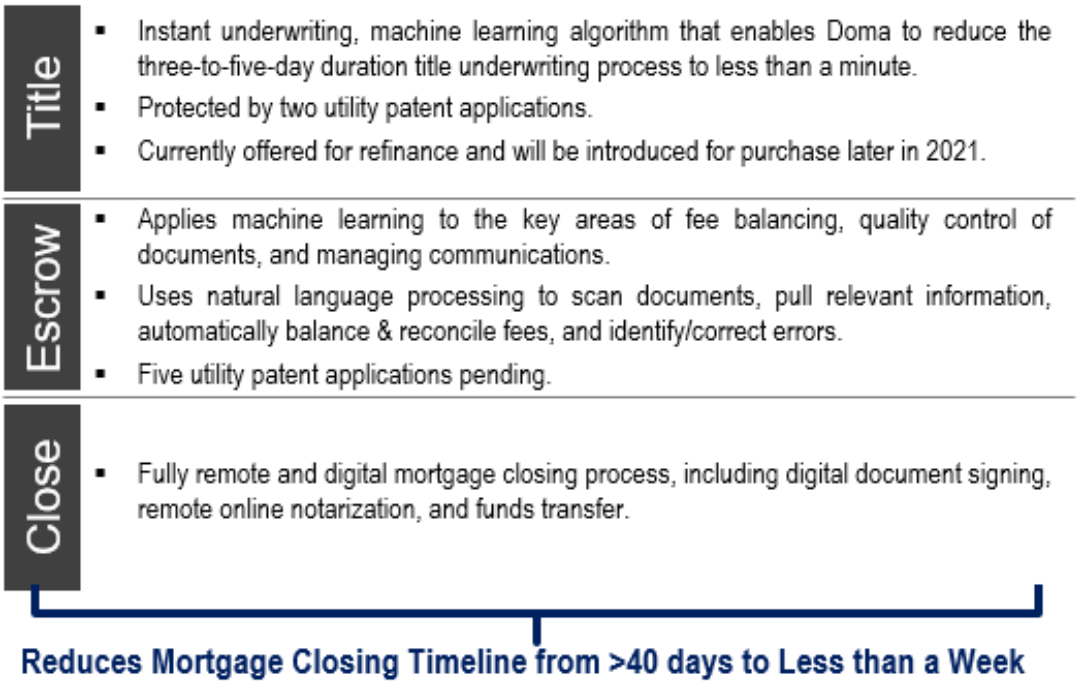
Title, Escrow, and Closing

While a painful mortgage closing process has become an accepted reality, artificial intelligence, machine learning-based can be applied to deliver a far faster, better, and affordable experience for consumers and industry participants. As "title and escrow" companies are essentially in the "mortgage closing" business, they have the unique advantage of being able to utilize technology to streamline this antiquated process.

For example, Doma, formerly States Title, aims to disrupt the antiquated $23 billion title and escrow market by using machine intelligence to replace large portions of the residential real estate closing process with instant technology solutions. The "Doma Intelligence" platform utilizes a suite of machine learning-based processes that enable Doma to close title orders autonomously without human touch and claims the ability to reduce the title underwriting process to one minute or less (from a typical 3-5 days) and the closing process to seven days (from a typical 30-50 days). The company replaces the traditional title search process with probabilistic, algorithm-based scores that are assigned to a title order, thereby enabling that order to clear and close in seconds. While Doma's data-based instant underwriting is expected to result in higher loss ratios (low- to high-single digits for refinance), this is more than offset by a materially lower expense ratio driven by the elimination of personnel and other costs. The company is targeting 35% EBITDA margins long term (on retained premiums/fees) versus traditional title players that operate with 10-15% margins.

Other relevant players include Qualia, Spruce, JetClosing, Blueprint Title, and Endpoint.

Exhibit 40: Doma Platform Overview



Source: Company reports

Digital Wealth/Asset Management

The role of technology and data in the development, management, and delivery of new and existing investment strategies, has created competition for legacy investment strategies. It has also increased the pressure for managers to invest in technology and data analytical tools as managers need to harness data and artificial intelligence (AI) tools to aid in alpha generation in fundamental strategies to the extent it can enhance a manager's ability to sort through and analyze a wide variety of data sets in search of information that can isolate different investment "factors" and aid in their exploitation. In theory this should help lead to greater investment insights and alpha generation.

In addition to aiding in the management of traditional strategies AI and data tools help in the development and management of quantitative oriented strategies, whether they be factor-weighted ETFs, risk parity strategies, or other quantitatively focused strategies.

Most notably, ESG sits at the intersection of the Data Revolution which has enabled the boom in ESG enabled and assisted strategies. Third-party vendors, who range from MSCI to Bloomberg to numerous niche data providers, as well as asset managers such as BlackRock, Federated Investors, T. Rowe Price, Invesco, and others, use data analytics and AI to "scrape," organize, and evaluate data from publicly available financial and regulatory reports, as well as items from news and other sources. Once this information is collected, the data provider or manager then uses some type of proprietary process or "secret sauce," which typically include the use of AI or other quantitative tools, to process, standardize, analyze, and ultimately assign a score on various ESG metrics. In addition, we expect a growing number of firms will have dedicated subject matter experts organized by ESG factors, who help analyze the data but are also tasked with engaging with portfolio companies on their ESG initiatives. This is necessarily an expensive endeavor (Federated, for example, has over 60 employees dedicated to this process) that many managers will be hard-pressed to replicate. Arguably, firms that already have well-established ESG capabilities, or the resources to build them, may have some competitive advantages over the intermediate term, presuming that underlying investment performance is competitive.

While AI and data analysis have taken front and center in the investment process, retail distribution too has increasingly used data tools to organize, segment, usage and sales data and create more focused and targeted marketing and distribution strategies.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Banks – Potential $36 Billion Cost Savings Opportunity

AI is a buzzword that has featured in many bank strategy presentations; however, we believe that banks are only at the very beginning of using AI. Even the definition of AI is somewhat mixed and can encompass anything from simple robotic processes through the genuine hopes of neural network technology.

AI could be the key differentiator between winners and losers in the future. In our view, AI is likely to be deflationary for both costs and revenues for banks. On the costs side, the ability to handle and interpret structured and unstructured data is most likely to benefit the compliance and risk departments in the near term. Longer term, banks want to talk about use cases that are more revenue-driven – for example instant decision lending. This is more around market share gains and improved targeting or anticipation of customer needs, rather than creating new products or an aggregate increase in the revenue pool, however.

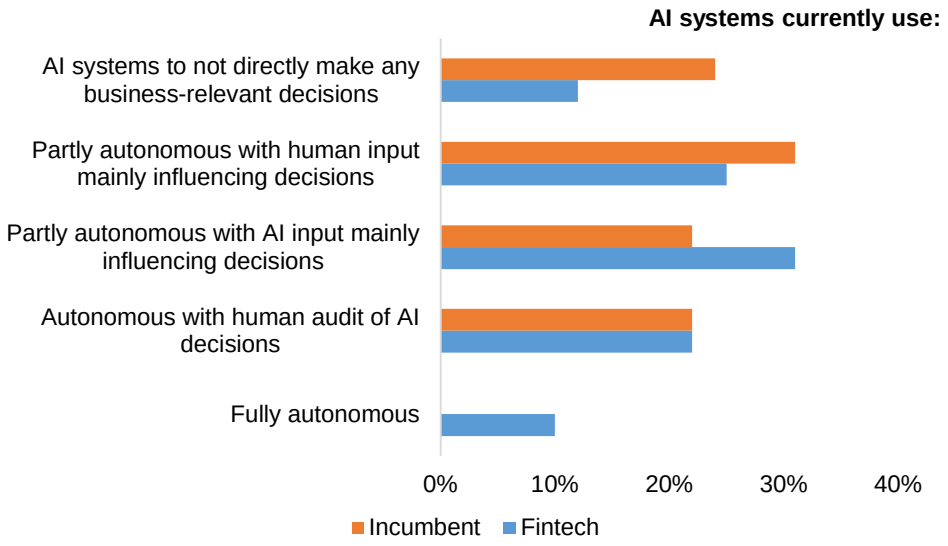
What is clear is that the benefits of AI mainly accrue to the largest players and there is a huge advantage to being early. Challengers could also have an advantage here because ultimately AI is about data analytics and cloud-native challenger banks are able to collect higher-quality data thanks to their modern technology stack. The difficulty these players face is the lower level of customers and therefore a lower quantum of data to feed to AI for it to learn more and become more valuable.

State of Play Today

Some banks in the US and Europe have rolled out chatbots and simple AI applications (e.g. Erica @ Bank of America, Kate @ KBC) which have reduced the strain on more traditional customer service center staff, freeing them up for more value-added work (or lower headcount and costs). This may be customer-facing AI and could improve the user experience and boost market shares. But it is not clear that it is really something which boosts revenues. It really comes back to being more efficient and reducing costs.

Currently most AI applications have been identifying anomalies or natural language processing /generation. Very few applications of AI today are genuinely making autonomous decisions.

Exhibit 41: Autonomy of AI Systems Currently in Use (WEF Survey)



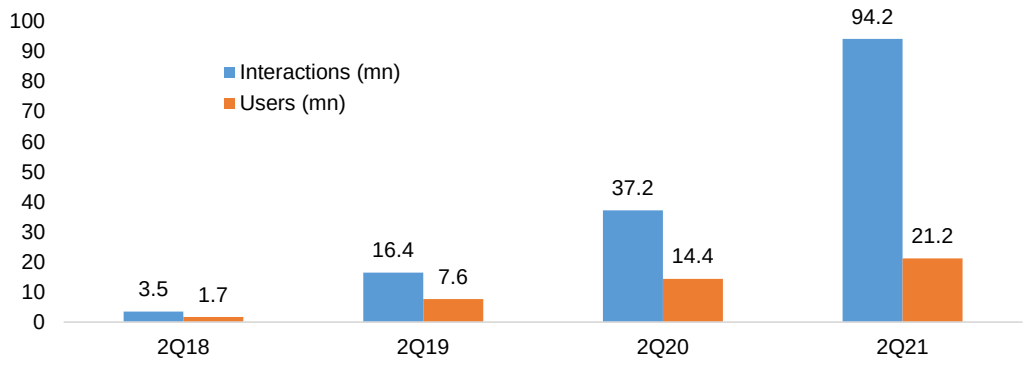
Source: WEF AI in Financials report

Existing Examples of AI deployment

Bank of America says the roll-out of its Erica AI product to its treasury and relationship managers in its commercial bank allows them to quickly search for things and has already saved 25,000 hours of search time. That may sounds a lot but is only equivalent to about three FTEs in the grand scheme of things. Nevertheless, given the scaling in the retail bank, this number seems likely to grow.

> *"That's the sort of thing that as we roll it out more and more, it saves our relationship managers from time spent searching for stuff and allows them to spend more time on advisory and sales work, which is what they enjoy doing. It's more value-added."* – Alistair Borthwick, conference presentation September 2021

Exhibit 42: Bank of America "Erica" Users and Interactions



Source: Company Presentations

KBC has developed a similar customer-facing AI called Kate. It has already been used by 1mn people in Belgium at 2Q21. KBC is also allowing Kate to be used with third-party services. There have already been more than 2mn transactions in 1H21, more than in all of 2019.

Reducing Need for Humans to do Repetitive Tasks: Adding 0.7-1.1ppts to RoTEs

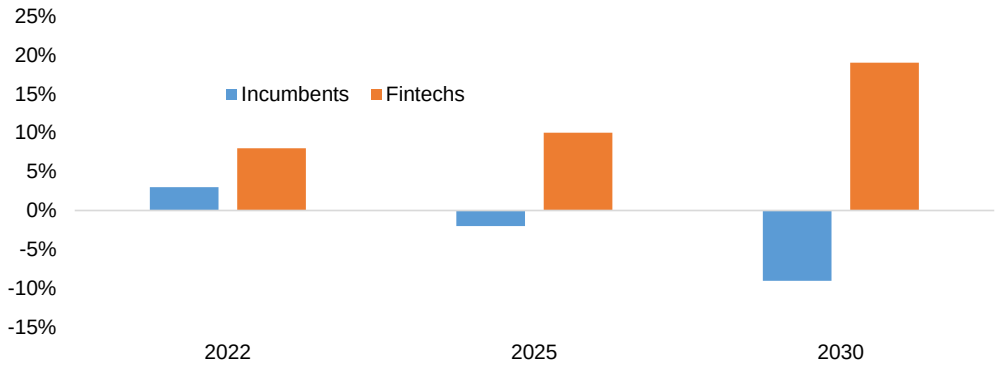
Saving time and industrializing the many repetitive tasks humans currently do is likely the biggest difference AI will be able to make. Simple robotic process automation (RPA) is nice, but it optimizes inefficient processes. Genuine AI (e.g. neural networks) should be deployed alongside better processes with good data structure. This will enable not only the elimination of expensive repetitive tasks, but should also allow banks to gain greater insights into risk, customer behaviors and free up human time to add more value with clients or make broader strategic decisions, rather than searching for data or interpreting simple data reports.

Staff costs are still 58% of total costs for European banks and 48% for US banks. Technology employees are clearly part of that cost base, but other employees will still be the vast majority of the costs. Using AI to make the front office staff more efficient, or to replace some human processes with robotic processes, would therefore be a positive for shareholders.

Estimates of the headcount reductions due to AI are wide: from a 30% reduction (Hawksworth and Berriman, 2018 - link).

The World Economic Forum survey showed that incumbents believed that net headcount could fall by -9% by 2030 as a result of AI which seems more plausible. Fintechs in the survey predicted a +19% increase in net headcount on the same basis.

Exhibit 43: Incumbents and Fintechs Disagree on Headcount Changes from AI



Source: WEF AI in financials report

If we aggregate a 9% headcount reduction for our US and European bank coverage, this would result in a gross saving of: $36 billion, adding 0.7-1.1ppts to RoTEs. The benefit to Europeans is more given the higher existing share of staff costs in the total cost base.

Naturally, there is an offsetting cost of AI investments that may show up away from staff costs.

Exhibit 44: A 9% Headcount Reduction Could Boost PBT by >$35bn, Adding 70-110bp to RoTEs

	US (FDIC)	EU (KBWe)
Staff costs 2020	-224,104	-182,008
-9% cut	20,169	16,381
RoTE boost	**0.7%**	**1.1%**

Source: KBW Research, FDIC. Note: 25% tax rate assumed on RoTE calculation

Regtech: Reducing Human Error, Fraud, and Cybersecurity

Being able to better analyze multiple forms of data, such as emails, voice calls, access keycard data but also tone of voice and speed of speech should better help compliance departments identify risks before they arise. It may also allow better underwriting over time, although as we discuss below, avoiding bias in underwriting is not straightforward.

Human errors and fraud have been an enormous burden for the financial markets since the financial crisis. The list is sobering: a 20-fold increase in fraudulent US mortgages between 1996-2005, the entire RMBS/CDO crisis, UK banks mis-selling PPI, multiple cases of banks being used to launder money, economic sanction breaches, global banks manipulating Libor, FX markets and fixed income markets, tax avoidance schemes, the Panama papers, FIFA bribes, JPM's London whale, SocGen's Kerviel, UBS's Kweku Adeboli, the flash crash, Madoff, Greensill and Archegos.

It's also an expensive list and the costs of paying fines has been truly enormous: litigation costs by 2017 had reached a whopping $236 billion. That excludes the losses the banks made on their own positions.

The commonality here, in some shape or form, is a failure for risk managers to either identify, escalate or act upon these issues.

The logical reaction to these failings has been to drastically increase compliance and risk management budgets (and headcount). This ongoing cost has continued to grow since the financial crisis.

Automating some of these functions and using AI to better detect and analyze anomalous data could save banks a huge amount not only in "one-time" fines, but also in ongoing costs.

We estimate that banks spend over 5% of their annual cost budget on risk management and compliance.

Greater Data Analytics and Reducing Loan Losses

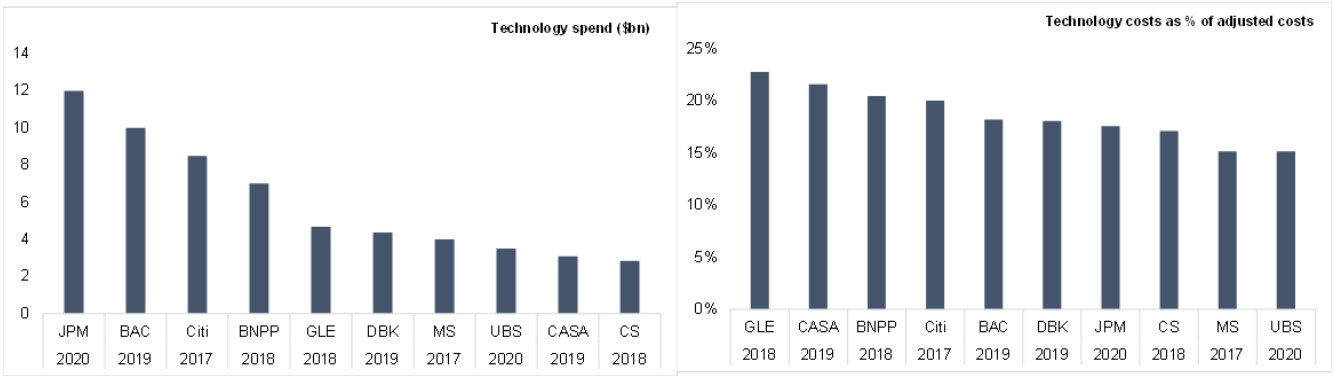
Many banks still use regular data sources for underwriting loans. However, new datasets that can reflect live data are also important and with power enough data analytics, can provide banks with better data to underwrite loans. This is made all the more powerful when combined with open banking – using data sources from third parties or competitor banks can lead to a much better underwriting process which is both quicker and more accurate.

Credit scoring systems provided by credit bureaus remains the most common factor used, but point-of-sale data, geo-location data and social media data are all becoming more important inputs into underwriting which are difficult for basic data analytics to manipulate.

Who Wins? Big Is Beautiful

Developing AI is not cheap and is largely a fixed cost in our view. AI also naturally needs information to learn from and the more information…the more the AI will learn and the better it will perform. This naturally benefits the larger banks in deploying this technology as they 1) have larger absolute technology budgets and 2) have more customers and transactions that therefore means more data points to feed the AI learning process.

Exhibit 45: Technology Budgets Only Heading Higher in the Global Banking Sector



Source: KBW Research

For example, Bank of America's Erica already has 21 million users, whereas KBC's Kate has 1 million users. One system will have much more data and be able to draw many more conclusions that the other.

The alternative for smaller banks is to access third party services, often via the cloud. This introduces other issues around privacy (can a bank send customer data to a third party in the cloud? If the data anonymized, does the AI work? If raw customer data is sent to the cloud and the third party loses the customer data, who pays compensation to the end – customer? Can the third party afford the insurance for the loss of data? Will an insurer cover them?).

First movers in AI are also likely to compound their lead over the laggards. The WEF survey also showed that the proportion of firms which can point to an AI-induced significant increase in profitability was greater for those firms spending a higher proportion of the R&D budget on AI.

Problems with AI: Bias and Being Auditable

Privacy breaches and cyber-attacks are commonly cited worries around greater adoption of AI. However, for banks wanting to use AI in decision making there are some particular challenges.

Bias in data. There have been several problems with introducing AI into too many facets of life. A report showed that a US court system used to profile the risk of criminal reoffending was heavily skewed to penalize black defendants versus white defendants

(link). The same issues are prevalent in bank underwriting too (see Brookings Institution paper on FICO score bias here). AI is often hoped to be impartial and remove implicit bias in underwriting. However, it has been shown to sometimes perpetuate the bias, but also make it harder to track and correct.

Having a process which is auditable. When regulators, supervisors, auditors or any other interested party arrives at a bank and wants to know "why was this decision made?" they ideally want to see names, emails, a process and some sort of risk management. If the reply is "the AI system told us to do it" then we would suggest that is likely to be an unsatisfactory answer.

Banks also face some regional differences and problems:

UK and European laws favor protecting personal data and are more protective of consumers. The GDPR law is particularly scary with a top level penalty of as much as 10% of global revenues.

The US and China have much less regulation around the use of personal data and can therefore apply AI to greater datasets, handing them an advantage in its adoption.

Exchanges

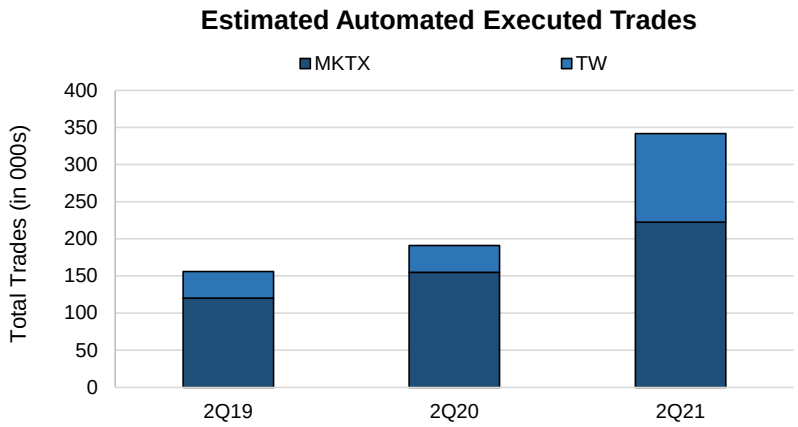
Credit Trading in the Early Stages of Embracing Automation

Automated and algorithmic trading strategies are prevalent in most mature trading markets (e.g., U.S. cash equities and options). This includes quantitative, rules-based strategies employed by traders, and also includes smart order routers employed by brokers to automate trade execution of customer orders, with historical and current market data provided by the exchanges a necessary input in these execution strategies and services.

Other markets have been much slower to adopt automation due partially to the liquidity characteristics of those markets, as less liquid markets such as credit largely trade "by appointment" without constant streaming prices (in institutional size) or a central limit order book. However, dealers have begun to embrace automation by rolling out dealer algos in order to price smaller order sizes with no human intervention. This allows dealers to service clients efficiently with lower costs, thereby increasing their returns in a capital intensive business. On the buy-side, cost and regulatory pressures have caused firms to look for efficiencies in trade execution as well. Firms like MKTX and TW have been instrumental in providing tools to the buy-side (pricing data and protocols) to help these firms automate smaller trades or trades for more liquid instruments. We anticipate that automation will continue to take hold in this market and facilitate a continued shift towards electronic trading, as we noted in the earlier section of this report on digitization.

In the future, we anticipate that more fixed income and credit trading will be automated, and that firms will become comfortable even automating larger sized trades as well. We expect the next evolution of automation for these markets to look more like the smart order routers of the equities world, where trading platforms may provide a service that will break orders into smaller sizes, work orders over a period of time, and/or use analytics to inform decisions about the best trading protocols to use for that specific ticket. MKTX has laid out a step in the direction with the announcement of Adaptive Auto-X.

Exhibit 46: Buy-Side Automation of Credit Trades Increasing Off of Low Base Due to Product Innovation



Source: TW & MKTX Company Filings and KBW Research

Artificial Intelligence Helping Power Anti FinCrime Services

Regulatory technology (regtech) and Anti FinCrime services like that offered by Nasdaq employ artificial intelligence to surveil markets including in the search for actors that employ malicious trading activities (e.g., spoofing). Nasdaq also provides fraud detection, BSA/AML compliance, and high-risk customer management and information sharing (via Verafin), Nasdaq uses the former surveillance software on its own exchanges but also sells this as a part of its market technology offering to marketplaces globally. With the continued sophistication of markets and financial services overall via technology, we believe this will be an area of continued growth for Nasdaq. For reference, Oliver Wyman expects the overall Anti FinCrime total addressable market to increase at a +17% CAGR through 2024 to $12.5 billion.

7. Public Market Investor Hunger for Growth

Key Areas explored in this section:

- ***Payments***
- ***NeoBanks/Lending***
- ***Insurance***
- ***Proptech***
- ***Digital Wealth/Asset Management***

Public Market Investor Hunger for Growth

The rules of Growth versus Profitability are changing as new fintechs come to market with the promise of massive share gain potential and potential for mass disruption. Historically, early to mid-stage private market investors have tended to fund the aggressive growth phase of startups with the emphasis shifting towards scale, efficiency, and profitability as companies approach their IPO. Public markets have also historically ascribed higher value to companies that are higher growth, but maintaining some moderate level of profitability has also been important to maximize their valuation potential.

This emphasis on profitability as companies become publicly listed is changing with public market investors increasingly willing to fund what they deem to be credible long-term growth opportunities. This is potentially lending an unfair advantage to the newer crop of companies that are using this capital as strategic weapon to capture market share without having to worry about the cost discipline required for profitability. Meanwhile the incumbents and large established companies (that are already encumbered by the law of large numbers) are held to a different standard of showing cost discipline and expanding profitability that limits their potential to become aggressive in the same way.

This environment of ample low cost capital can be a boon for emerging companies that are adding real value and have strong network effects that may eventually lead to a "winner takes most' type of market dominance. But it is also enabling many lower quality, lower margin businesses to flourish where having market share may not offer the same level of defensibility and the lack of network effects could take longer to manifest itself.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Payments - Market's Appetite for High Growth Is Reflected in Valuation Disparity

Few areas are more reflective of the market's appetite for high growth than the payments space, where new entrants have eyes on the estimated $235 trillion in total global payment flows with potential to be monetized. Particularly as the world accelerates its transition further away from the legacy payment methods of the past towards the digital ways of the present and future, there is a constantly expanding pool of money flows to be captured by various technologies.

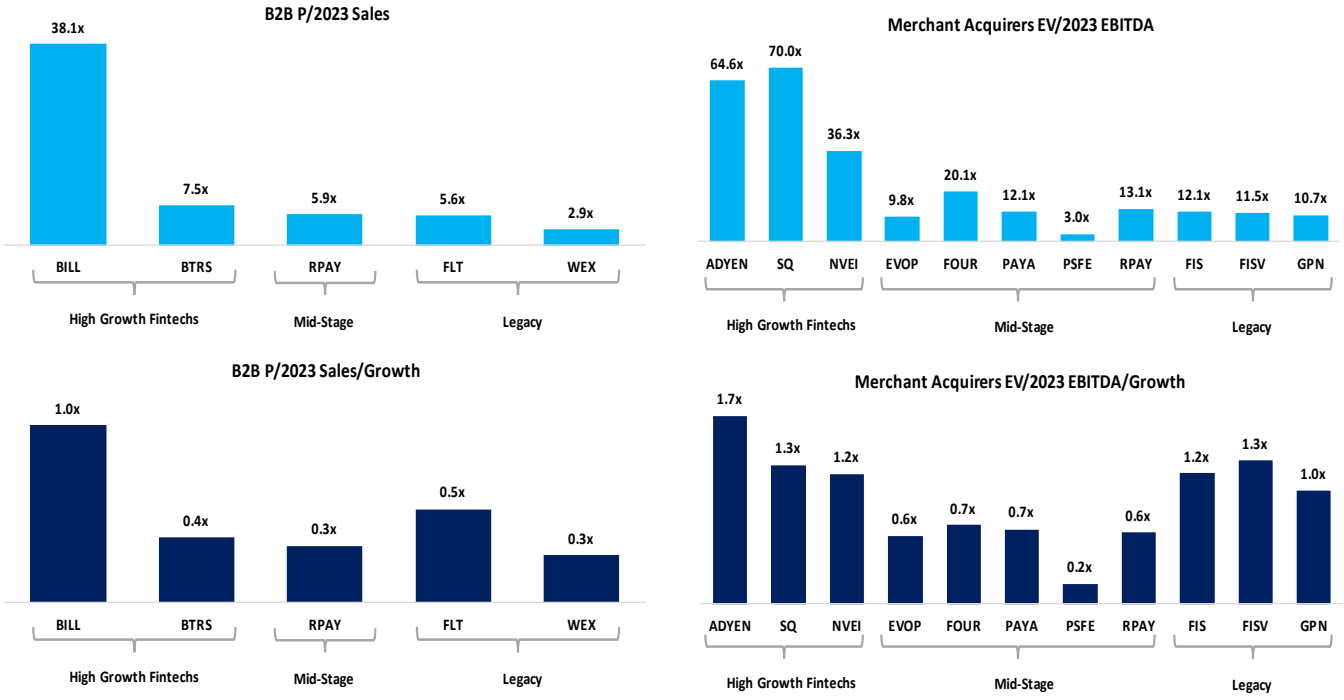
Within payments, few flows are more representative of both the demand for high growth and the willingness to overlook near-term profitability than B2B payments. With estimates appraising the B2B TAM at around $125 trillion, there has been a surge in new competitors coming to market aspiring to capture their own piece of the pie. In order to do so, they require significant investments today that will leave the companies unprofitable for years to come, yet investors both the private and public markets are rewarding these players with high valuations. Meanwhile, legacy players with expertise in the B2B payments space are under intense pressure from investors to maintain and expand profitability, while striving to compete with the heavily funded efforts of new entrants who remain un-penalized despite their lack of profitability. These players are thus enabled to seek growth with little regard for margins today in hope of reaching scale and capturing market share.

Similarly, high growth competitors in the merchant acquiring space are also garnering sky-high valuations as they attempt to take share from legacy players. Here, new players are touting modern technology and a single integrated platform to merchants that allows them to go to market more efficiently and take share. Still, much of the valuation story remains the same, with public market investors rewarding emerging players without a focus on profitability, thereby enabling them to compete more aggressively with legacy competitors in terms of investing both organically and inorganically, than may otherwise have been possible.

As an example, the high valuation of existing high growth public payments companies, as well as the positive reception of private companies entering the public markets, creates the potential for acquisitions that would be cost prohibitive for legacy players with lower valuations. The ability to use highly valued stock as a currency is a distinct advantage, such as in the case of Square's recent acquisition of Afterpay. The deal was far less costly for Square than if it had funded the deal with lower multiple stock or cash, and it significantly enhanced the company's future growth. Similarly, the high valuations attributed to new market entrants is fueling the entry of additional companies to the public market, which then allows them to use stock for growth-enhancing acquisitions.

While in some cases, we believe that new entrants have the moat and capability to be long term winners, which is being reflected in their valuations today, the market's willingness to overlook profitability in favor of growth is potentially also helping a slew of inferior businesses grow more aggressively in the moment, having significant implications for legacy players.

Exhibit 47: Payments Valuation Multiples



Pricing as of 11/15/2021

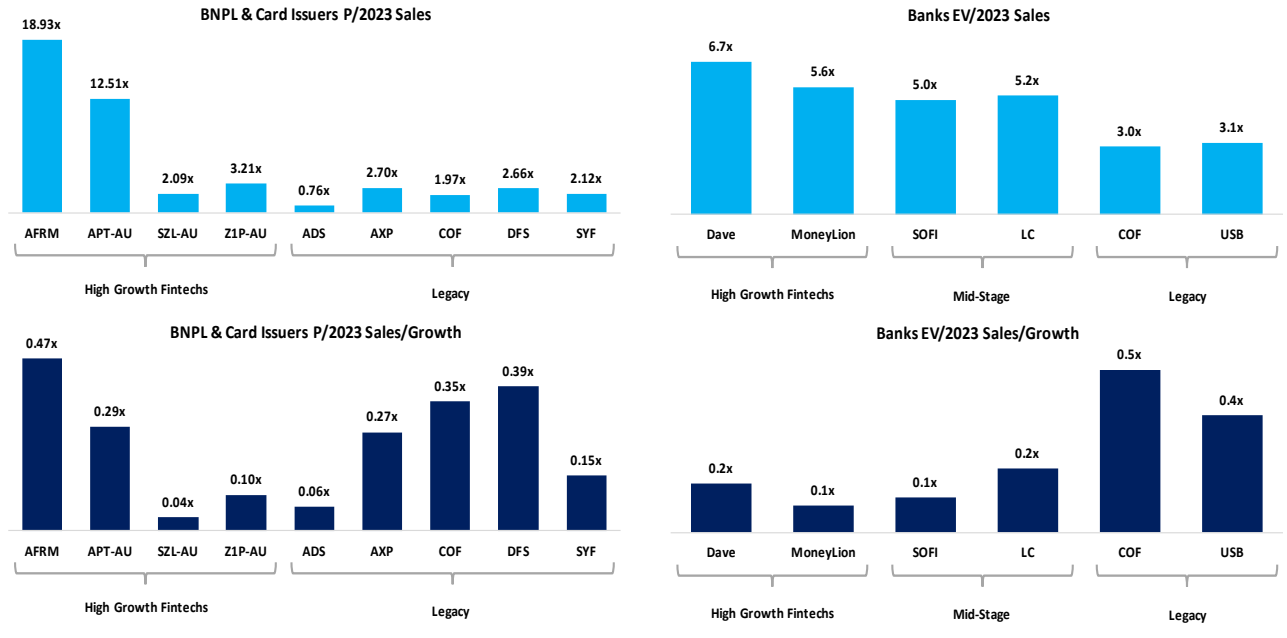
Source: FactSet and KBW Research

Neobanks/Lending

In the world of banking, the slow pace of technological improvement, high fee structure, and limited inclusivity of underserved consumers in traditional banking have been a few of the many factors leading to the rise of neobanks. Seeking to capitalize on these inefficiencies, countless new competitors have created startups in recent years, and valuations have been growing exponentially, despite limited visibility on a path to long-term profitability and revenue drivers that could be subject to regulatory risk (more on that below). As a result of those valuations, multiple neobanks have been raising additional funds and coming to market via SPAC. While the true neobanks are clearly being rewarded in spite of little clarity on future profitability, mid-stage companies with adapting business models are also getting compensated for molding into digital versions of more traditional banks via acquisitions of whole banks or bank charters.

On a similar note, entrants in the Buy Now Pay Later arena are garnering lofty valuations today as a result of the accelerating use of split pay and installment products by consumers. While growth is a key driver leading to such valuations, the majority of players again remain unprofitable today and operate in a landscape of significant regulatory uncertainty, in addition to being unproven operators through a full credit cycle. The willingness of investors to reward players in the space for volume growth is another example of both private and public investors' willingness to fund growth at the expense of profits in hopes of winning in the long run.

Exhibit 48: Neobank/Lending Valuation Multiples



e: MoneyLion and Dave multiples use company estimates and implied value at SPAC merger announcement

Pricing as of 11/15/2021

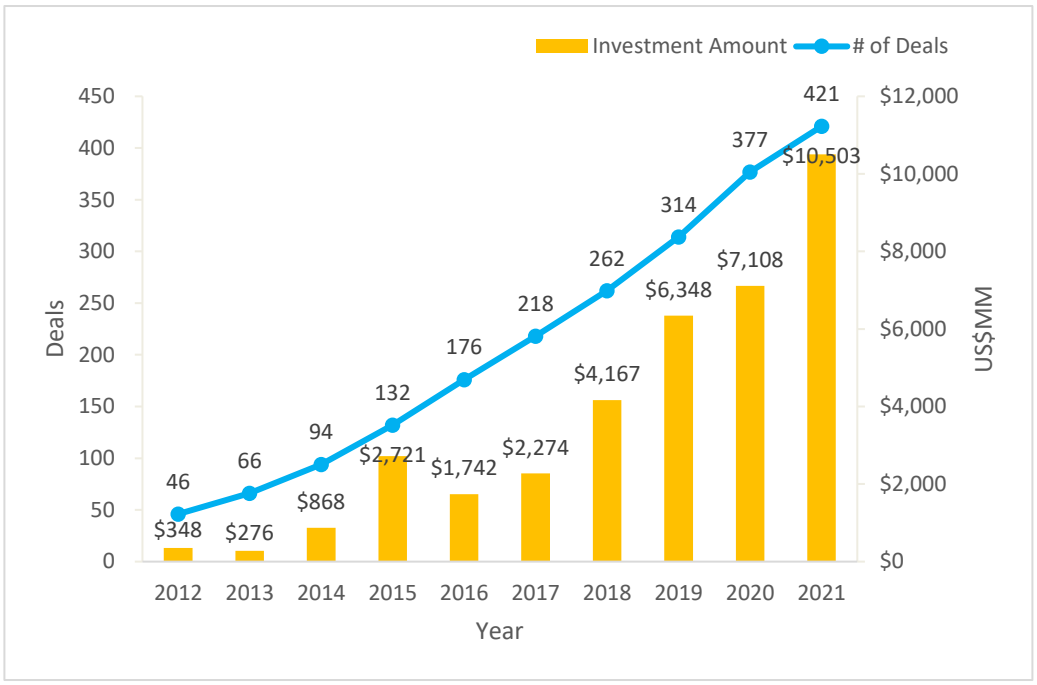
Source: FactSet and KBW Research

Insurance

Investor appetite is continuing to grow in the broadly termed insurtech market, but the gap between 2021 returns in the handful of public insurtech companies and the total global interest in the private markets are not necessarily currently aligned. Private investment already broke 2020's record through the first three quarter of the year with $10.5 billion, on track to be double pre pandemic levels in 2019.

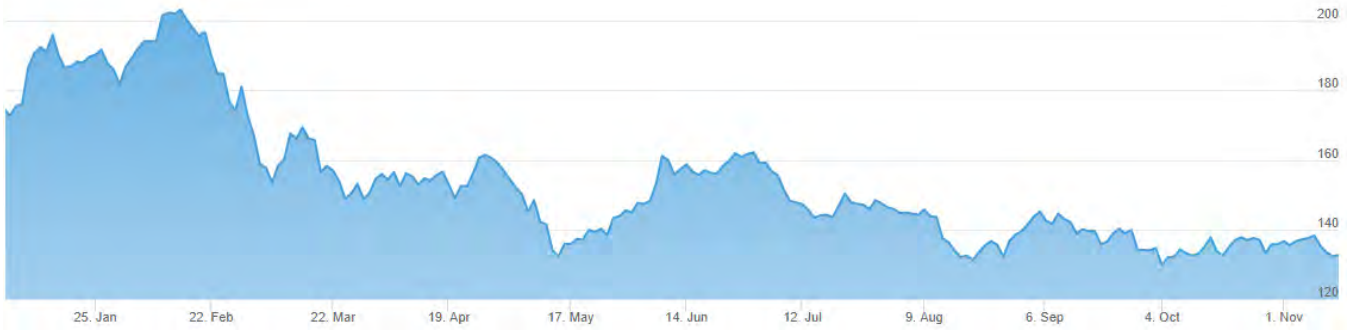
This explosion in funding excludes the equity capital raised in the year with the multitude of SPAC mergers, HIPO, KIN, and MILE (recently announced to be acquired by LMND), to name a few, which demonstrates the uptick interest across public and private markets. This likely indicates interest is not waning in the near term to find unique opportunities, but the public market performances may signal a sector finding its footing and valuation as a newly traded cohort. Year-to-date performance is down roughly 30% as of publication, but relative to value stocks and the insurance market as a whole, valuations note that investors are seeking growth. The desire to find growth companies in the global $6 trillion insurance market has seen new and diverse investor entrants and the spawning of insurtech-dedicated funds from traditional VC and PE funds will be played out in the coming years.

Exhibit 49: 2021 Is Tracking Significantly Higher in Both Gross Dollar Amount and Deal Volume



Source: Willis Towers Watson, CB Insights, KBW Research

Exhibit 50: HSCM Public Insurtech Index Is Down 30% YTD but Investors Are Still Intrigued

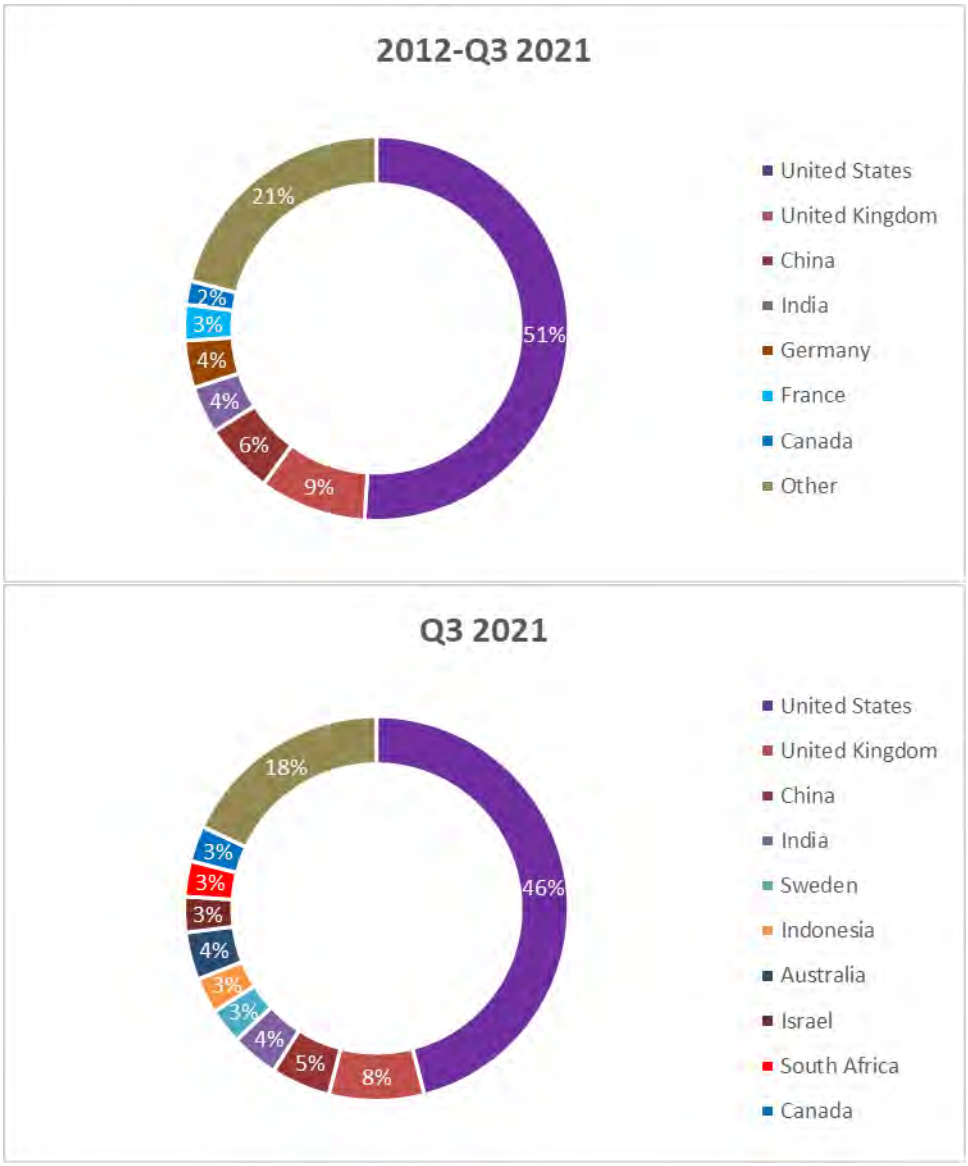


Source: HCSM, KBW Research

Insurtech is a phrase that has been around for only half of a decade now. Grouping all types of businesses together – from MGAs to Brokers to Carriers to Data Companies and more - loses the diversity and complexity of companies that are coalescing to augment the industry. The story is evolving from disruption to augmentation. Each part of the value chain is now able to be improved and investors are seeing an opportunity to understand the individual TAMs the industry.

This varies across geographies as some Insurtechs are looking for growth in the $2.5 trillion US market while others in emerging markets are shaping the expansion of the incumbent market. This is an enticing story as new technology does not beget the shrinking of the market, but rather an expansion, unlike other traditional fintechs seeking efficiency only. The opportunity is in the efficiency of an ever growing revenue pie. Funding is still dominant in the US, but the relative share is decreasing with a wider geographical footprint.

Exhibit 51: US Insurtech Funding Still Leads, but Is Shrinking as Markets Mature Globally



Source: Willis Towers Watson, CB Insights, KBW Research

Pure technology insurtech companies will likely be the driver of the next wave of exits. Whether through acquisition by the larger incumbents, such as GWRE's acquisition of HazardHub or similar to the purchase of RiskGenius by Bold Penguin with insurtech's bolting on pieces to improve their own marketability. Though the TAM of these pure tech players may be smaller than the underwriters, the ability to grow with healthy margins sells a different story to a broader set of investors.

The complexity of the industry is an often overlooked reason for how "slow" insurers have been to innovate in the eye of the consumer, helping to bolster the interest globally to invest in what can be. The fintech market has seen the evolution of payments, wealth management and banking, among others, and the insurtech industry is understanding the lessons learned, but investors are also taking note.

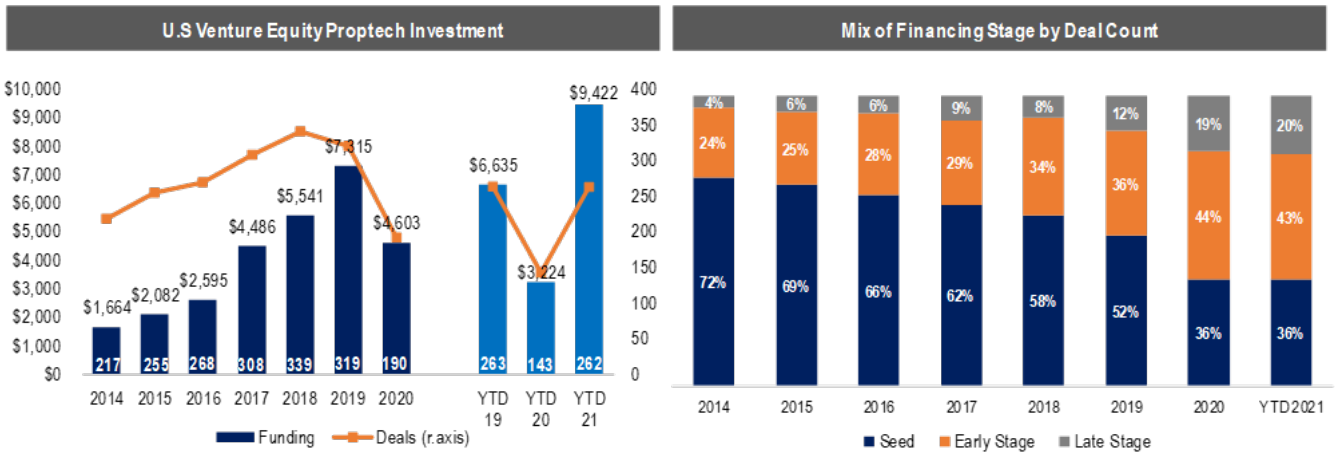
With advancement in core underlying technologies, particularly in machine learning, intelligent process automation, computer vision, and no-code development platforms, the industry structure should begin shifting rapidly with those who can adapt, blurring the lines between the incumbents and startups, creating more read-through opportunities of innovation overall.

Proptech

While the term “proptech” was only recently coined within the last decade or so, a handful of real estate technology incumbents have quietly forged their own paths to success beginning as early as the 1980s (Proptech 1.0), including firms like CoStar (CRE information), Autodesk (architecture, engineering, and construction technology), and Yardi and RealPage (rental property management technology). The turn of the century brought a new wave of entrants (Proptech 2.0), including firms like Procore (2002), Redfin (2002), Zillow (2004), and AppFolio (2006). Despite a growing landscape of technology players with a dedicated focus on the real estate category, the sector has historically been without a home in the eyes of public investors, and instead has been grouped with other established technology sectors such as information technology, business services, and broader software.

It wasn’t until around the 2010s that a rapid acceleration of private investment in early-stage real estate technology companies did “proptech” begin to establish its own reputation as a stand-alone, emerging sector. According to JLL, proptech firms have raised a combined $97 billion in equity funding over the last decade globally, while the number of startups have increased four-fold from under 2,000 to nearly 8,000 firms. In the U.S., we estimate equity funding for proptech has increased at a 32% CAGR since 2014 (totaling a cumulative $36 billion), while 2021 U.S. equity funding activity for proptech is running at a record pace of $9.4 billion year-to-date through mid-October.

Exhibit 52: U.S. Proptech Venture Equity Funding

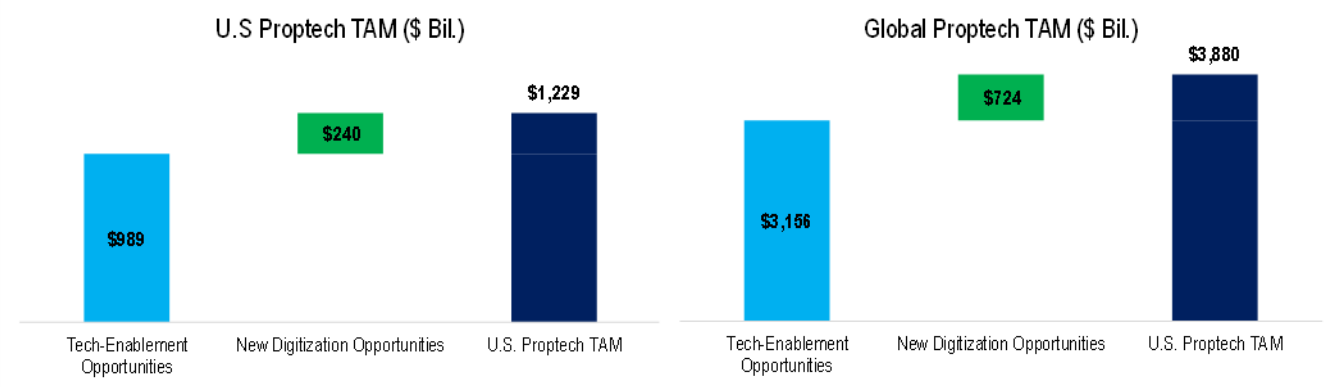


Source: Company reports, Crunchbase, Pitchbook, and KBW Research

The opportunity for these legacy and emerging proptech players is clear—a massive TAM backed by the largest asset class in the world with global real estate values totaling over $250 trillion. In the U.S. alone, the $55 trillion real estate market (by asset value) sees an estimated $5-6 trillion in annual transaction volumes across both residential and commercial asset sales and mortgage origination. This in turn drives approximately $1 trillion of annual real estate-related fee revenues (i.e. commissions and other fees), all of which are ripe for tech-enablement or outright disintermediation. We estimate the global real estate sector drives approximately $3.2 trillion in services revenue annual. The advent of new technologies has also resulted in entirely new revenue opportunities, which we estimate total approximately $725 billion in revenues globally and $240 billion in the U.S,

including in such areas as property management software, construction management software, smart home automation, online marketplaces, and data and analytics.

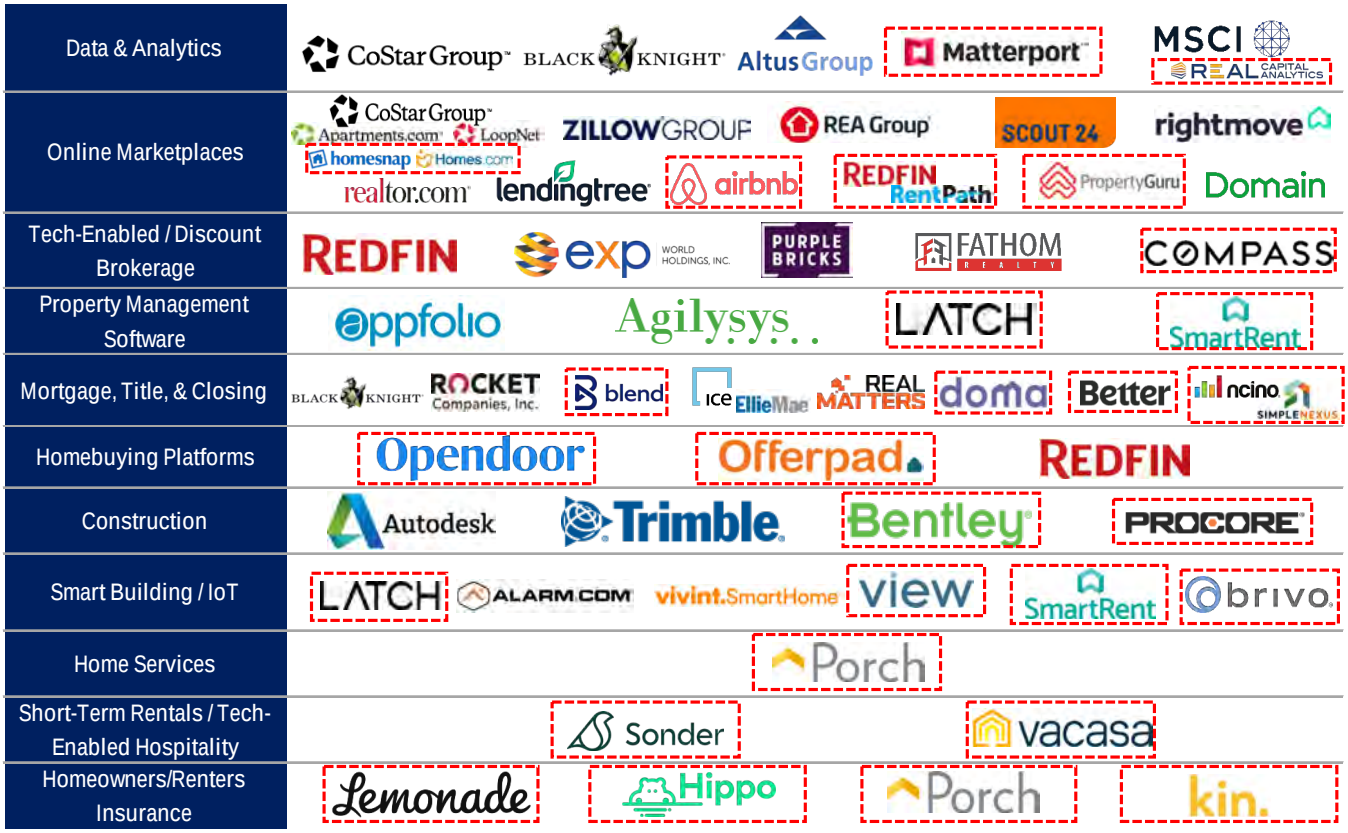
Exhibit 53: U.S. and Global Proptech Tech-Enablement & Digitization Opportunities



Source: KBW Research

Over the last two years, the landscape of private proptech firms has rapidly matured driven by growing adoption and acceptance of their business models, ample private investor appetite for exposure to the high growth sector, and accelerating M&A-led consolidation. As category leaders have begun to emerge and garner material valuations, the landscape of public proptech companies has increased rapidly, more than doubling in size by company count over the last 18 months to over 40 firms with a combined market capitalization approaching $500bn.

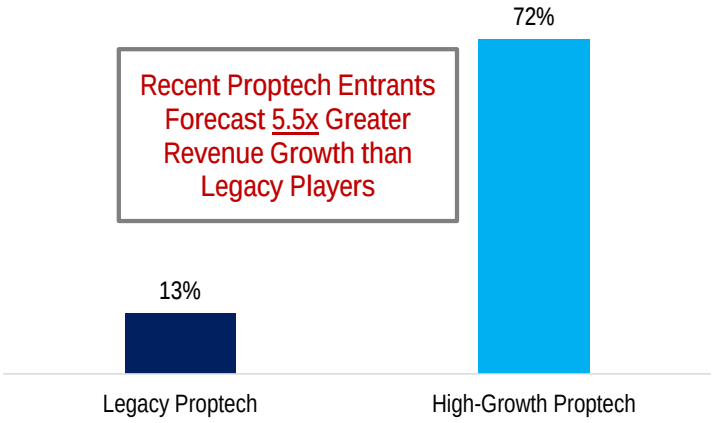
Exhibit 54: Public Proptech Players



Source: KBW Research.

With the public proptech sector beginning to reach a critical mass of participants, public investor interest in proptech has increased meaningfully over the last 2 years, thereby helping to carve out a new technology/real estate sub-sector for proptech. In addition, incumbent real estate technology firms that once partially benefited from scarcity value are now beginning to face stiffer competition for capital allocation as investors are now faced with numerous options to gain exposure to proptech. Further, the more recent public entrants, having been brought public predominantly through SPACs and to a lesser extent traditional IPOs and directly listings, are oftentimes backed by much higher growth stories than the incumbents as they are monetizing in many cases entirely new TAMs and are earlier on in their life cycles. For example, for the 16 proptech SPAC mergers announced over the last 18 months, we estimate an average revenue CAGR projection of 72% (per management forecasts). This compares with 13% for legacy real estate technology players.

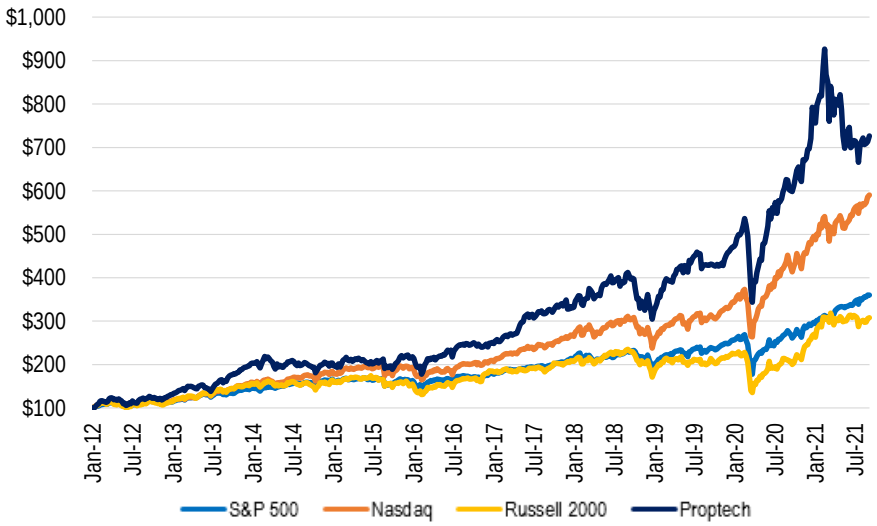
Exhibit 55: Recent versus Legacy Proptech Revenue Growth



Source: Company reports, FactSet, and KBW Research

To date, most proptech players, especially those in the public markets, have been more focused on digital enablement of traditional real estate incumbents and established processes rather than outright disruption. However, there are some notable exceptions—most prominently in the residential housing market where certain players aim to disintermediate prior norms such as traditional real estate agents. As a result, the growing appetite from public investors for exposure to proptech has been a combination of traditional real estate investors aiming to augment their returns with technology plays as well as traditional technology and fintech investors aiming to diversify their portfolios into another high-growth sector with strong secular tailwinds.

Exhibit 56: KBW Proptech Index



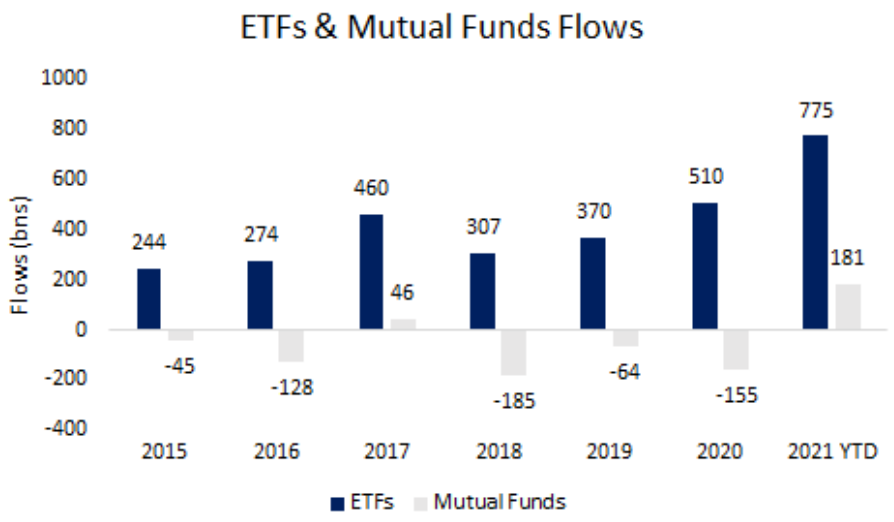
Source: FactSet and KBW Research.

Digital Wealth/Asset Management

The willingness of investors (both public and private) to pay up for growth has mainly impacted the wealth/asset management industry to the extent it has funded the digital revolution in the delivery of investment advice and investment services, which in turn has a fundamental impact on the types of investment products and strategies that are in demand.

As we reviewed in our October 5, 2020, research report titled, "Yogi Says, "The Future Still Ain't What It Used to Be,"" One key outcome of which is the shifting of many financial advisors' (and investor's) idea of alpha generation to advice and asset allocation, and away from active security and investment product selection. The digital revolution in the delivery of investment advice and services means that sophisticated, scalable, and automated asset allocation and portfolio management tools, as well as investment advice, such as those utilized by companies such as newer companies such as SoFi, Betterment, and Wealthfront, or Pensionbee or Embark in the U.K., are available to greater numbers of potential investors at lower costs. Many of these investment and allocation tools and strategies used by these organizations incorporate low-cost and easy-to-trade ETFs. For many financial intermediaries, this shifts the focal point of their value added to the asset allocation process (or other advisory activities) as the source of differentiated returns or value-added, as opposed to the investment skills of a manager. Derivatively, this has decreased demand for many traditional active investment strategies, which has contributed. The increased usage of ETFs as fuel for these cheap allocation services and model portfolios is one of the drivers behind the explosive growth of ETFs over the past several years relative to more traditional mutual fund products. With respect to retail wealth management, many younger growth-stage companies have the benefit of investors simply valuing their businesses off of revenues or even the number of users, with no near-term interest in profitability. This allows these companies to invest heavily in market disrupting products, which include Robinhood's push to commission-free trading in equities, options and ETFs.

Exhibit 57: Annual Flows to ETFs versus Mutual Funds



Source: Morningstar Direct, KBW Research

Note: Effective Date: 11/17/2021

Public Market Hunger for Growth has also manifested itself in what asset managers and distributors are willing to pay for technology enabled investment management businesses. ETF businesses have long-garnered premium valuations such as WETF trading at 15x our 2023 EPS forecast compared to a peer group average 12x, or BLK with its large ETF business, technology platform, and quantitative investment business trading at 20x 2023 estimates. In turn both WETF and IVZ in the past paid 13x-20x EBITDA or more for ETF businesses when traditional managers trade at closer to 9x.

Also, one of the fastest growing product categories in the wealth management channel is the technology intensive direct indexing and portfolio customization business. This business allows wealth managers to compete more directly with cheap index products by offering customized investment exposures in addition to the opportunity for generating tax alpha through portfolio optimization. Eaton Vance has been the largest managers of these customized portfolios and we believe it was a contributing factor to not only EV's growth, but more notably Morgan Stanley's willingness to pay a substantial premium valuation that we estimated at 14x EBITDA. Similarly, not long after, BlackRock paid an estimated 20x revenue for personalized index manager Aperio.

8. Uneven Regulatory Playing Field

Key Areas explored in this section:

- ***Payments and US Banks***
- ***European Banks***
- ***Exchanges***
- ***Digital Wealth/Asset Management***

Uneven Regulatory Playing Field

The financial service regulatory framework in the US tends to be entity-based as opposed to activity-based. For example, banks are subject to minimum capital and liquidity requirements as well as additional regulations related to consumer protections, anti-money laundering etc. However, by and large, no adjustments have been made to the applicability of these regulations to accommodate fintechs that are also providing similar financial services.

Some may argue that the emergence of Neobanks in the US is in large part attributable to regulatory arbitrage which protects small banks (under $10 billion in assets) from debit interchange caps. The primary revenue driver for Neobanks (mostly not licensed as financial institutions themselves) today is payments monetization via debit card products, which in turn they are able to optimize by working with multiple licensed card issuers in order to benefit from the interchange cap exemptions.

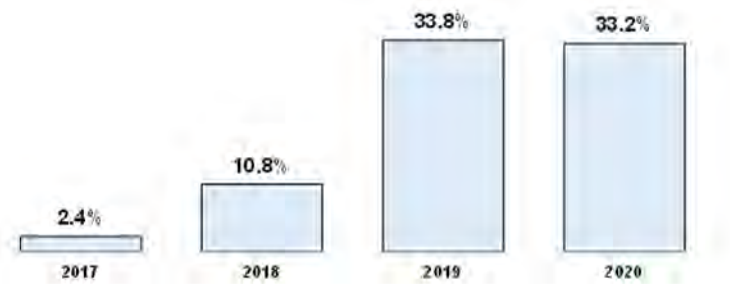
This is one of many examples of how fintechs are advantaged versus the incumbents under the current regulatory paradigm. The question is whether this regulatory paradigm will need to evolve to accommodate fintechs as some of the startups gain critical mass and become more meaningful players without appropriate regulatory oversight. On the other end of the spectrum are crypto assets, which are a nascent asset class with limited rules and regulations in place today, which could arguably be helping rapid growth at this point in time but has potential to hinder longer-term growth of the industry. We discuss some of these discrepancies and uncertainties below.

Payments and US Banks

New fintechs such as neobanks, acquirers, and buy now pay later firms have created competitive offerings that are easy to use, driving engagement, conversion, and growth. While their success is attributable to their efficient tech stacks or focus on digital distribution, many of these names have also benefitted from looser regulatory requirements. This is rooted in the fact that many of these new fintechs are not banks, allowing them to circumvent regulation ranging from caps on debit interchange to various capital and reporting requirements. Below, we highlight areas where clear regulatory arbitrage is taking place.

Circumventing Debit Interchange Caps: Neobanks have been able to capture better economics on their issued cards by earning higher debit interchange fees relative to large banks through partnership with third party banks (such as The Bancorp Bank, MetaBank, Sutton Bank and WebBank) that allows them to be exempt from interchange caps set by the Durbin Amendment. For more context, the Durbin Amendment was added to Dodd-Frank in 2011 and set interchange caps on debit cards issued by banks with over $10 billion in assets ($0.21 + 0.05% + $0.01 for fraud prevention). By utilizing partner banks with less than $10 billion in assets, fintechs have been able to avoid this cap. Capturing higher economics has strengthened their competitive positioning, providing more funds for customer acquisition, card rewards, and potential to generate positive economics on customer segments avoided by competitors. In Exhibit 59 below, we show GDV growth rates for The Bancorp Bank, a notable partner bank for Neobanks such as Chime, which serves as a proxy for how fast Neobanks are growing, and highlights recent acceleration over the past two years. As new entrants continue to take share, we'll be looking out for any potential amendments that could affect this dynamic. Recall, the Fed recently published a notice of proposed rulemaking (NPR) to amend Regulation II of Durbin Amendment to broaden network choice for card-not-present transactions. With large US banks voicing their concerns around an uneven regulatory playing field, we'll be on the lookout for any potential changes to the Durbin exemptions down the road.

Exhibit 58: The Bancorp Bank GDV Growth Rates (Prepaid/Debit)



Source: Company filings and KBW Research

Looser Capital and Disclosure Requirements: Compared to banks, new fintechs have also benefited from looser capital requirements, particularly those offering buy now pay later services (BNPL). These benefits extend to limited operating risk capital and liquidity requirements, and it's not because their products are inherently less risky. It's because they are not banks, and are thus exempt from common rules. Like firms able to bypass debit interchange caps, these looser requirements have strengthened their unit economics leading to increased funding for marketing and investment. Furthermore, new fintechs face

lax requirements relating to FDIC insurance, UK bank levy/surcharges, privacy/data restrictions, KYC/AML requirements, social requirements (CRA), and reporting requirements among others. A notable example is how BNPL providers typically don't report to credit rating agencies, even if customers miss payments and incur fees, which could lead to the consumer being more levered than what the ratings agencies report. It's worth noting that regulators across the world are beginning to take notice as the BNPL companies in Australia have self-regulated through their own code of conduct, while Europe is looking into the industry with the Financial Conduct Authority (FCA) in UK having announced plans to overhaul consumer credit regulation. While the CFPB in the US has only published a blog (link) about BNPL thus far, we expect further reviews by regulators going forward - especially as market incumbents launch their own product offerings. Notable examples include ADS' acquisition of Bread, SYF's launch of SetPay Pay in 4 in October, and COF's testing of its BNPL product at select partners.

Exhibit 59: Bank and Nonbank Regulation Requirements

Bank	Fintech / Nonbank
1. Higher Capital Requirements (Also requires expensive debt and non-tax deductible preferreds), Even on Deposits	**1.** Lower Capital Requirements, Set By Market
2. Operational Risk Capital	**2.** No Operational Risk Capital
3. Extensive Liquidity Requirements	**3.** No Liquidity Requirements
4. FDIC Insurance	**4.** No FDIC Insurance
5. UK Bank Levy and Surcahrges	**5.** No UK Bank Levy or Surcharges
6. More Costly Regulations (eg. Loans, CFPB, OCC), Including Resolution Planning and CCAR	**6.** Less Costly Regulations
7. Heavy Restrictions Around Privacy and Use of Data	**7.** Fewer Privacy Restrictions, Virtually No Data Restrictions
8. Extensive KYC / AML Requirements	**8.** Less Extensive KYC / AML Requirements
9. Substantial Social Requirements (CRA)	**9.** No Social Requirements (CRA)
10. Extensive Public and Regulatory Reporting Requirements (eg. Disclosure, Compensation)	**10.** Limited Public and Regulatory Reporting Requirements
11. Lower Revenue Opportunities (ie. Durbin)	**11.** Higher Debit Card Income

Source: JPM Annual Report

European Banks

In Europe, the regulators are increasingly taking a "same activity, same risk, same regulation" approach when deciding where the regulatory perimeter lies. This in theory should limit the regulatory arbitrage between banks and non-banks and even big tech firms, for instance.

The incumbents are still disadvantaged in some areas. There is a cultural (and sometimes deliberate) barrier to exploiting customer data for the benefit of the firm, unlike many big tech companies. Trust in financial institutions is therefore often surveyed as being much higher than trust levels for big tech firms or even governments. Open banking is exaggerating this difference even further: banks are required to share data in a standardized format with third parties, if the customer gives permission. However, non-banks do not need to share their data with banks in the same way.

Regulators in the UK in particular are clear that in the context of a CBDC that the BoE is more than open to transformative change noting that their role is "maintaining monetary & financial stability … not seek to preserve … any particular business model."

The various regulatory sandbox entities have been a huge success, in allowing fintechs to get used to the regulators' expectations and to avoid tripping up later in their development. The "rule breaking" mantra might be cool in tech circles, but will impress few regulators. 8 years ago, fintech CEOs would proudly say they are rule breakers, whereas the mantra today, from all serious fintechs, is that they welcome regulation.

Therefore, our view would be that while some fintechs have been less regulated in the past, the regulators are more able and willing to respond to regulatory arbitrage. At the same time, they are keen to foster and promote innovation and competition, not to protect the incumbent banks.

Exchanges

It is not every day that a new tradable asset class rapidly forms. However, this is exactly what has happened with the adoption and growth of cryptocurrencies. Many crypto exchanges were formed less than five years ago in what seemed to be a nascent crypto industry. Now, the value of some of these crypto exchanges have far surpassed their traditional counterparts, as the growth in crypto assets has rocketed to $2.7 trillion. In the U.S., these crypto exchanges must apply for a money transmitter license (FinCen), as well as a BitLicense to operate in New York State. However, up until now, crypto exchanges have largely fallen through the cracks between the regulatory bodies of the SEC and CFTC, and the level of regulatory burden on crypto exchanges from these agencies has been very light relative to their traditional counterparts. For example, the traditional financial exchanges are mostly fully registered with the SEC (securities exchanges) and/or the CFTC (commodity derivatives exchanges) and also with other international regulators. For crypto, there is also some uncertainty on what regulators can actually regulate for globally-operated trading platforms, some of which with no centralized exchange mechanism.

The lighter regulatory environment has paved the way for new exchanges to grow rapidly as the incumbent exchanges' have been reluctant to provide trading in cryptocurrencies without a more formal regulatory regime in place (the exception being launching regulated futures contracts on underlying crypto assets). SEC Chairman Gary Gensler has emphasized that regulators already have significant power to regulate cryptocurrencies, but that legislation may also be required to properly address regulatory gaps as a result of

this new technology. We believe that regulation is necessary for the long term growth of the crypto ecosystem, although we acknowledge that this may be painful as it could slow innovation and adoption.

Once a more concrete regulatory environment for cryptocurrencies is in place, we believe that there could eventually be a long-term convergence of available, tradeable assets between the incumbent exchanges and the largest, regulatory-compliant cryptocurrency exchanges. In this case, traditional exchanges may move more directly into the trading of digital assets, but crypto exchanges may also compete more directly with traditional exchanges as traditional assets become tokenized or are issued on blockchains. For now, these companies will likely continue to operate in seemingly independent industries from one another, but this could change quickly depending on regulatory developments globally over the next decade.

Digital Wealth/Asset Management

Despite the threat of more imminent regulation, cryptocurrency brokerage platforms today currently operate with more regulatory leeway in comparison to traditional brokerage platforms, specifically allowing for these platforms to more quickly launch new products within the crypto space in comparison to that of traditional brokerages. This, however, could be changing, as evidenced by the SEC's decision in September to deliver a Wells notice to Coinbase regarding its impending lending product on eligible customer USDC deposits, as well as regulatory scrutiny at the state level on some of these products offered by other crypto-specific platforms. This is without considering the ramifications of potential securities designations on underlying cryptocurrencies and/or related activities (e.g., staking). The recent SEC actions and statements from SEC commissioners suggest that this regulatory gap may be narrowing somewhat. In fact, full regulatory clarity that results in more concrete, firm regulatory rails will likely lead the way for more of the incumbent financial players to enter this market, with Charles Schwab suggesting as such this year. However, while the regulatory gap may be narrowing somewhat, we still don't expect regulatory clarity industry-wide without congressional action. Therefore, some of these traditional brokers may elect to remain on the sidelines. Even if traditional players enter this crypto market in a meaningful way, the uneven regulatory playing field has already led to the creation of platforms with millions of users, and some will be able to retain these customers due to their first mover advantage over the long-term.

Track Fintech in Real-Time with KFTX

KBW in partnership with Nasdaq provides the KBW Nasdaq Financial Technology Index (KFTX), which is a unique index that allows investors to track and keep pace with the acceleration and interest in fintech through a single index of fintech companies.

KFTX is an equal-weighted index that tracks the performance of companies that leverage technology to deliver financial products and services. Their distribution is nearly exclusively electronic, with limited or no "bricks and mortar," and their revenue mix is predominantly fee-based. Fintech firms leverage new assets such as advanced data aggregation and analysis, innovative technology, and creative thinking.

Fintech is a relatively new industry designation garnering increasing investor attention. Fintech is not consistently defined and the term is used to describe many different types of companies classified in various industries. KFTX leverages KBW's financial services expertise and Nasdaq's long history of creating innovative, market-leading transparent indexes to provide investors with the most precise index representation of fintech available in the market.

As of September 30, KFTX consisted of 48 members ranging from payments companies to software companies to internet banks. The 48 fintech companies that compromise KFTX account for almost $2.4 trillion in aggregate market capitalization.

Below is a breakdown of the current constituents as well as a breakdown of the sub-sectors weightings within the KFTX. The top three sub-sector contributors to the index are: networks/payments (31.5%), financial data (18.5%), and exchanges/trading (12.7%). The remaining six sub-sectors account for less than 10% of KFTX's weighting.

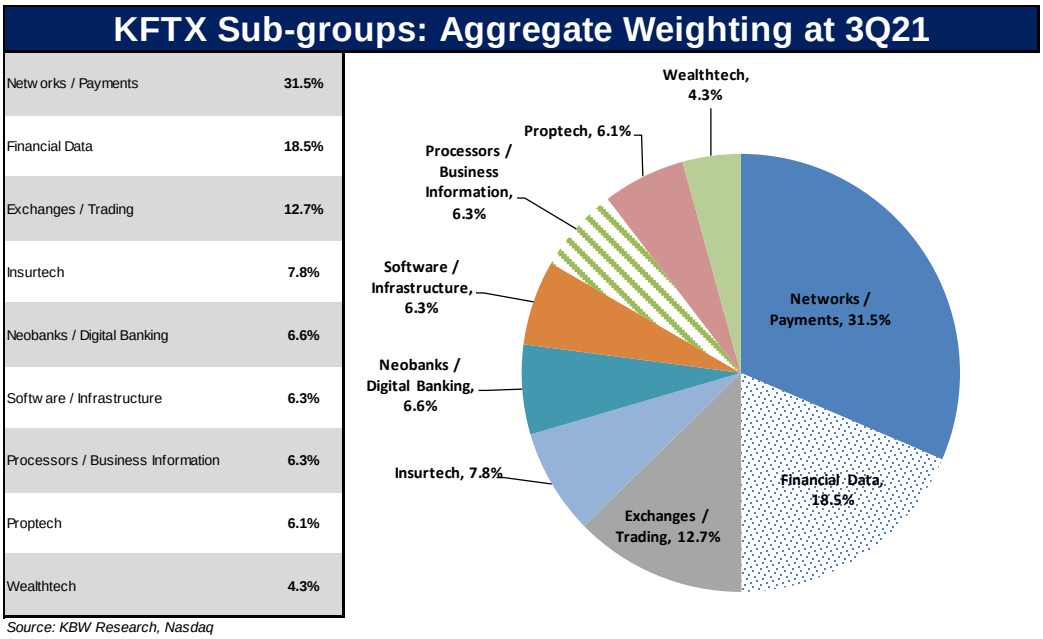
Exhibit 60: Constituents of the KBW Nasdaq Financial Technology Index

Ticker	Company Name	Sub-classification
ACIW	ACI Worldwide, Inc.	Networks / Payments
ADS	Alliance Data Systems Corporation	Financial Data
AXP	American Express Company	Networks / Payments
AX	Axos Financial, Inc.	Neobanks / Digital Banking
BKI	Black Knight, Inc.	Proptech
EPAY	Bottomline Technologies (de), Inc.	Networks / Payments
BR	Broadridge Financial Solutions, Inc.	Processors / Business Information
CBOE	Cboe Global Markets Inc	Exchanges / Trading
CME	CME Group Inc.	Exchanges / Trading
CSGP	CoStar Group, Inc.	Proptech
DCT	Duck Creek Technologies, Inc.	Insurtech
ENV	Envestnet, Inc.	Wealthtech
EFX	Equifax Inc.	Financial Data
EEFT	Euronet Worldwide, Inc.	Networks / Payments
EVTC	EVERTEC, Inc.	Networks / Payments
FDS	FactSet Research Systems Inc.	Financial Data
FICO	Fair Isaac Corporation	Financial Data
FIS	Fidelity National Information Services, Inc.	Software / Infrastructure
FISV	Fiserv, Inc.	Software / Infrastructure
FLT	FleetCor Technologies, Inc.	Networks / Payments
GPN	Global Payments Inc.	Networks / Payments
GDOT	Green Dot Corporation	Networks / Payments
GSKY	GreenSky, Inc.	Networks / Payments
ICE	Intercontinental Exchange, Inc.	Exchanges / Trading
JKHY	Jack Henry & Associates, Inc.	Software / Infrastructure
LMND	Lemonade Inc	Insurtech
LC	LendingClub Corp	Neobanks / Digital Banking
MKTX	MarketAxess Holdings Inc.	Exchanges / Trading
MA	Mastercard Incorporated	Networks / Payments
CASH	Meta Financial Group, Inc.	Neobanks / Digital Banking
MCO	Moody's Corporation	Financial Data
MSCI	MSCI Inc.	Financial Data
NDAQ	Nasdaq, Inc.	Exchanges / Trading
PYPL	PayPal Holdings Inc	Networks / Payments
ROOT	Root, Inc.	Insurtech
SPGI	S&P Global, Inc.	Financial Data
SEIC	SEI Investments Company	Processors / Business Information
SQ	Square, Inc.	Networks / Payments
SSNC	SS&C Technologies Holdings, Inc.	Wealthtech
TRI	Thomson Reuters Corporation	Financial Data
TRU	TRANSUNION	Financial Data
VRSK	Verisk Analytics Inc	Insurtech
VIRT	Virtu Financial, Inc.	Exchanges / Trading
V	Visa Inc.	Networks / Payments
WU	Western Union Company	Networks / Payments
WEX	WEX Inc.	Networks / Payments
WETF	WisdomTree Investments, Inc.	Processors / Business Information
Z	Zillow Group, Inc.	Proptech

Source: KBW Research, Nasdaq. Data as of 9/30/21.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Exhibit 61: KFTX Sub-Groups: Aggregate Weighting at 9/30



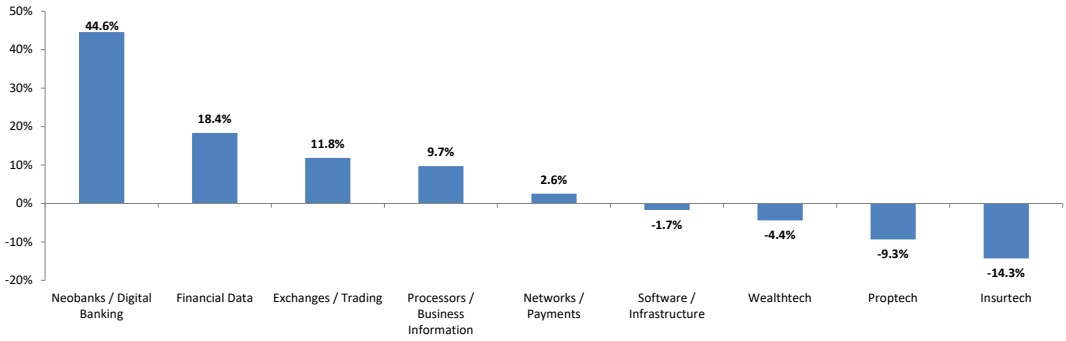
Source: KBW Research, Nasdaq

Source: Nasdaq and KBW Research, data as of 9/31/2021

In 2021 through September 30, neobanks and digital banks, which comprise 6.6% of the KFTX, led the way in terms of performance, advancing 44.6% on average. Insurtech, which accounted for 7.8% of the index, had the worst performance falling 14.3% on average.

The largest contributor to KFTX weighting, Networks/Payments, accounted for 31.5% of index weighing, and rose just 2.6% in 2021 to date and materially lagged the market, weighing on overall KFTX performance. The other two top three sub-sector contributors to KFTX weighting, financial data and exchanges/trading, rose 18.4% and 11.8%, respectively and outperformed the S&P 1500 Index.

Exhibit 62: Average Price Performance of KFTX Sub-Groups in 2021-YTD

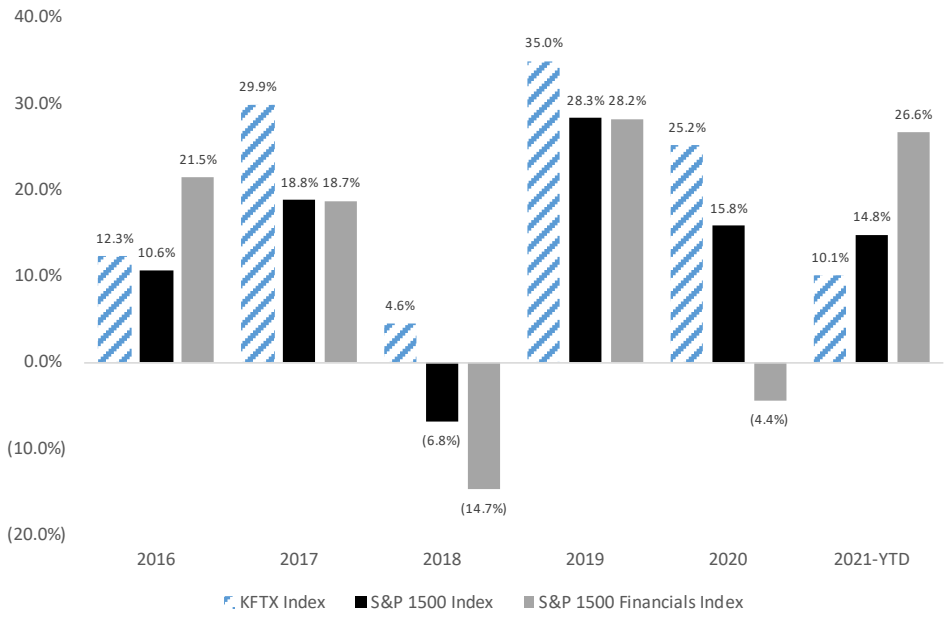


Source: Nasdaq, FactSet, and KBW Research; 2021-YTD is through 9/30/2021

Over the last five years, KFTX consistently outperformed the S&P Composite 1500 Index. But, this has not played out this far in 2021-YTD, as the S&P Composite 1500 Index rose 14.8% while KFTX advanced a more modest 10.1%. KFTX also outperformed the S&P

Composite 1500 financials each year save 2016 and 2021-YTD. In 2021-YTD, KFTX meaningfully lagged the S&P Composite 1500 financials which rose 26.6%.

Exhibit 63: KFTX Performance Since 2016



Source: Bloomberg and KBW Research; 2021-YTD Data is through 9/30/21

Key Index Details

Index Description:	An index that tracks companies that leverage technology to deliver financial products and services, with nearly exclusively electronic distribution and limited or no "bricks and mortar" exposure, and a predominately fee-based revenue mix.
Index Weighting Methodology:	Equal-weighted
Number of Components:	Variable, presently 48
Membership Rebalance Frequency:	Annually on the third Friday in December
Index Rebalance Frequency:	Quarterly Rebalance - occurs on the third Friday in March, June, September and December
Inception Value and Date:	1000 as of July 18, 2016
Data History:	Daily data from Dec 18, 2006
Index Currency:	US dollar
Dividend Treatment:	Price return and total return versions are available.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Companies mentioned in this report:

Company Name	Ticker	Price	Rating
Adyen NV	ADYEN.NA	$2,544.50	Outperform
Alliance Data Systems Corporation	ADS	$75.61	Outperform
Ally Financial, Inc.	ALLY	$48.51	Outperform
American Express Company	AXP	$176.21	Outperform
AppFolio, Inc.	APPF	$123.84	Market Perform
Bank of America Corporation	BAC	$46.32	Market Perform
Bank of New York Mellon Corporation	BK	$57.77	Outperform
Black Knight, Inc.	BKI	$71.88	Outperform
BlackRock, Inc.	BLK	$922.77	Market Perform
Capital One Financial Corporation	COF	$152.99	Outperform
Cboe Global Markets, Inc.	CBOE	$129.51	Market Perform
Citigroup, Inc.	C	$67.11	Outperform
CME Group, Inc.	CME	$226.20	Market Perform
Coinbase Global, Inc.	COIN	$323.57	Market Perform
CoStar Group, Inc.	CSGP	$81.38	Outperform
Customers Bancorp, Inc.	CUBI	$57.22	Market Perform
D.R. Horton, Inc.	DHI	$101.84	Market Perform
Deutsche Bank AG	DBK-DE	$11.38	Market Perform
Deutsche Börse AG	DB1-DE	$146.70	Market Perform
Discover Financial Services	DFS	$115.51	Outperform
EML Payments Limited	EML.AU	$2.90	Outperform
Euronext N.V.	ENX-FR	$91.55	Outperform
Federated Hermes, Inc.	FHI	$34.67	Market Perform
Fidelity Information Services (FIS)	FIS	$109.01	Outperform
Fidelity National Financial, Inc.	FNF	$51.35	Outperform
First American Financial Corporation	FAF	$76.67	Outperform
Fiserv, Inc	FISV	$101.25	Outperform
FleetCor Technologies, Inc.	FLT	$227.29	Outperform
Franklin Resources, Inc.	BEN	$34.82	Outperform
Global Payments, Inc.	GPN	$126.85	Outperform
Green Dot Corp.	GDOT	$41.75	Market Perform
HSBC Holdings, PLC	HSBC	$29.54	Not Rated
Interactive Brokers Group, Inc.	IBKR	$74.65	Market Perform
Intercontinental Exchange	ICE	$135.37	Outperform
Invesco, LTD	IVZ	$24.54	Outperform
J.P. Morgan Chase and Company	JPM	$163.05	Market Perform
Jones Lang LaSalle, Inc.	JLL	$259.70	Market Perform
Lennar Corporation	LEN	$111.13	Outperform
Live Oak Bancshares, Inc.	LOB	$96.79	Outperform
MarketAxess Holdings, Inc.	MKTX	$366.83	Market Perform
Mastercard Incorporated	MA	$348.22	Outperform
Meta Financial Group Inc.	CASH	$63.05	Outperform
Morgan Stanley	MS	$97.68	Outperform
MSCI, Inc	MSCI	$665.43	NR

Priced as of November 18, 2021.

Please refer to important disclosures and analyst certification information on pages 115–118 of this report.

Companies mentioned in this report, continued:

Company Name	Ticker	Price	Rating
Nasdaq, Inc.	NDAQ	$208.70	Outperform
New York Community Bancorp, Inc.	NYCB	$12.40	Outperform
Nuvei	NVEI	$99.93	Outperform
Paypal Holdings, Inc.	PYPL	$200.50	Outperform
PensionBee Group plc	PBEE.LN	$1.46	Outperform
Radian Group Inc.	RDN	$21.51	Outperform
RE/MAX Holdings, Inc.	RMAX	$30.91	Market Perform
Realogy Holdings Corp.	RLGY	$16.25	Outperform
Redwood Trust, Inc.	RWT	$13.82	Outperform
Repay Holdings Corporation	RPAY	$18.98	Outperform
Robinhood Markets, Inc.	HOOD	$30.53	NR
Rocket Companies, Inc.	RKT	$15.61	Underperform
Signature Bank	SBNY	$328.00	Outperform
Silvergate Capital Corporation	SI	$198.60	Market Perform
SoFi Technologies Inc	SOFI	$20.57	NR
Square, Inc	SQ	$230.35	Outperform
Standard Chartered PLC	STAN-GB	$4.61	Outperform
Stewart Information Services Corporation	STC	$77.74	Outperform
Synchrony Financial	SYF	$48.35	Outperform
T. Rowe Price Group, Inc.	TROW	$209.97	Market Perform
The Charles Schwab Corporation	SCHW	$81.72	Market Perform
The Goldman Sachs Group, Inc.	GS	$391.37	Market Perform
Tradeweb Markets Inc.	TW	$98.42	Market Perform
Victory Capital Holdings, Inc.	VCTR	$33.00	Outperform
Visa, Inc	V	$203.33	Outperform
Wells Fargo & Company	WFC	$49.90	Outperform
WEX Inc.	WEX	$138.12	Outperform
WisdomTree Investments, Inc.	WETF	$6.69	Outperform

Priced as of November 18, 2021.

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