Supervisory Research Forum (SURF) Spotlight 2020:Q4

Summary of the Recent Workshop on Credit Card Lending and Payments
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The Federal Reserve Bank of Philadelphia's Supervisory Research Forum (SURF) and Consumer Finance Institute (CFI) held the virtual Workshop on Credit Card Lending and Payments on September 16–17, 2020. The workshop included sessions on payment systems and financial innovation, COVID-19's impact on consumer finance and credit use, and the industry impact of machine learning and artificial intelligence (ML/AI). The agenda, including recordings of some of the presentations, is available on the CFI website (link).

With more than $800 billion in unsecured balances in the U.S., the credit card market is strategically important for the economy and consumer and financial institutions, with a significant concentration of credit card portfolios in large banks. Along with this, rapid innovation in payment systems and services has led to an increasing interest in this area among policymakers and regulators. The intent of the workshop was to provide regulators, industry experts, and academics with an opportunity to share insights on trends and risks in credit cards and payment services, particularly in light of the COVID-19 pandemic, the ensuing economic downturn, and the hastened shift toward contactless payments.

Session 1: Financial Innovation and Payments

Bob Hunt, associate director of CFI, opened the workshop and highlighted the importance of a conference that brings together practitioners from industry, academia, and regulatory agencies. In his view, this type of event can better focus on the current and emerging questions that will advance our understanding of consumer finance, advance the frontier of academic research, and inform good policymaking.

The first keynote speaker was Mark Begor, CEO of Equifax, who discussed the impact of the pandemic on consumers and the importance of looking closely at credit files, as well as alternative data, to gain better insights and implement better credit actions. Begor highlighted the growing importance of data and analytics, particularly in the current environment. More data and analytics create better solutions. He also emphasized the importance of reaching out to consumers who are currently nonscorable by credit data to build a more inclusive economy.

COVID-19 has changed every consumer's world and building multiple data assets is critical in this environment. Prior to the COVID-19 pandemic, lenders could be confident making decisions on 65 percent of the population — that number has decreased to about 30 percent during the crisis. Lenders cannot identify these consumers accurately using traditional lending data alone. Credit reports remain a strong indicator of credit history, but COVID-19 brings the power of alternative data into even sharper focus.

Begor described Equifax's efforts to extrapolate past natural disaster experiences to inform the expectations of consumer performance during the COVID-19 crisis. Using this information, he indicated that the current trajectory for consumer delinquencies is expected to peak at a rate 23 percent higher than at the beginning of the year. He also indicated that best practices in credit decisioning call for the use of a layered approach that starts with the traditional credit file and extends available insights using AI and alternative data. Income and employment information

represent critical alternative data, given the increase in unemployment experienced in past months. Consumer-consented utility payment data are particularly useful for accounts with thin credit files, and consumer-consented bank transactions provide a clearer picture of creditworthiness. More data provide smarter insights and allow for smarter actions.

The first paper session of the workshop on payments and financial innovations was presented by Martin Brown from the University of St.Gallen. His presentation focused on how consumers decide to use new payment methods and what mix of payments to use. He discussed the impact of contactless cards on consumer payment behavior, finding that the issuance of these cards increases the their point-of-sale usage, particularly for small-dollar transactions; however, it has little to no impact on cash demand. The presenter also noted that this trend is being driven by young and urban consumers.

Scott Schuh, from West Virginia University, presented his work on the welfare implications of consumers' holding and use of cash, using a dynamic structural modeling framework. His analysis indicates that consumers value cash-in-wallet up to a certain level of about $50, but the shadow value of cash for consumers becomes negative beyond that amount. His research also indicated that eliminating cash completely will lower consumer welfare significantly. Ellen Merry, principal economist from the Board of Governors of the Federal Reserve System, examined the adoption of mobile peer-to-peer (P2P) payments, finding that lower-income households use these less, but those with thinner financial buffers are more likely to do so.

Jackie Nugent, assistant vice president at the Kansas City Fed, moderated the first panel discussion on innovations and opportunities in payments and credit card lending. Charles Walton, senior vice president at Mastercard, initiated the discussion with a brief introduction on digital identity and financial inclusion. He pointed to the importance of digital identity and authentication in digital payments and for financial inclusion. He described a collaborative ID network model with users and relying parties — defined as organizations that need to establish a user's identity — as well as trust providers, organizations with a trusted relationship with the user, and identity verification providers that can verify the identity of documents or data. A trust provider can provide an application that allows the use of the digital identity, either as a stand-alone app or a feature of a multipurpose mobile banking app. Walton also highlighted the importance of adhering to the principles of data minimization, transparency. and user privacy.

Amy Friend, senior advisor at FS Vector, focused on the need for advances in privacy regulations in the U.S. and the international arena to stay abreast of innovations in this field. Walton expressed his views on the need for uniform data privacy regulation at the federal level and pointed to the General Data Protection Regulation (GDPR), and similar regulation in Australia as examples. James Kim, the fintech and payments team Lead at Ballard and Spahr, joined the discussion and spoke about the importance of giving consumers greater control of their information. He indicated that consumers own their own data by law, but they don't really control it. He noted a forthcoming notice of proposed rulemaking (NPR) recently announced by the Consumer Financial Protection Bureau (CFPB) about access to consumer data.

The panel members discussed challenges and models for consumer data sharing with third parties, subject to consumer consent. Friend stated her belief that there is a general realization that consumers need more control over their data and that current status quo on disclosures and opt-out options can be improved. Kim discussed a recent fintech report issued by the U.S. Department of the Treasury and highlighted parts of the report that deal with consumer data use and consumer consent. Friend said there are many unanswered questions about the responsibility for safekeeping and liability on the part of consumer data aggregators. Walton

concluded the discussion by underscoring the need for an appropriate data, privacy, and identity framework to advance our efforts.

After the engaging discussion on digital identity and consumer data privacy, Friend spearheaded a panel discussion on the interaction between digital identity and financial inclusion. For starters, she shared her enthusiasm about the many opportunities that technological advances afford for financial inclusion. She emphasized the opportunities to better identify individuals who until now have been excluded from the financial system, as well as alternative forms of underwriting and financial products designed to help individuals build better credit. According to Kim, fintech firms, with alternative underwriting business models, have shown resilience during the current period of economic stress, and this experience may result in the acceleration of alternative underwriting business models. Friend highlighted the role of fintech firms on the deployment of Paycheck Protection Program (PPP) loans and indicated that this experience is likely to speed up the adoption of technology and the use of new techniques, such as cash-flow underwriting.

At the end of the panel discussion, Kim presented his views, building on prior remarks from Friend and Walton. He focused on the opportunities available to fintech companies but without losing sight of the challenges including a fragmented federal/state regulatory system for non-bank fintechs, in particular. However, Kim also highlighted significant advances in the bank charter front in recent months with the Office of the Comptroller of the Currency's fintech charter proposal, and the payments charter in particular. He also pointed to the Industrial Loan Companies (ILC) charter from the Federal Deposit Insurance Corporation as another opportunity for fintechs and nontraditional companies beyond bank partnerships and state licenses. Finally, Kim focused on a third option available to finance companies: the possibility of acquiring a bank. This panel concluded the first session of the day.

Session 2: Industry Impact of COVID-19

The second session focused on the importance of the industry impact of COVID-19. This session started with the second keynote address of the day by Wayne Best, chief economist at Visa Inc., providing an economic and market update focused on the impact of COVID-19. Visa is able to use real-time transaction data to gain insights about economic performance. Best highlighted the huge drop in credit card spending seen during the crisis, along with a decline in delinquencies and charge-offs. He noted a reduction in cash usage with almost one-third of customers between the ages of 35 and 54 engaging in 0 cash transactions in July 2020. He also discussed recent changes in consumer behavior with a dramatic shift toward ecommerce and online/mobile ordering, indicating that ecommerce has seen 10 years of growth in just three months. Consumers who indicate the highest level of concern about COVID-19 are changing their behavior the most, with older consumers beginning to embrace the online channel as well. Consumer spending is recovering more quickly for low-income households because of a lower percentage of discretionary spending.

Some of the emerging patterns are consistent with the Global Financial Crisis: increased debit usage, increased savings rate, contraction of discretionary spending, and a shift away from travel credit products. However, some significant changes in consumer behavior are specific to this crisis: the shift to online spending, reduction in cash usage, and collapse of entire economic sectors. Government actions have played and will continue to play a significant role, starting with the fiscal policy response and the rapid and extensive action by the Fed, as well as the expanded use of forbearance and deferrals across loan types. Although consumer behavior has changed dramatically as a result of COVID-19, there is significant uncertainty about the persistency of

some of these changes after the crisis. Some emerging patterns could become a "new normal" — online channels used more broadly by a wider array of consumers and contactless as a necessity and not a convenience.

The focus of the afternoon paper session was on COVID-19's impact on consumer finance and credit use. During the first paper session, all three presenters highlighted the substantial impact of the federal government's relief efforts on cushioning the blow of the economic crisis on households, particularly those that are low income. Michaela Pagel, Roderick H. Cushman Associate Professor of Business, Columbia Business School, analyzed the impact of the Coronavirus Aid, Relief, and Economic Security (CARES) Act on consumption using transaction-level data on linked bank accounts from a nonprofit fintech company. The analysis points out that the multiplier effect of the stimulus is subdued as a result of shutdowns in certain economic sectors. The overall effect is heterogeneous, with some consumers substantially increasing their payments of rents, mortgages, and credit card debt.

Benjamin Kay, senior economist from the Federal Reserve Board, presented his research on the impact of COVID-19 on consumer credit using credit card data. He finds that in counties severely impacted by the pandemic, prime credit card customers reduced their use of credit, while less creditworthy consumers increased their outstanding balances. Fiona Greig, director of Consumer Research, JPMorgan Chase Institute, presented data on changes in income and spending since the onset of the crisis, showing a large drop in spending shortly after the initial shutdowns to contain the virus; however, spending recovered quickly, especially among low-income households. She noted that the change in income (year-over-year) for low-income households has actually been positive.

The final session of Day 1 was a panel focused on the impact of COVID-19 on credit card lending and payments. Panelists highlighted the difficult situation for lenders in the current crisis, with an increase in uncertainty around credit reports and with significant increases in forbearances. Panelists agreed that the crisis has resulted in a sharp reduction in new account originations, although lenders are working to keep existing customers by maintaining, or improving, rewards programs and minimizing credit line cuts.

The panel discussion began with brief introductions from each panel participant, which were broadly consistent while relying on a diverse array of data sources. Cristian DeRitis, deputy chief economist at Moody's Analytics, introduced the topic of "credit cards and the COVID Economy." He focused his presentation on changes in patterns of credit card usage up to August 2020 with an emphasis on three main areas: credit card balances, shifts in card spending, and trends in saving and saving rates. To begin, he highlighted the significant drop in card balances and indicated that the drop also extends to related consumer finance products such as debt consolidation and personal loans, with the largest decline associated with the superprime segment. The largest decline in spending was associated with expenditures in services, highlighting the impact of the COVID-19 crisis on the service economy. Online shopping, home renovation, and grocery shopping were some of the areas with the largest year-over-year increases in spending. DeRitis concluded by also highlighting the significant increase in the personal savings rate, particularly for older Americans, a trend that may persist.

Amy Crews Cutts, president and chief economist, AC Cutts & Associates LLC, was the second speaker and focused her introductory remarks on the impact of the CARES Act on consumer credit reporting. The CARES Act made possible certain deferral accommodations for federally backed student loans and mortgages. Federal student loans get automatic deferrals, while mortgages backed by a GSE, FHA, or VA are eligible for a six-month deferral renewable for another six months. Federal student loans are automatically marked as current, while for

mortgages, the delinquency state is frozen at the time of deferral. Cutts pointed to several implications of these provisions for reporting to the credit bureaus. Tradelines in deferrals or with zero payment status will be characterized as "possible accommodations," delinquent student loans that enter forbearance will be reported as current, and a significant number of accounts will see their credit score increase in some cases significantly.

Moshe Orenbuch, managing director at Credit Suisse, was the third speaker and focused his introductory remarks on issuers, investors, and regulators and their response to the COVID-19 crisis. Orenbuch said that issuers have pulled back significantly on new credit card originations and mail solicitation volume. He also highlighted the significant decline in spending and balances and the significant decline in delinquent balances. In his view, the consumer has been diligent in using consumer resources to pay debt. Credit card utilization is significantly down because of the pandemic, but the data do not indicate significant cuts in credit lines. He noted that financial companies were particularly impacted by the downturn in the stock market, particularly in the early months of the COVID-19 crisis but have been recovering, although not at the pace of the rest of the market.

Tom Akana, the panel moderator, also offered his own insights based on his analysis of a special monthly survey of consumers conducted by the Philadelphia Fed that focuses on tracking employment, income, and consumer resources. The analysis of survey results is broadly consistent with the trends highlighted by other panelists. Interestingly, survey respondents indicated a higher likelihood of increased future use of online and mobile banking as well as credit/debit cards, P2P and mobile payments, and a decrease in use of paper checks and cash.

Herman Ramirez, the fourth speaker, analyzed insights from a Visa panel of consumers. Ramirez's presentation highlighted findings before and after the onset of the pandemic. He noted that cash had been on decline already in 2019, while card use was increasing partly as a result of the increase in ecommerce. Interestingly, survey results for the second quarter of 2020 signal an acceleration in these observed trends prior to the pandemic.

After the individual introductory remarks, the panel participants engaged in a group discussion. The first item was about the enduring impact of the crisis. The general view was that the crisis resulted in an acceleration of technological change and online commerce. Consumers are getting used to new technology, in payments in particular. Consumption patterns will not change significantly, and travel will remain weak for an extended period of time. In the short run, there is a movement away from rewards and toward cash-back incentives. Demographic changes combined with the crisis will accelerate saving and spending patterns. Increases in online education will result in a widening of the digital divide. The current crisis may have accelerated the evolution of the credit card industry, although it is difficult to ascertain at this point which trends will continue or accelerate.

The second discussion item concerned the potential impact of the second COVID-19 wave of infections. The panel members highlighted concerns about specific economic sectors, including leisure and travel. They also highlighted concerns about the need for additional fiscal stimulus and policies around unemployment extensions, forbearances, and eviction moratoria. They indicated that delinquencies are likely to increase in future quarters but highlight the fact that finance companies continue to maintain conservative levels of reserves under current economic conditions.

Session 3: Industry ML/AI Adoption

Day 2 of the conference focused on the industry impact of ML and AI. Our invited keynote speaker was Charles Elkan, managing director and global head of machine learning at Goldman Sachs. His presentation highlighted lessons learned by his team at Goldman Sachs, as well as in his previous job at Amazon, around machine learning and finance. Elkan gave a brief historical introduction to the evolution of ML and presented best practices for incorporating ML/AI into existing business workflows.

The field of ML/AI dates back to 1956, has been an area of academic research for many years, and has received significant industry interest in recent years. Significant excitement on the field nowadays arises from the success of reinforcement learning methods applied to traditional board games such as chess and go. However, to temper expectations about progress in ML/AI, he indicated that he does not anticipate achieving the goal of general intelligence anytime in the foreseeable future. The resurgence in excitement about ML/AI is in no small part due to progress in the field over the last 10 years in the area of deep learning, which has enabled significant progress in computer vision and natural learning processing as well as combinations of both.

From his experience at Amazon, Elkan emphasized the usefulness of ML for demand forecasting in ecommerce where demand patterns can be very irregular presenting challenges for traditional time series methods; furthermore, the ML/AI approach can incorporate additional information about product descriptions contained in catalogs, such as descriptive text and photos. Still ML/AI methods lack deep understanding of the problem being addressed. While deep understanding is not needed for many applications, it is important for solving important "AI-complete" problems that require a broad or complete understanding of the world, such as true autonomous driving.

Moving on to the area of ML applications in finance, he indicated that the management of model risk is not fundamentally different in ML. Models are approximations, and ML models, as well as more traditional models, can fail when something in the environment is different, which is connected with the lack of deep understanding previously referenced.

Elkan also shared his insights about identifying useful business applications of ML. He suggested looking for opportunities to automate decision-making, such as predicting future demands for products that help the company with purchase decisions. In his view, ML applications that can contribute to automate specific tasks are potentially much more helpful than one-off analysis of specific problems. Successful implementation of a ML solution often involves the following steps: start by identifying the decisions that need to be made, work backward to the predictions that would help make better decisions, and then work backward to the historical data needed to learn to make these predictions.

Another lesson learned is that ML methods always have to fall within an existing workflow and do not change it fundamentally. Specifically, "ML can improve a good business model, but it cannot rescue a bad business model," according to Elkan. As important workflow principles, training should be offline because putting a new model into production carries risks, and predictions should be based on the newest available data. Understanding the true business process is fundamental. For example, in order to forecast portfolio losses, it is important to understand the associated business process and to verify that the available data captures all aspects of true economic loss.

Elkan concluded his presentation by highlighting risks in ML applications: lack of consensus on a relevant quantitative objective; too few decisions to be made, each one too important; outputs that are not accurate enough to be useful; real-time data and/or historical data that are different and/or not available; the model is not easy to explain to stakeholders; and the ML method is held

to a higher standard than current business process. The last risk is particularly relevant, and Elkan illustrated its importance by pointing out that self-driving cars may ultimately be held to a higher standard than regular drivers.

While deep understanding is out of reach for the foreseeable future, we can still expect superhuman performance from ML/AI in specific applications. There will be more breakthroughs in future ML/AI research, although we cannot predict when they will occur.

The final paper session of the conference consisted of three presentations that addressed a broad range of topics relevant to ML/AI. The first speaker was Joseph L. Breeden, CEO at Prescient Models, who presented his recent survey on ML in credit risk. The survey analyzed the usefulness of different ML/AI techniques for credit risk decision focusing on its performance in specific applications. In his presentation, Breeden highlighted the strengths and weaknesses, as well as risks and opportunities, associated with ML/AI models using insightful graphical representations.

The second speaker was Scott Zoldi, chief analytics officer, FICO. Zoldi's presentation delved into the important topic of responsible and ethical AI. He indicated that responsible AI requires models that are auditable, are not biased or unethical, are explainable and provide reasons attributed to score, and are robust and built carefully and properly. Models need to be validated and revalidated to ensure that they work as intended. Responsible AI requires preparation; every step of the model life cycle has to be properly documented. Adair Morse, associate professor of finance, Haas School of Business, discussed discrimination in algorithm-based credit decisions, proposing a simple test to look for discrimination in algorithmic credit decisions, going variable by variable in the algorithmic model. She highlighted that any variable used in an algorithmic credit decision model needs to be justified on the grounds that it is relevant and necessary for the business purpose.

Panel 3: ML/AI in Consumer Credit: Evolution or Revolution?

The final panel session of the day focused on the importance of interpretability and explainability for algorithmic model decisions, highlighting the need for credit decision and scoring models to be easily explainable to consumers but also as accurate as more black-box models. The panel moderated by Simon Freyaldenhoven, machine Learning Economist at the Federal Reserve Bank of Philadelphia, included a diverse group of practitioners from industry and academia. Cinthia Rudin is a professor from Duke University and a leading scholar in the area of interpretable ML; Morse conducts work on the interaction between algorithms and the law, with a focus on discrimination; Amit Gandhi is a leading scholar on econometrics and consumer behavior and a former chief economist at Microsoft Cloud; Nitin Sharma is a senior research scientist at PayPal and a leading practitioner in ML/AI, with a special interest in fraud detection as well as reinforcement learning and adversarial learning.

The first topic that the panel tackled was discrimination in the space of ML/AI. The first question posed by the moderator was whether we need to regulate the outcome or the input of ML/AI models. Morse indicated that the relevant law in this area is the Civil Rights Act of 1964, which is explicitly "input based," but challenges remain about how to interpret it. Rudin indicated that in her research she has been able to develop interpretable ML/AI models even for the most complex applications, such as computer vision, although she indicated that it can be challenging. To illustrate this point, she shared some slides describing her recent work on interpretable ML/AI in a credit score application with data from home equity lines of credit. Using sophisticated ML techniques, she built a scoring model that provided rule-based explanations for specific score outcomes. Interpretability is especially useful when a human has to make the final decision, or

to gain an understanding of the interworkings of the model on specific outcomes, or when troubleshooting the model is required. In her view, we need to stop thinking about models primarily in terms of accuracy. Instead, we need to start thinking about interpretability as a tool to help improve models and databases. In addition, interpretability may be particularly useful, for example, to help with our understanding of model outliers.

Simon questioned Rudin about the differences between fairness constraints and interpretability constraints. Rudin indicated that, in her experience, both types of constraints are usually very different. She also said that interpretability constraints do not usually impact accuracy, while fairness constraints may have an impact on model accuracy. Finally, she also indicated that interpretability is domain dependent, for example, the expectations of interpretability in the field of credit scoring will be very different from interpretability in computer vision and may be tailored to specific audiences, such as customers, business clients, or regulators.

Ghandi contributed to the discussion by highlighting the relationship between interpretability and explainability and of low-stakes versus high-stakes decisions. He pointed out that these concepts are particularly important for stakeholders who find themselves in a position of explaining potential model shortcomings or failures in high-stake scenarios. He also brought into the conversation the important topic of domain expertise, which is also important when considering interpretability and explainability. Domain expertise can also be important for improving accuracy in models.

The panel discussion also addressed audience questions related to market power and ML/AI, and the possible future of more human ML/AI capable of simulating empathy when interacting with humans. Improvements in models will continue; there is a large space of data that remains untapped. A major challenge in ML/AI is the problem combinatorial search over different paths that may imperfectly represent the data-generating process; improvements in this area are a key to the future. Morse highlighted the important goal of empowering ML to build a fairer society. Sharman highlighted that the academic research in ML/AI is evolving in a very empirical manner, and this creates challenges of reproducibility and applicability of results for industry practitioners.