

October 12, 2018

Jennifer Piorko Mitchell
Office of the Corporate Secretary
FINRA
1735 K Street, NW
Washington, DC 20006

Re: FINRA's Request for Comment on Financial Technology Innovation in the Broker-Dealer Industry

Dear Ms. Mitchell,

Credit Suisse appreciates the opportunity to provide FINRA with a response to the request for comment on financial technology ("FinTech") innovation in the broker-dealer industry.¹

When considering the adoption of emerging technologies, it is important to evaluate business objectives and risk management approaches within individual organizations and across types of market participants. We welcome the thoughtful approach that US regulators are taking to evaluate how regulated financial institutions can successfully adopt new financial technologies. We are aligned with FINRA's objective to assist regulators in creating an environment supportive of FinTech innovations that benefit investors and the capital markets.

Global banks and broker-dealers collectively have invested heavily in the professional skills, systems, processes, security, compliance and governance needed to capture, render usable and make secure the market, counterparty, retail customer and institutional client data that we generate. This includes exploration and integration of advanced technologies such as artificial intelligence, to include machine learning, into existing business capabilities and infrastructure.

Our response focuses on suggested approaches to supervisory processes regarding the use of artificial intelligence ("AI") specifically in trade surveillance, anti-money laundering ("AML") and know your customer ("KYC") applications, and the development of a taxonomy-based machine-readable rulebook, which includes the creation of common ontologies for the rules and visually interactive representation of the regulatory framework.

I. Supervisory processes concerning the use of artificial intelligence

Banks already have begun to deploy AI algorithms in areas such as trade surveillance. Many other potential applications of AI, to include client products and services and machine-readable rulebooks, are at nascent stages and will require more experimentation on the technologies involved and further evaluation of how to incorporate them into existing enterprises and regulatory structures. Other FinTech capabilities not addressed in this letter (to include blockchain) may also require continued discussions, and in some instances may potentially warrant active experimentation with regulators. This will allow regulated financial institutions and startups alike to rapidly experiment with, evaluate and move innovative products and services smoothly to production, while maintaining investor protections and market integrity. In our response, we highlight some potential uses for several of the emerging technologies referenced in FINRA's Request for Comment, the uncertainties (including regulatory), and potential benefits.

a. The potential applications of AI

Credit Suisse empowers its business divisions and corporate functions to drive innovation according to their business requirements, supported by central Credit Suisse Group functions to ensure alignment and knowledge-sharing. The exploration, development and use of AI at Credit Suisse follows this model. The three principal areas where Credit Suisse focuses the potential use of AI within the bank are:

1. **Client service**, by continuously finding better ways to deliver value to our clients through technology;
2. **Effectiveness**, by optimizing our internal processes; and

¹ See FINRA request for comment on "Financial Technology Innovation." Published July 30, 2018.

3. **Risk reduction**, by enhancing controls and improving our risk profile.

We view the potential use of AI methods to support Client Service as our most likely area for growth of AI-based products and services in the immediate future. We are also interested in increasing the use of AI in activities such as news screening, internal communications, and transaction monitoring.

In this letter, we will focus our discussion of AI in areas such as trading and AML/KYC.

b. Example of AI Use: Trading and Surveillance

The use of AI in monitoring trades may be a promising way to augment and assist trade surveillance teams, analysts and investigators. By using machine learning and outlier detection algorithms for real-time trade surveillance, firms may be able to identify atypical trader behavior both in terms of a trader's own past behavior and performance, as well as in comparison to the trader's peers. We would support the use of AI to augment and empower human-directed and controlled surveillance.

The financial services industry appears to be evaluating FinTech from a risk management perspective on a global scale. These efforts could also include new guiding principles when considering the adoption of emerging technologies across business divisions. Key risks of integrating AI are similar to risks of any new technology implementation, but distinct focus areas for AI in trade surveillance would include acceptance testing for interpretability (e.g., testing the model outcomes of human-AI interactions, not just the AIs in isolation), and the distinctive operational nature of AIs, (e.g., how they are adequately trained, managed, performance assessed and supervised).

We would welcome regulatory clarity regarding expectations for the development and use of AI tools within trading systems, to include expectations for implementation, testing, monitoring, security, data integrity and confidentiality. One of the ways that regulators can help industry tackle the challenges of AI model risk management is by providing clear guidance on the types of principles that market participants (financial institutions and FinTech startups) should incorporate into design and deployment of AI models. Examples could include guidelines for model appropriateness to a specific use case (to include ethical considerations, reputational risk and trust in the industry), monitoring and performance measurement of a model and implementation standards for data integrity and technical hygiene. Additionally, we would support discussions with regulators in the US and globally regarding consistent cross-regulatory definition of an AI model, and how that definition would compare with existing regulatory model definitions.

c. Example of AI Use: AML/KYC Applications

AML compliance represents a significant challenge for the financial services industry in terms of resources, costs and scale. There is a growing awareness that more sophisticated analytics may benefit the industry in terms of identifying money laundering concerns as well as increasing efficiency and reducing costs, which could free resources to address more targeted AML concerns. Reductions in false positives for sanction and transactional reviews as well as efficiencies in the KYC on-boarding process are of particular interest in the context of anti-money laundering compliance.

UK Financial Conduct Authority's May 2018 AML/Financial Crime Techsprint

Credit Suisse researches and reviews current AI development and trends and is an active participant in industry events featuring AI development, as well as other emerging technologies. As an example, Credit Suisse participated in the United Kingdom's May 2018 Financial Conduct Authority ("FCA") AML and Financial Crime Techsprint. During the Techsprint, 260 participants, including Credit Suisse, were tasked with 15 problem statements resulting in more than 20 solutions presented by 105 firms. We found the following key concepts/solutions may warrant further exploration and discussion:

Blockchain Technology

Some TechSprint teams proposed use of Blockchain/Distributed Ledger Technology to develop a platform or database for various institutions to share questions and answers, "bad actors," and suspicious case patterns without sharing the actual transaction data. Such a platform could have the potential to enable a large AML/KYC and Financial Crime Detection network, with the intent to benefit all registered financial institutes in the ecosystem.

Advanced Big Data Analysis Methods

Teams also were interested in applying time series, cluster and network/graph analyses on large, given datasets. Network/graph analyses potentially could help measure all relevant graph metrics, which in turn potentially could help banks in identifying money-laundering behavior.

Natural Language Processing

Teams also proposed using text analytics natural language processing, as well as topic modelling, to improve payment screening. By reading text content in a transaction reason section and filtering out risky transactions, banks potentially could use this method to prevent authorized payment fraud.

II. Opportunities and Challenges of Integrating Emerging Technologies into Financial Markets

The benefits Credit Suisse seeks to gain from use of AI and other emerging technologies include, among others, the potential ability to substantially increase the accuracy, timeliness, and performance of our business functions, products and services. Increases in knowledge (understanding) and efficiency have the potential to help reduce costs and free resources to address more complex targeted issues and concerns.

While there is a significant movement to embrace the benefits of AI and other emerging technologies, the use and integration of these technologies bring their own challenges. In general, many financial market participants (regulated banks, broker-dealers and other less-regulated industry players) may need to develop risk frameworks and governance structures that manage regulatory, reputational and economic risk, while at the same time fostering, rather than stifling, innovative thought and development of potential solutions to address market and investor needs. Established model frameworks may need periodic review and possible refinement to determine whether they address the challenges associated with AI and other emerging technologies. Further education and user acceptance may be required to support an environment that can lead to the successful use of AI and new technologies.

III. Machine Readable Rulebook

a. Credit Suisse's Proof of Concept ("POC") and the FCA Techsprint

Machine Readable Framework

Digitalization has created a tremendous opportunity for regulators and industry to work together to streamline accessibility to and improve compliance with regulations. For example, publishing industry-specific regulation through a common platform can help to push specific, detailed and relevant content to firms.

Credit Suisse supports a machine-readable regulation framework, as a potentially efficient way to achieve the target state of automated regulatory reporting. Achieving effective machine-readable regulation may depend on the data quality and the standardization of participants, as well as the internal complexity of existing reporting rule sets. Firms that operate regionally and globally may need to develop common data elements that can be applied consistently within each organization and across jurisdictions.

Implementation of machine-readable regulation rules may vary across jurisdictions. A machine-readable regulation framework could analyze the subset of semantics of business vocabulary defined in regulatory documents, taxonomies and the ontologies. Credit Suisse suggests the use of a flexible, feature-rich and expressive standard, such as the Semantics of Business Vocabulary and Business Rules ("SBVR"),² to publish the regulations; standards such as SBVR support human-readable and machine-readable publications from a common specification. Other standards, such as XBRL,³ are more difficult to transform into a human-readable representation.

In addition, both the public and private sectors may need to consider what allocation of resources may be required to advance adoption of technology solutions for implementing regulatory improvements.

² SBVR is an OMG managed standard, designed for rule management <https://www.omg.org/spec/SBVR/About-SBVR/>

³ "XBRL" is the open international standard for digital business reporting, managed by a global not for profit consortium, XBRL International." <https://www.xbrl.org/the-standard/what/an-introduction-to-xbrl/>

Early and open engagement between regulators and industry can help facilitate discussion of these considerations and is key to addressing any challenges that may arise from large-scale overhaul of the existing reporting technology infrastructure in favor of technology solutions such as machine-readable regulation.

Credit Suisse recommends that the design and objectives of machine-readable regulation support ease of compliance with existing regulatory environments applicable to firms. Market participants that operate regionally and globally should work with regulators to develop a common business vocabulary that can be applied consistently within each organization and across jurisdictions.

A Proof of Concept Approach to Using Common Ontologies

One of the biggest opportunities emerging from new technological innovations is the creation of machines with the potential to understand regulatory requirements through vocabularies and ontologies as defined by regulators in collaboration with industry. Credit Suisse is currently working with a US university on a proof of concept ("POC") to develop a machine-driven analytical solution for implementing and complying with regulations. Ultimately, we seek to determine if the use of machine learning algorithms and neural network models can enable machines to learn regulatory documents' vocabularies, illuminate unknown linkages, and provide new insights into the regulations. To achieve these broader goals, regulators and industry would need to work together to develop industry-wide standardization and definitions for the ontology and glossary for key regulations.

The critical processes for making regulation machine-readable are:

1. Extracting the text necessary to fully understand the regulation;
2. Extracting the new requirement by the process of mapping the regulation text to an existing vocabulary, as well as possibly expanding the vocabulary; and
3. Identifying the regulation requirement based on the published regulatory document.

Our POC uses an AI feed forward neural network (FFN) to find the relationship between the set of input values and the set of output values, Word2Vec neural network to convert the dictionary of texts into numerical values, and Word-embedded models to convert and understand the regulatory documents. Key questions that will need to be answered include:

1. What is the **body of words** in a new policy or regulation?
2. What is the **meaning** of each word?
3. What are the **relations** between the words?
4. What are the **decisions** of the policy /regulation?

FCA Regulatory Reporting Techsprints

The FCA is exploring machine executable regulation (which is being referred to as digital regulatory reporting) and is now entering the second phase following its Techsprint in December 2017 and previous roundtables. The FCA has implemented a pilot collaboration between two regulators, the FCA and the Bank of England, and 7 financial institutions. The pilot experiments with the prototype created during the 2017 Techsprint with the goal of making regulatory reporting seamless for both firms and regulators. The objective is to implement a shared solution that automates and digitizes current manual processes. It seeks to remove inconsistencies in interpretations and prevent duplication of data across the industry, to make the entire process more efficient and effective.

After proving that machine executable regulation is technically possible in the 2017 Techsprint, regulators in tandem with industry are moving forward:

Prototyping and Engagement Phase

In 2017, a prototype was built showing potential value and served as an anchor point to begin a pilot with other participants in the industry. In parallel, further collaboration with other firms in the TechSprint and engagement with government, universities and other firms was also developed.

Pilot at an Industry Level

In 2018, a pilot was implemented and engagement with selected firms began. Two use cases will be implemented (retail and corporate) with a target to complete the pilot by the end of 2018.

Scaling Phase Proposal

Once completed and the feasibility of machine executable regulation at scale (technically and non-technically) is proven, a plan will be drafted to propose the expansion of the program with the final objective being implementation across the industry.

b. Benefits and Challenges of a Machine Readable Rulebook and Taxonomies

We believe that all participants may potentially benefit from a machine readable rule book and embedded taxonomy. The regulator potentially could benefit from consistent interpretation of the regulation due to common data elements throughout the industry. Firms may be able to implement regulations more quickly with less exposure to compliance risk due to unambiguous definitions. Market participants could use the same classification in their algorithm, making it possible for the machines to learn regulatory documents and identify what deliverables the rule or regulation requires. Engagement between regulators and market participants may be crucial to achieving these results. Smaller market participants that do not have the infrastructure to read and process the regulation in an automated way could use the more precise definition of the rulebook terms and the intention of the regulation. Technologies such as SBVR may be able to specify the rules to help generate desired outcomes.

Benefits	Challenges
Time to Market	Adoption ratio of the technology-large scale overhaul of the existing reporting technology
Cost Reductions	Resource scarcity with semantic technologies
More Timely Reporting	Required specification and modeling efforts by regulators
Disambiguation of terms and regulations	Alignment efforts for coordinated reference ontologies
Semi-automated alignment of ontologies of different regulators (identification of harmonization potential)	Lifecycle and maintenance of ontologies
Support of an evolutionary approach	Testing frameworks for ontology integration
Flexibility of data model and impact on firm internal data standardization efforts	End-to-end tools support for integrating new technology into existing application landscapes
Support of regulator-based individual ontologies by linking ontologies together	

IV. Programmatic changes by Other Regulators in Support of Innovation

Regulators can play a significant role in the successful development and integration of emerging technologies. Effective collaboration among financial market participants and regulators could help foster the development of innovative products and services within the context of detecting and understanding any new risks to investors or systemic market risks that may emerge. We support the use of regulatory sandboxes to provide protected environments for all market participants to develop and evaluate the utility and effects of innovative products and services. We would welcome the continuation by regulators (and self-regulatory organizations such as FINRA) of their active outreach and their solicitation of comments on market and investor concerns and initiatives.

a. Points of Contact within Regulator

We support the identification of an innovation contact within each regulatory agency or SRO who is responsible for identifying the correct individual within that agency to speak with regarding a particular inquiry from a stakeholder, offering a clear and open line of communication.

b. Consultations/Reports/Techsprints/Sandboxes

Credit Suisse supports international regulators collaborating in the FinTech arena. Communication and engagement creates a space for regulators and market participants to learn from one another and potentially incorporate similar approaches when furthering innovation efforts in their home countries and

across the globe. We recognize and appreciate that each regulator faces unique opportunities and challenges, which may lead to nuanced differences across jurisdictions. We also believe that jurisdictions could learn from each other – to leverage and adapt existing regulations and lessons learned from those regulatory implementations. We encourage regulators to continue to work with market participants to develop regulatory sandboxes, co-operation agreements, networks, Techsprints, and other mechanisms enabling safe and effective innovation as well as regulatory collaboration across jurisdictions.

Below are several initiatives being implemented by both US and international regulators in relation to FinTech with a focus on consultations/reports/techsprints/sandboxes that could serve as models for consideration by regulators evaluating ways to foster innovation.⁴

CFTC RFI

The CFTC announced a new FinTech initiative in May called “LabCFTC,” to “accelerate the CFTC engagement with FinTech and RegTech solutions.” The lab will allow the CFTC to pinpoint where the regulatory and supervisory frameworks could better support “responsible innovation” and allow for collaboration with the agency. It will also support and stimulate innovation through prize competitions that can solve public policy challenges. Examples of potential topics include sharing data, a “robo rulebook,” and a “smart” notice and comment platform.⁵ In anticipation of the Prize Competition, the CFTC released a Request for Information⁶ last spring, to which Credit Suisse responded with a focus on machine readable regulation.

Treasury Report

In response to an Executive Order by President Trump on the financial system, the US Treasury, among a series of reports that were a product of the Order, published a report focused on FinTech as well as other nonbank issues. The report presented an opportunity for stakeholders within financial services as a whole with an interest in financial technology to submit feedback to the Treasury Department. The final report was released in July 2018 with a list of recommendations. Reports and consultations allow industry and regulators to work together to produce ideas that are collaborative.

UK Sandboxes/Techsprints

The FCA initially began accepting its first cohort of firms into the regulatory sandbox in May 2016. The regulatory sandbox aims to create a “safe space” in which businesses can test innovative products, services, business models and delivery mechanisms in a live environment without immediately incurring all the normal regulatory consequences of engaging in the activity in question. The FCA is now accepting applicants into its fourth cohort with 90 percent of firms from cohort one taking their innovation to the market.

The sandbox has been a success in improving access to the market not only for innovators, but also for consumers. The sandbox is useful for firms that are not currently authorized by the FCA, and it encourages large “incumbents” like Credit Suisse to trial new products or platforms. If required, the FCA can agree to temporarily waive a regulation that may make it difficult to go to trial as long as consumers are protected. The regulatory sandbox is a material step forward in establishing a safe space for technology-driven innovation in financial services. Further, the tightly controlled environment of the regulatory sandbox aids the development of new business models while discouraging regulatory arbitrage.

The FCA and Bank of England have also hosted TechSprints and hackathons, where industry is invited to participate in a (usually) two to three day event to work on innovative solutions and creating efficiencies using cutting-edge technology. In May 2018, the FCA hosted the first multi-regulator TechSprint focused on AML, financial crime, and terrorist financing. This collaboration is where we envision the market developing.

⁴ This is not a comprehensive list of all actions being taken by regulators around the world in the area of FinTech.

⁵ Gorfine, Daniel. “FinTech Innovation: Building a 21st Century Regulator.” IIEL Issue Brief 11/2017.

⁶ “Request for Input on LabCFTC Prize Competitions.” April 25, 2018.

GFIN (Global Financial Innovation Network)

The FCA along with 11 other regulators/agencies (including the Bureau of Consumer Financial Protection in the US) are creating the Global Financial Innovation Network ("GFIN"). This will expand the current sandbox used in many jurisdictions to test products and technology in a global arena. It will create a network where innovators, regulators and supervisory authorities can share experiences with emerging digital finance solutions, ensuring that deployment in various jurisdictions at the same time is possible while keeping in mind existing policy objectives.

V. Conclusion

Global dialogue and collaboration between regulators and market participants is an important step in allowing innovation to flourish within the financial services industry. While many emerging technologies are still in the early development stages, productive discussions now about current and future guidelines and regulations inspire confidence, and the kind of environment that can allow experimentation with and potential adoption of new technologies to continue. Many of the steps being taken by domestic regulators and those around the globe in relation to FinTech are positive and enhance cooperation among FinTech stakeholders. We appreciate the ongoing dialogue on this topic and look forward to continuing to actively engage our US and international regulators, as policies regarding FinTech continue to evolve.

We thank FINRA for the opportunity to provide our input. If you have any questions, please do not hesitate to contact the undersigned or Ashlyn Teel at 202-626-3325.

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