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Chapter 12: Future-proofing residential lending through responsible innovation and data governance

12.1. Introduction

Responsibility applied to the universe of lending—home, business, automobile, credit card, or through shop merchants—is an important lens for providers (Chakilam & Rani, 2024; Challa, 2022; Chava et al., 2022). And it has increasingly become clear that responsibility is yoked to sustainability for profit as well as social returns. This paper describes the circle of responsibility and sustainability using the case of the largest category of U.S. consumer lending: residential mortgages. We begin with a point of position: young people and people with low, moderate, or even middle incomes are central to the American ideal and thus are vital to its definition of sustainability. They must remain able to achieve a classically defined American Dream: access to home ownership with a mortgage running over time that costs less than rent. This is a core principle of economic democracy in a capitalist society. It is indicated as a prime determinant of a child's attainment and an intergenerational bridge to the future. It builds personal incentives for care and maintenance, investment, and capital formation.

Recessions, declining incomes, rising costs, inflating prices, and market flimflammery are threats to the ideal. But, unlike deeply substantiated and morally powerful condemnation of intergenerational capital accumulation, sustained housing strategies anchored by historically supported lending strategies encourage the non-rich toward both a present place of happiness and a hoped-for future of sustainability. Economic determination has proved a wise choice, reinforced equally by speed and depth of recovery. Private action is needed to ward off excesses that can threaten collective futures of capital and workforce. The protective institutions have been housing policies, corporate strategy, community interventions, and bits of prescience at odd intersections of public and private life.

12.1.1. Overview of the Residential Lending Sector

Residential mortgage lending is the cornerstone of the U.S. housing finance system and for most Americans the only practical way to acquire a home. The valuation and development of residential real estate is the largest asset class in the country, with residential financing accounting for almost 70% of the credit extended in the U.S. Residential mortgage lending is also an essential activity for all financial institutions. Consequently, the housing finance ecosystem is large and diverse and includes lenders that specialize in the origination of residential mortgage loans, originators, and lenders that are independent of consumers and rely on technology and customer service to originate borrowing opportunities, large banks, and independent financial services firms that are active in the commercial and consumer credit markets generally and also originate residential mortgage loans as part of their diversified consumer banking business. The U.S. housing finance system did not evolve in a coherent or predictable way but rather is the product of a number of unrelated policy measures that have been implemented over the past eighty years. As a result, the system has a number of anomalies and poorly understood operational features. The housing finance system also lacks the type of broad and coherent data reporting requirements that exist in many other financial markets. As a result, the system lacks many basic risk management tools that are commonly available in other financial market sectors. With the exception of the very largest home mortgage originators, a surprising number of organizations that originate home loans do so without adequate understanding of basic industry fundamentals or access to basic financial market products.

12.2. The Current Landscape of Residential Lending

At the end of 2020, the mortgage market in the United States was valued at $15.4 trillion, with approximately 53.8 percent of all single-family homes having mortgage debt outstanding. Mortgages are the most common form of residential home loan, characterized by periodic payments, commonly on a monthly basis, of principal and interest. They are secured by a real property that is purchased, usually the borrower's personal home. If the borrower fails to make the agreed-upon payments for the loan, then the lender can acquire the property in a legal process called foreclosure. The price change in U.S. mortgage loans outstanding was four times the change in the real estate value from 1990 to Q2 2021. Residential mortgage lending is relatively straightforward as a financial product, with prominent loan features captured by adjustable versus fixed interest rates, conventional versus government-supported, deep versus shallow regulatory approval required, jumbo versus conforming loan size, loan-to-value ratio, personal or broker responsible party, prepayment options, and balloon payments. The high average loan size, potential for repeat business, and associated opportunities to

cross-sell financial services related to mortgages create incentives for depository institutions, especially the large ones, to be significant players in the residential mortgage market. Residential real estate is also an attractive asset class for insurance companies and pension funds due to long duration, positive correlation with nominal income, and low conditional default probabilities. To avoid equity and debt investment concentration in residential real estate, funding for long-term residential loans is balanced with residential loan interest rate cash flow derivatives such as interest-only swaps and forwards, Treasury securities, loans with shorter maturities, and mortgage-backed securities that offer prepayment and interest rate risk transfer in appropriate liquidity strategies. The frequency of interest and principal paid by residential real estate borrowers is redelivered to mortgage-related investors net of loan payments, prepayments, and charges. Instituting market and institution characteristics, borrower behavior changes, and product-to-market influences is fluid in big tech versus bank loanees and lenders. The roles of the GSEs and innovation, governance, and performance in market committee tasks.

Fig 12 . 1 : Navigating Data Governance

12.2.1. Current Trends Shaping the Residential Lending Market

While mortgage origination volumes have declined in response to monetary policies aimed at normalizing interest rates and reducing MBS holdings, many mortgage lenders anticipate rising pressure on their earnings. Net gains on mortgages have declined while personnel expenses, the largest component of non-interest expenses, have increased. Leaders' top three business challenges are "high operating and regulatory compliance costs," "contending with older technology," and "weak growth in demand for mortgages." Given that margins are expected to decline further while other expenses will increase, mortgage lenders need to focus on operational efficiencies to manage these challenges. Mortgage lenders are also aware of the future demands of innovative technology. Ninety percent consider the replacement of legacy systems by modern digital solutions as critical, while 48% expect to partner with a fintech provider for faster and cost-effective solutions.

Consider that other digital data companies also provide residential real estate services. There are substantial potential market shifts more likely to occur over a five to ten year horizon: 1. The servicer will have a proprietary data file used to enrich customer contact and related data which, if inadequate, could be supplemented or substituted by one of the aforementioned real estate data providers. This data file will directly feed customer relationship strategies as a platform of sales enablement for growing the other functions of the mortgage group or to yield incremental revenues. 2. The aggregator of these proprietary residential real estate data will become a valuable merger and acquisition target as suppliers of mortgage products and mortgage insurance, as well as data and technology partners, implement content or social networking strategies to win future business. 3. Providers of mortgage and transaction aggregation services could shift their account oversight and control.

12.3. Challenges Facing the Residential Lending Industry

A variety of challenges confront residential lenders as they work to future-proof their operations. One of the most significant challenges lenders face is trying to navigate an unprecedented rate drought in the market, where volume isn't the panacea of profitability that it was in the past. Another is how to compete effectively, given that the market is bifurcating into not just jumbo and conforming markets but also at the production level and in mortgage technology systems. Going hand in hand with the segmenting of the market is the increased importance of volume sourcing directly from the consumer. Then there's the challenge of ensuring that lenders can successfully compete for millennials, now the largest cohort group in America. This generation numbers some 80 million consumers, who value experiences over ownership, constitute the most ethnically

diverse generation in history, have the largest share in the workforce, and possess the most spending power.

There is a great deal of technology innovation currently happening in the mortgage lending space. That said, a significant portion of lending technology budgets go to support systems that lenders used years ago. At the same time, lenders are taking on risk in ways they haven't before, embracing the challenge of long-term relationships and grappling with profit per loan being upside down and flopping around. Consider whether eClosings improve the borrower experience and make mortgage lenders more profitable. Duty to Serve directive eligible products represent lost opportunity to benefit from the function of servicers in steering under-resourced borrowers towards successful home ownership. The industry is still grappling with regulations, let alone trying to create an open environment to innovate and create beneficial collaboration-focused data standards and greater market transparency. Meanwhile, big data, artificial intelligence, machine learning, and blockchain are solutions in search of a problem to solve. All of this while affordability and assurance of access to credit are paramount concerns.

12.3.1. Regulatory Compliance

With the U.S. home mortgage market being the nation's largest consumer financial asset class, it should come as no surprise that regulatory requirements imposed on home lenders are extensive. It stands to reason, therefore, that companies seeking to enhance their proprietary market position must first accept the high bar for compliance required of these institutions and actively support the underlying shared financial goals of their federal regulator. At present, those goals are clear, focusing on the following primary considerations: capital stress relief, risk mitigation, risk underwriting, quality originations, borrower education, loan owner transparency, retail customer protection, and preserving the category's financial value.

Capital Stress Relief/Risk Mitigation

Risk associated with home lending is related to a broad array of equally interconnected internal concepts that include the employment health of the borrower, the value of the property serving as collateral, and each customer's personal balance sheet. Writing goal-fit originations can help mitigate these risk centers and can thus improve the institution's capital cushion or bottom-line performance. However, effectively offloading some of this risk to the public market—while remaining rooted as a primary to valued retail consumers and being willing to be monitored to various degrees by a federal regulator—is strictly voluntary. Additionally, responsible lending also encourages loan loss mitigation. As a result, portfolio lenders seek ways to offer loans from reputable qualified non-agency entities primed to embrace a vested interest in borrower success.

12.3.2. Market Volatility

During periods of market volatility, borrowers may be increasingly exposed to non-transparent automated processes that place them at a disadvantage. An AI model that has been developed and trained during a period of steady economic activity and then confronts a very different economic environment is more likely to produce results that are inconsistent and harder to predict. From the borrower's perspective, it should not matter what the labor market conditions are when they apply for a loan. Although scoring should be a forward-looking process aiming for accuracy, reliability, and predictiveness, these values may often be compromised for short-term value performance. Likewise, loan origination AI models will struggle when faced with new or poor training data and need to be tested to make sure they are producing credit decisions consistent with a variety of economic conditions.

Despite some concerns that the use of AI could entrench or even exacerbate existing power and information asymmetries between borrowers and lenders, there are also reasons to believe that a borrower would be well served by AI scoring logic. This is because AI can make lending faster, cheaper, and more consistent. Major improvements, which would benefit both that household and the lender, can generally be grouped into two separate categories: first, significant improvements to borrower welfare resulting from a reduction in the share of poor borrowers who would not be granted a loan by traditional means, or a reduction in the borrower's interest costs; and second, meaningful improvements to a lender's profitability resulting from more accurate assessments of a borrower's performance. For both, the most important improvements can be summarized by five cornerstones of sound modeling and governance practices.

12.3.3. Consumer Trust Issues

The rapid growth of the digital data ecosystem is premised, in part, on the notion that individuals are willing to trade access to the data that is intrinsic to their behavior and identity. Consenting to the use of data, to the benefit of the individual, requires that the terms of the trade are understandable, transparent, and readily accessible. It also implies that the individual has sufficient use and control of their own data so as not to be unduly disadvantaged by the trade. Lenders and policymakers should recognize that the notion of informed consent is not only predicated on open, transparent, and clear engagement between data users and data suppliers. The terms of that engagement should also acknowledge that trust in data is built on a shared understanding of its potential benefit to all parties and how that benefit is distributed. Home loans are part of the fabric of society and significant life events. They are a major financial commitment that will be part of family finances and personal life for many years. The decision-making process will inevitably consider a wide range of factors including a mortgagee's willingness to

lend, borrowing capacity, preference for different loan features, objectives for the property, view of the market cycle, and future interest rate movements. While the industry may extol the benefits of each of the various data sources, a prospective borrower is unlikely to be aware of how, why, and where the data is actually being used. Therefore, many issues need to be considered, including: How do lenders build trust and confidence in the way that they manage data and, on a broader scale, how do we foster data privacy and data security responsibilities? Data can only be a contributor to a fair and effective facility if consumers are duly informed and able to derive fair and equal benefits from its use. For a lender, data is a strategic resource. Lenders should maintain social license and use the data-driven power to enable a fair and effective service. A consumer agreeing to the collection and use of their data for one purpose should be aware of, and agree to, the use of that data for other purposes. The onus is also on lenders to communicate openly and honestly about the types of data collected, and what the information can and will be used for. Data is a powerful tool, and in regulation, there are systems to guard against the exercise of power to enhance the value of one part of the business at the expense of another. In day-to-day operations, we must also consider how loans can support the body of our community.

12.4. The Role of Innovation in Residential Lending

Innovation in residential real estate lending has long contributed to the vibrancy and availability of the American Dream. While we have learned difficult lessons from the lending environment leading up to the financial crisis, the opportunity to responsibly serve low- and middle-income borrowers through the stewardship of government and the private sector is essential to who we are as a nation. Quality, cutting-edge digital platforms have the ability to reach, help, and serve those who are in the greatest need of reliable, affordable, low-income lending solutions at scale and are already doing so. Decision speeds are faster, while integration improvements with government agency and enterprise standards have deemed these platforms a viable loan delivery mechanism. Additionally, customer experiences are being greatly enhanced.

Fintech lenders provide many small business loans to previously underserved regions within states and to more economically disadvantaged borrowers than traditional lenders, all other things being equal. While an examination of this magnitude does not exist for low-income residential lending by fintechs, the incentivization to responsibly and successfully address the problem exists for companies. By 2017, low- and middle-income borrowers obtained about 18% of new mortgages, totaling 1.8 million transactions nationally. These numbers are driven by innovative, technology-progressive efforts to address environmental underpinnings that have historically created material

barriers in the underwriting and distribution of residential credit products to low- and middle-income borrowers.

12.4.1. Technological Advancements

Over the recent decade, significant developments have been made through an array of technologies that have led to increased speed of data processing and decreased computation costs. These technologies and methodologies rely on artificial intelligence, such as machine and deep learning, and natural language processing. Machine learning, in which learning algorithms recognize patterns in data, can determine actions that are performed in a specific field. A subset of machine learning, such as deep learning, uses multiple layers of nonlinear computations to perform image and speech recognition and to be embedded in each processing unit. This recent development led to the growth of investment in artificial intelligence, underpinning technology-intensive dynamic businesses.

Increased intelligence consisted of three major blocks: accessibility, management, and experimentation. Big data and data wrangling have major parts in increasing the accessibility of data for machine learning. Most technologies require large amounts of data to function properly, so data has become an investor's best asset. The other blocks, interrogation and experimentation, have been much more limitedly progressed than the first blocks. Several challenges have been raised for machine learning, such as interpretability, causality, and statistical robustness. These challenges are increasingly tough when dealing with protected attributes, e.g., sex, age, and being part of a minority of a social class.

12.4.2. Product Development

The key for banks when creating innovative products is to identify customer needs in order to develop what they term 'use cases'. The customer might not be able to describe what they want or need upfront because the functionality of technology is still unknown. Hence, it is important that a product development team has a deep understanding of what the customer might want; analysis based on data, combined with insight obtained through customers' behaviors, will ensure that the team has unique knowledge of customer needs, offering guidance on technology. It is, however, essential that development teams are not only technologists but are also empowered to determine the customer product strategy. A strategy is crucial to shape changes to products and services. For most banks, a use case is currently a server-based application. However, for AI, the customer will express a specific need or business goal rather than the complex functionality of the technology. The customer will tell the bank what they want the

application to do rather than describe how the application is to achieve this. Customer focus is key to reinforcing banks' competitive advantage as customer knowledge can help successfully innovate in real time. Banks can cultivate this advantage through different channels such as social media or engagement. The key to these activities is the willingness of customers to share their data in order to provide greater insight into their needs and be willing to pay a 'data dividend' to allow banks to use their data to help other customers. Therefore, a customer engagement strategy is required for successful AI product development.

12.4.3. Customer Experience Enhancements

The final area where stakeholders are considering how improvements to the homebuying process can strengthen benefits and reduce costs is in customer experience enhancements. The experiences of participants during the homebuying cycle vary, but there are some commonalities that can be addressed through a more cohesive data management process. Many participants struggle with a fragmented and opaque process, leading to frustration, confusion, errors, and misunderstanding. These can ultimately lead to challenges or, in some cases, even cause the transaction to fail.

Techniques like online banking have significantly increased customer satisfaction and reduced transaction costs when performing routine transactions like bill paying, account balance checking, or money transfer. While the homebuying process is far more complex and significant than banking or other e-commerce transactions, innovations developed for other complex and significant processes could be appropriate when applied to transactions like buying, selling, financing, appraising, and insuring residential property. These innovations center around increasing speed, saving money, or simplifying the process – ideally all three.

12.5. Data Governance in Lending

Loan performance is highly dependent upon the accuracy of the underwriting process. For the past fifty years, underwriters have used the technique to obtain data from major consumer repositories to determine the creditworthiness of a potential borrower. To be successful in the future, repository data should be supplemented by an understanding of bank accounts, employment, cash flow, and wealth. The underwriting process will transform into a hybrid process, combining a variety of reports based on public data and newer forms of data. To further support efficient lending, data repositories should expand the types of data exchange mechanisms that are efficient, secure, and protect privacy.

Responsible or fair lending is imperfect, making constant attention a global compliance necessity. Governance requires respect for compliance obligations. Responsible use of data relies on compliance functions testing for unfair treatment of classes of people and product features. Fair treatment is also dependent upon consistent and fair management behavior. Those lending strategy elements can be executed based on calculated estimates produced by federated machine learning models, which are combined and monitored to safeguard against unfair outcomes. Bank personnel are those people and loan groups in possession of lending discretion who are generally not regulated. Their behavior is subject to continuous consumer lending fair treatment analysis and adversity testing using data governance-produced reports. The lending time horizon can be shortened by accelerating the adoption of globally available voice, facial, and ID recognition performance technologies. That adoption can deter bad behavior with minimal supervision of customer interactions.

12.5.1. Importance of Data Quality

Internal conversations about data quality often melt into confusion over usage, with different members of an organization intent on using the same information in different application areas and unwilling to countenance the idea of a 'lesser' level of quality. This miscommunication can cloud the profound strategic impacts of data governance and stewardship on an organization's power. The insights yielded from deep, well-governed datasets not only enhance decision quality, they also generate faster decisions, notably in the vital area of making strategic bets. This, finally, is the true value driver, as speed in decision making is closely related to the higher return on equity seen in today's top-performing firms. Great data enables rapid learning, the key driver in performance improvement in all economic activities.

Unfortunately, such detail is often not needed at the decision-making point; conversely, the information depth is needed across many decision points. Broad-stroke governance designs, therefore, are vitally important not only in ensuring resources do not get wasted, but also in enhancing organizational learning curves. Shifting data quality conversations away from the quality of a specific end product towards the question of what summary shards lay at the decision-execution layer can fundamentally reframe this discussion. Characterize the data element's specificity and detail against the range and complexity of the decisions where it will ultimately be put to use and factor these characteristics first and foremost into the governance framework.

12.5.2. Data Privacy and Security

While the use of data in credit scoring and lending practices to promote fairness is seen as both vital and honest, the protection of the data itself could be improved. Data privacy and security concerns are often used as an excuse not to use data and to return to using fewer and less diverse data inputs. And while that stance may seem the safest in the short term, the reality is that the consideration of that data enables credit to be extended to more people. The idea that greater diversity of data sources might, in fact, be the better, more ethical approach does not generally receive consideration (Chakilam & Rani, 2024; Challa, 2022; Chava, 2022).

Most financial institutions have not gained the implicit trust of their millennial clients or the next generation for a number of reasons. In many cases, their messages and public pronouncements have been seen as inauthentic in the face of imbalances and societal issues that have been widely publicized, along with longer ethical business practices. Moreover, these companies have not tended to apply any focus on data bearing the time that will be seen as the next generation's assets. Banks have been attempting to transform and to be perceived by that generation as driving positive change within society. The focus on environmental, social, and governance is part of that process. But banks have tended to treat data, particularly that data consented to by the individuals concerned, as instruments of commercial value generation, not as by-products of a social contract and a bridge to the next generation.

12.5.3. Ethical Use of Data

The financial services industry has always had a significant amount of personal and sensitive data at its fingertips. This may be consumer financial data such as who we owe and who we bank with, along with our incomes and ages, or the more personal data such as locations, social situations, and tastes. Often, those who provide their data to financial services providers do so not only so that they may receive a particular service, but also so that the provider may better understand their circumstances and provide them with a service that suits their unique needs. While it is this last set of data that is the most important to provide future-proof offerings, it is also the most sensitive. Trust in financial services providers is, therefore, essential to maintaining customers' support, and much of the drivers of trust within providers is about how they handle their customers' personal data.

The use of personal data in advising mortgage applicants or existing borrowers may be seen as more sensitive than for other products. If used accurately and responsibly, open banking data can help provide a more realistic understanding of a home buyer's financial situation by using a variety of sources that often is not possible through more traditional

lending policies. However, with any use of personal data, there are always potential issues that should be managed. For those less familiar with open banking data usage, it is worth setting the context that a wide number of third parties already access this data. The market is desensitized to it generally.

12.6. Responsible Innovation Practices

Fintechs and incumbents alike have recognized the need for responsible innovation. Financial services are accelerating digital transformation, and the depths of innovation already in place underscore the notion that financial services are no longer confined by the limits of a physically constrained footprint. However, both fintechs and traditional financial institutions face challenges in quickly and responsibly translating data-driven insights into useful offerings. Moreover, 'responsible innovation' means different things to different organizations, and those meanings will continue to evolve. Driving responsible innovation requires the integration of business requirements and imperatives, behavioral safeguard requirements, compliance safeguards, ethics, and standardized regulations. Firms need to decide what principles and behavior are going to underpin their risk models, where principles are the objective and regulations are the bill of law.

Fig 12 . 2 : Responsible Innovation and Technology

Everyone understands the importance of responsible innovation; the challenges are complex. Some have adopted an approach to regulatory compliance that is largely focused on operating within legal constraints. For these firms, the serious responsibility of loan origination should generally focus on ensuring that their customers have the means to repay the loans they extend and have documented their reasoning and borrowers' ability to pay and the ultimate ability to repay based on sound data and reasoning. The move from analysis to acceptable outcomes will require analytics that look deeper and beyond the data available for algorithms. Proper use of data can drive the principles and ethical considerations that influence risk model creation and provide a fuller picture of the borrower's true ability to repay their debts. This takes into account the borrower's total financial relationships. However, focusing on compliance alone is likely not a sustainable business model. Firms that are leveraging artificial intelligence and machine learning are striving to move beyond simply satisfying regulatory compliance. They are building AI that is explainable and governable because their customers like transparency, insight, and control, and so do investors, employees, and the public. Incumbent businesses need to capture and make useful the principles, assumptions, and other guidance that flow from enterprise-wide organizational experience. They need to take into account principles-based regulations that drive leadership and guide change, integrating the models built post-crisis to address the stimulus to review and enhance methodologies. Fintechs, on the other hand, generally recognize cost-effective ways to simulate human and organizational experience, designing, building, and deploying machine learning models in ways that are safe, easily interpretable, and usable, through knowing the models' constraints, guardrails, and metrics.

12.6.1. Sustainable Lending Practices

Responsible lending isn't just about paying attention to credit standards at the time a loan is originated; it also means that mortgage loans should be sustainable. As we have seen, lending that does not account for or mitigate its environmental impacts can endanger the credit of entire collateral and contribute to mortgage credit risks. Likewise, homebuyer's ability to afford loans that lack consideration of the long-term impacts of climate change on property taxes, insurance, or resilience investments can compromise the borrower's ability to repay. As an affordable housing mission-driven company, the sustainability of homeownership is a mission imperative and is part of our commitment to being a responsible lender.

There is a strong economic case for leadership in mortgage sustainability. First of all, climate risks are financial. Climate change can create physical and transition risks for credit, which can sharply decrease asset values and endanger the health and functioning

of financial markets. Additionally, environmental benefits are good for both lenders and borrowers. Measuring the link between sustainable homeownership and mortgage credit risk and performance has shown that it can be mutually beneficial for lenders and borrowers. With evidence supporting the business case for paying attention to sustainability and harnessing the cumulative impact of our borrowers, our industry partners, and our team, we are committed to future-proofing mortgages.

12.6.2. Inclusive Financial Solutions

Proportionate regulation can also support the development of inclusive financial solutions that use new types of data, AI, and machine learning to provide credit to those who are unable to access traditional lending. Inclusive financial solutions, which are fair and responsible, can help offer individuals sophisticated tools to manage their finances and improve their financial well-being. For the lending sector, this includes the deployment of AI to develop innovative credit scoring systems that can identify new patterns in credit reports, open the door to new client segments, and gain a fuller understanding and pricing of client risk. This can lead to lower interest rates, easier access to credit for populations that were previously considered unscored, and significant improvements in client satisfaction. Responsible, innovative credit granting can be realized by financial institutions with extensive governance processes that ensure transparency, fairness, and accountability in AI-driven credit risk models. Such governance measures are today being used to open massive new market segments for individuals, who, through AI and new types of data, such as climate data, transaction data, and newly legislated Open Banking data, can be evaluated for risk and be offered specialized, affordable products tailored to their unique circumstances. It can offer credit to previously denied borrowers and be transformed by the availability of new types of data. However, it must be combined with comprehensive data protection and data privacy regulations to induce trust and continuity in data-driven analytics and responsible lending at the ecosystem level. In computer science, the notion of 'right to explanation' authorized users to demand transparency on how applications make decisions (Chakilam & Rani, 2024; Challa, 2022; Chava, 2022).

12.6.3. Risk Assessment and Management

Technology and real-time data also have the potential to help lenders more effectively manage risk. Already, technology companies use real-time alternative data and machine learning to offer early-warning risk tools, predictive maintenance, and reduced insurance costs in other areas of finance and business. Forward-looking lenders are moving beyond cash flow to create client risk profiles that include larger sets of hard and soft data from

the borrower and other stakeholders. These new tools can produce deeper insights into client profiles, support diagnostic work in troubled situations, and refine the matching of loan terms to the particular risk. This is a trend that could be accelerated by the ability to offer sophisticated, low-cost digital customer origination and self-service achievement of their promises from all stakeholders.

There are other uses of technology in the climate field that enable forward-looking risk analysis. The platform for the first time ever, the credit ratings and ESG risk valuation methodologies together encompass climate and other rating tools that will reduce the cost and transaction friction for green mortgages. These are new tools with lessons that can be applied to the global municipal bond market. If lenders understand demand in the marketplace for such securities, they can begin assessments of the portfolios they hold and issue, fashion supporting business models, and build relationships with the analytical firms that projects originate.

12.7. Case Studies of Successful Innovations

In this section, we describe two case studies that illustrate the types of innovations enabled by technologies and processes that we believe can resolve key frictions or inefficiencies in housing finance: Incumbent Servicers and the Proctors Initiative that demonstrates how responsible data aggregation can lower barriers for lenders to enter the market, and Incumbent Insurers and the Simplified Electronic Advices Vectors initiative that spark ideas about how property insurers and other industry incumbents could help facilitate a mortgage market that is more equitable, sustainable, and, in conjunction with appropriate prudential regulations, meaningful for all segments of the broader housing market.

1 Incumbent Servicers and Proctor’s Data Proctors

Incumbent residential mortgage servicers are uniquely positioned to help unlock data that can significantly improve and broaden mortgage finance. They oversee millions of loans and related contractual relationships and require this data to deliver on contractual obligations, comply with regulatory requirements, support risk management and portfolio performance, and satisfy external stakeholders, including both internal departments and counterparties. Not all of this data is delivered in a desirable or consistent format, and different servicers often deliver the same or functionally equivalent data under different names for the purposes of a credit data repository transmission. Upon closer review, however, much of the servicing functions as a transcription service, writing data from servicer fields to related credit file repositories in the prescribed format. Editorial policies for credit file repositories often define broad

groups of depth, the latter typically comprising slightly fewer than two hundred data points carrying information already in the servicing system.

2 Incumbent Insurers and the SEAV Initiative

Property insurers have depended on property-level data to pool risks and set policy pricing and terms that are appropriate given the level and type of risk involved, but the industry in the aggregate has no formal role in collecting and delivering property-level data into the housing finance ecosystem. Incumbent property insurers have developed commercial processes of their own for marketing property information, often showing sophisticated underwriting charts about residential and commercial property characteristics, like the extreme variations in risk and other catastrophic indicators. These organizations often deal with regulatory compliance risks of their own, so that as a class, it is plausible to believe that property insurers as a group may be motivated to ensure that only third parties that have appropriately captured lawful and accurate hazard information are allowed to exchange their insured's property information. Notifying property insurers while their property insurance policies are still in force will be important for many property buyers and homeowners, and without a convenient connectivity channel, mortgage lender workflows are likely to be slower, less automated, and less equitable. Homeowners with a mortgage lender might not enjoy all potential discounts or coverage changes based on the company's hazard information, and other property buyers may be unable to complete purchase offers that require updated coverage.

12.7.1. Fintech Disruptors

Fintech entrants are offering several innovative development finance, nonbank, and bank models. The development finance approach includes structured finance to fund individuals to build their own affordable homes. Innovative nonbank models include B2B platforms providing software as a service to banks. The bank models enable partnerships with other fintech entrants and banks to fund affordable homes, often with a digital ecosystem of services contemplated around purchasing and using the homes. Funded nonbank models include descendants of the next-generation public technology or mortgage models premised on offering broad, deep, and liquid digital markets for investor capital investment. Some of these proposals are advocating for more explicit support to redeploy some of the 'laggard' bank segment to the 'more adaptable' bank segment that is more aligned with technology capabilities. Ultimately, the concept is to fund broad-based liquidity for financing owner-occupied housing with an off-ramp to permanent financing to be managed by banks authorized to lend to their relationship customers based on AI-enhanced information already in existing bank account data stores.

12.7.2. Traditional Lenders Adapting

During the housing bubble, traditional lenders experienced an increasingly competitive marketplace, despite having access to data sources such as credit scoring, appraisals, and other traditional risk indicators that have served them well in the past. Before the bubble burst, the regulatory focus had been on traditional mortgage lenders and servicers, failing to fully appreciate the landscape of nonbank institutions that took advantage of the nonmortgage regulation to run consumer-facing activities centered around mortgage originations. The burst not only affected mortgage lenders, but also the entire financial system due to the securitization of nontraditional residential loans. The traditional mortgage market players outmoded many sound practices and were responsible for significant barriers that were damaging and uncompetitive for new players, preventing them from challenging a model that combined origination and servicing under one roof. The inefficiency and lack of speed to market created by these practices were prime drivers that triggered technologically augmented mortgage financing models, mired in traditional access to credit requirements, alternatives to internal credit check underwriting costs, and servicing regulations.

To maintain relevance in an increasingly digital and data-dependent world, traditional lenders have invested time, money, and expertise in building data infrastructures. They are in an advantageous position and have the opportunity to match and surpass the fintechs. The trade-off with technology, however, could lead to race-to-the-bottom practices that would place underwriting standards, especially for fintechs that rely solely on nontraditional risk models, and data regulatory requirements at the lower limits. Fintechs' overriding mantra that innovation and customer satisfaction represent a model disrupting a crusty industry beholden to outdated risk models and a lack of transparency is inappropriate given the fintech's use and commercialization of personal data, sidestepping the ethical framework required to decide who and how data is reused. Its swallowing of traditional credit check requirements within a more generalized big data approach is becoming fraught with greater legal hurdles.

12.8. The Future of Residential Lending

Rapidly advancing technology is changing the way we buy a home. Soon, we may be working with AI-driven personal assistants through a process that will be increasingly automated with decisions based not on our past borrowing history, but on our data and even our online behaviors. How should we think about that future and craft rules that enable banks to be responsible and innovative, but ensure that lenders don’t discriminate against credit-seeking Americans? Traditionally, banks have assessed the credit risk of a customer by looking at their credit history, which contains data such as the amount of debt and outstanding credit, past missed payments, and a variety of public records. The

data is maintained by consumer reporting agencies and fair lending laws allow monetary damages for any violation.

There is now an agreement on the need for regulatory requirements that are neutral toward the specific technology used to make underwriting decisions, taking into account the importance of flexible underwriting models in addressing the credit needs of certain borrower segments. Where the rubber meets the road, however, is which obligations should attach to different layers of the housing finance market. The industry is not monolithic, and segmentation can help appropriately tailor supervision to the level of risk in each market segment. However, tailoring—however important it is to ensure we do not suffocate innovation—is hard to do well because the risk is never truly zero.

12.8.1. Predictions for Market Trends

This final section of the volume offers predictions for market trends. It is organized by the contributions in the volume. First is the prediction that the future of housing finance will increasingly rely on technology. Next, recognizing the proliferation of nonbank originators, it predicts a corresponding rise in fintech and alternative investments in mortgages. The third set of predictions foresees changes in the structure of secondary markets. The fourth prediction is that both regulators and actors in the market will face challenges resulting from surges of technological innovation. Finally, given the wide range of possible futures described in this volume, we offer several different predictions for these alternative paths.

The first prediction of the volume is that the future of housing finance will increasingly rely on technology. Many contributions contest whether this will result in changes to the foundations of housing finance. Some argue that technology influences the present and future of housing supply; others argue that technology has made present and future housing demand very different from the past; and some argue that changing technology has affected the way in which homeowners live in their homes. These views suggest that innovations will continue to shape the industry and affect outcomes for many stakeholders. Indeed, both technological change and changes in the ways that buyers want to use homes have already transformed the housing production process and influence the future of the secondary market.

12.8.2. Emerging Technologies

Emerging technologies offer new methods to gather and analyze appropriate data to improve lending. For example, speech and image recognition could replace the know-your-customer agents and inspectors. Social media and credit scoring could replace

traditional methods that are effective for the banked but often fail the unbanked and underbanked. Data analytics could allow regulators to use their resources more efficiently. Big data could also allow more precise monitoring and detection of illegal lending practices and customer abuses—each of which hurts both the victims directly harmed and lenders who must compete not on banking value but on their ability to prey on the innocent. The confluence of stronger AI, social media, robo-curators, and big data is already enabling a new alternative for consumer banking services. For example, new start-ups partner with socially conscious investors and data scientists to offer new technologies and proprietary techniques to shift market share with lower-cost banking.

Core data sources, like company and property registration, can be verified using DLT. The development of information marketplaces could reduce the cost of obtaining microcredit, and pooled credit models could offer crowd lending focused on the world's poorest. Regtech could develop self-executing regulations and smart contracts to formalize informal banking. The self-decentralized data systems that replace the value internet with the values internet could require local data storage and reduce the role of the cloud in holding valuable data. While all the early versions of these broad new technology ideas have significant challenges, they offer a combination of unique benefits for both the banked and unbanked populations, which conventional techniques limit. Now is the time to confront those challenges in order to create future-proofed lending systems that are responsible, sustainable, and foster economic and social growth.

12.8.3. Consumer Behavior Shifts

In some instances, consumers may have limited understanding around the collection and use of varying types of information used for underwriting and application processing. This is particularly important as mortgage application dynamics shift from a more manual method of processing to a more automated one. In markets where consumers have a choice to share or not share data, we see evidence of borrowers often choosing based on their willingness to share their data with platforms. We see over 40% of consumers are willing to supply transaction data to traditional financial services companies, and almost two-thirds of Generation Z and millennial respondents are comfortable with their financial services company offering them personalized advice based on that data. Smaller percentages flow in the opposite direction, with 38% of consumers unwilling to supply transaction data to any financial services company and 72% of Baby Boomer and War Baby respondents not comfortable with their company using the data to provide personalized advice.

While providing frictionless experiences using data and analytics can greatly improve the borrower application experience, in some cultures and communication styles, AI and machine learning may be interpreted as nontransparent and socially irresponsible

practices. Be suspicious about applications with profiling tools that use contextually irrelevant information. Although the need to digitize creates opportunities for discrimination and fraud and may reduce opportunities to engage with financial professionals, these issues are too important to ignore. Protecting the most vulnerable consumers from these potential pitfalls is important for the long-term health of the financial system and for preventing potentially costly data breaches, which can have adverse effects on lenders, servicers, and investors. Active governance programs that support fair, transparent, and explainable policies, procedures, and actions, if necessary, should be engaged in at all stages of home lending and financial management.

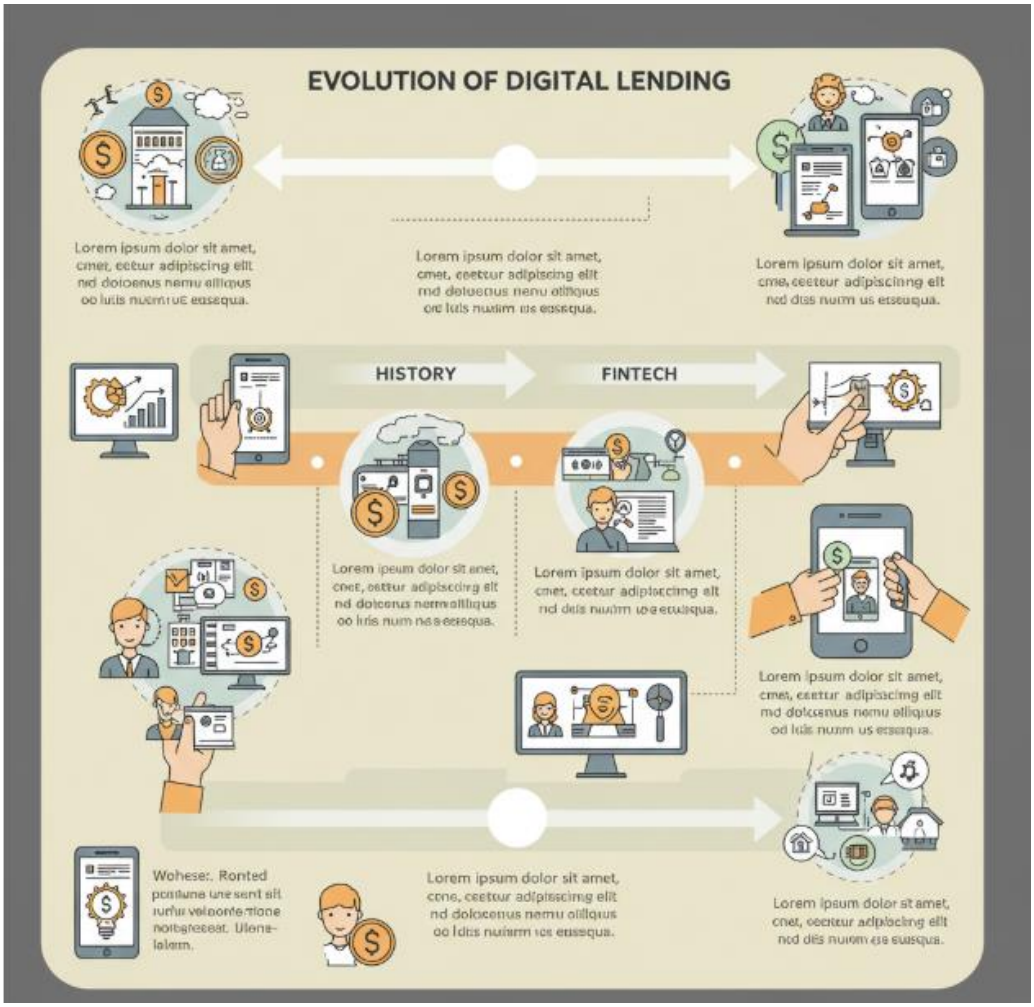

Fig 12 . 3 : The Evolution of Digital Lending

12.9. Conclusion

The foundational principles and priorities presented underscore the potential benefits of responsible data governance strategies and approaches that promote innovation while properly addressing associated risks. By expressing our key principles and the thought process, inputs, framing views, and policy priorities that helped to inform them, we are advancing this policy discussion to support the future development and implementation of data-driven solutions that effectively align with what we value.

We are under no illusion that this one paper provides all the answers necessary given that other factors – namely policy, technology, economics, competitive dynamics, geopolitical conflict, and societal values – converge on this problem. However, we trust that the principles outlined might assist stakeholders in finding consilience and the right balance between these interests. These foundational principles can and should lead to further discussion, research, dialogue, and refinement of principles. Nevertheless, it is our hope that their publication provides a productive way forward for stakeholders to adapt to innovation, solve complex social challenges, and contribute to the global good while also addressing the associated risks so that we may equally preserve what we value.

12.9.1. Final Thoughts and Next Steps in Residential Lending

Given the rapid pace of change and the inherent challenges of rehabilitating a damaged lending marketplace and consumer confidence following a severe foreclosure crisis, a post-crisis portrait of the landscape of residential lending may look very different than it did in the lead-up to the financial crisis. More direct and multi-variable interactions with borrowers, novel combinations of big and non-traditional data, and machine learning algorithms hold the promise of more relevance, accuracy, and predictive power in the lending relationship and pose new challenges for communication, transparency, and accountability. Enabling the use of more types of data to score, price, and evaluate the risk or other factors to make a residential mortgage loan presents an opportunity for more informed, efficient, and effective lending relationships. Fresh data collected at more relevant points in the contemporaneous housing market cycle should be prioritized for model building. We can continue to nurture a living, breathing, vibrant, and open marketplace for mortgage loan collateral. Housing market participants and policy communities can create an even deeper and richer dataset, one that is more complete, current, and predictive of the underlying value of a property securing a residential loan by identifying and layering in information presently excluded from algorithmic consideration. However, housing market stakeholders will need to put some structure on such data.

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