

August 24, 2020

## **Course on Suptech and Regtech**

### **Opening Remarks**

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### **Welcome Remarks**

- Dr. Kimmo Soramaki, Dr. Samantha Cook, Ivana Ruffini, representatives from regional central banks, colleagues, good morning.
- I am very pleased to welcome you to the virtual Course on Suptech and Regtech that CEMLA organizes with the academic support of Financial Network.
- Let me also thank Dr. Soramaki for partnering with CEMLA to ensemble this Course. He has prepared a very practical and applied training on how new technologies can be used by financial authorities to fulfill their financial stability goals. And let me thank you all for your attendance to this event, I am sure we will not disappoint you.
- Along this week, we explore conceptual and hands-on sessions to showcase the application of innovative technology in financial supervision, regulation and monitoring.
- I would spend my remarks in sharing with you what we are doing at CEMLA as regards financial technologies. First of all, you may know that Dr. Manuel Ramos Francia, our Director General, established in the Strategic Plan the need to foster regional collaboration on understanding the implications and potential uses of new financial technologies within the regional central banking community. Second, the Center is working hard to upgrade our capacity as a vehicle for sharing knowledge with scientific and academic pillars; in other words, we are making the research one of our most important activities. And, third, we are aware that the central banks of the region are on the keenest mood to test and learn new technologies, both for regulate them and for use them in favor of their mandates.

### **Why this time financial technologies may be different?**

- As we all here know, technological change has been at the hearth of innovation in the financial system. Today, we are in front of a major and significant change in the financial system and the economic world, if I may. First of all, changes are taking place at a greater speed than ever before and financial authorities acknowledges this worldwide. New technologies and business models are transforming the provision of financial services, bringing benefits to customers in terms of expanded and richer choice of products, with increased convenience and, sometimes,

at little cost.

- As suggested by the FSB and other multilateral organizations, fintech comprises advances in technology that have the potential to transform the provision of financial services, spurring the development of new business models, applications, processes, and products. Within this broad definition, we find new technologies such as Machine Learning and Big Data analytics; distributed consensus protocols, or what we know as blockchain technologies; biometrics and digital identification; contactless technologies; cloud computing; and complex networks systems; just to name a few. Such technologies have allowed the industry, especially new entrants, to develop new products and services, and have led the markets' participants to set new arrangements.

### **CEMLA Innovation Hub**

- With this background, we established an Innovation Hub as a mechanism to identify and develop knowledge related to fintech applications that could be relevant for central banks, either for operation or for regulation purposes, and which could be scaled up through regional collaboration. Its scope could be broadened, as we understand the pace of change of technology, but it essentially runs now as a technical advice vehicle in the following fields:
  - Financial stability monitoring
  - Payment systems oversight
  - Other surveillance activities
- Thus, if you allow me, I will briefly walk you on the progress made by the Hub to conclude with some perspectives on future work that could be developed, and that have been included in the agenda of this regional event.
- As a way of introduction, it is important to underline that adoption of technologies in finance is not necessarily new. In fact, the modern society has achieved progress thanks to technological advances. The financial system is one of the economic activities that relies heavily in such continuum of innovation enabled by technology.
- But, at the same time, Artificial Intelligence, Deep Learning and Complex Networks are becoming useful developments to enhance the central banks' institutional capacity as regulators, operators and overseers of financial markets and infrastructures.
- The Innovation Hub has exactly focused in formulating use cases which aim at answering questions in the three fields I referred early. The Call for Proposals we submitted last year allowed us to select 9 relevant use cases from regional central banks. Systemic risk and contagion understood by resorting to Network Analysis, but also Neuronal Networks to detect anomalous payments, to name a few.

### ***Financial stability monitoring***

- In this field, use cases have mostly focused in the study of financial contagion, systemic risk and stress testing, enabled by complex networks systems.

- As the (broad) financial stability mandate has gained prominence, complex networks serve as an innovative analytical approach to better understand direct and indirect effects of the network structure and behavior on the financial system. This is of utmost importance given that systemic events are costly and painful. The ability to study contagion and systemic risk is therefore a desirable feature for financial stability.
- ***Use Case 1 on “Measuring systemic risk and systemic importance”***. As illustrated by the Central Bank of Bolivia, analyzing payment system networks allows to identify the most systemic institutions by resorting to the Sink Rank metric. Also, by using the outstanding exposures among financial entities, it is possible to derive a metric, the DebtRank, about systemic risk for the uncollateralized interbank markets. Both analyses are useful to characterize the structure and interconnectedness of the wholesale payment system and to study financial contagion and systemic risk.
- ***Use Case 2 on “Interbank market surveillance”***. The Reserve Central Bank of Peru’s is a case that allows us to pay special attention to interbank markets as a source of financial contagion, by developing a multilayer network model. By using data on unsecured exposures, cross holding of securities, interbank deposits, and balance sheet information, it is possible to both, characterize the interbank market, and to carry out systemic risk assessment.
- ***Use Case 3 on “Credit risk analysis”***. As shown by the Central Bank of Colombia, it is possible to estimate the probability of default for individual loans with financial network analysis. More specifically, to identify the network backbones to develop a predictive tool on credit risk. An enriched credit risk analysis underpinned by link prediction in a bipartite lending network was performed for this use case.
- ***Use Case 4 on “Macrofinancial surveillance”***. A case of the Central Bank of Uruguay focuses on the linkages of financial and corporate entities by developing a bank to firm network and an intra-firm network. Systemic risk analysis can be performed by estimating the impact of firms’ default on the banking system taking into account direct and indirect exposures through the firm to firm network. This is an interesting approach to contagion from real to financial sector.

### ***Payment systems oversight***

- With the advances in data-driven modelling techniques, financial authorities can use Machine Learning to identify patterns or enhance predictive analysis. At the same time, payment systems and other market infrastructures are very rich sources of data.
- Using their data to feed both supervised and unsupervised Deep Learning models could be useful to monitor markets and institutions, but also to establish and predict patterns of how money is being used by economic agents, for instance to detect anomalous behaviors.
- ***Use Case 5 “Anomalous payments detection”***. As proposed by the Central Bank of Ecuador, it is feasible to develop an alert system on anomalous payments by using Machine

Learning. The autoencoder is a model designed as a feedforward algorithm that could detect unusual activity on a forward-looking basis. This approach may be helpful in two ways. First, it can help to financial intelligence activities (to prevent financial crime). Second, it can be used to analyze participants' profile in a payments network.

- **Use Case 6 “Identifying entities behavior at payment systems”.** The Central Bank of Colombia proposes a case to understand how an Artificial Neural Network can serve to detect atypical behavior of the participants of the wholesale payment system. This is an interesting application to learn the main features and patterns of financial institutions, using Artificial Intelligence to detect outlier patterns in the interbank market.
- **Use Case 7 “Monitoring payments flows”.** As established by a case of the Central Bank of El Salvador, an unsupervised ML model including clustering and Principal Component Analysis (PCA), is useful to develop monitoring tools for payments flows. A remarkable aspect of this case is the ability of new technologies to study underlying patterns at systemically important payment infrastructures, while: 1) reducing dimensionality of datasets; 2) increasing interpretability; and, 3) minimizing information loss.

#### **Other surveillance activities**

- Financial authorities have the opportunity to use increasing amounts of granular data, often referred as Big Data to perform surveillance and research activities that could be useful for policy making. This applies to a very broad range of sources, such as e-commerce and social media.
- **Use Case 8 “Economic forecasting and analysis”.** The Central Bank of Uruguay develops a case to understand and measure price rigidity based on micro- and macroeconomic data, and its effects on the business cycle. When granular and diverse data on business activity is available, a Big Data approach may be useful for a central bank to forecast economic activity, in this case by feeding a Principal Component Analysis (PCA) with such kind of data

#### **A case in point: decentralized protocols**

- DLT is a fintech development that may change current paradigms, for instance the functioning of market infrastructures. DLT are designed to store and access information using cryptographic encryption, and in finance they could be used to underpin infrastructures handling assets (tokens) and their holders' accounts and transactions in a shared database, without the need to rely on a trusted central validation system.
- **Use Case 9 “Broadening access in the RTGS, enabled by blockchain technology”.** As proposed by the Central Bank of Chile, the RTGS features -like access- could be enhanced by using DLT architecture and protocols. This is a very topical case, because DLT designs may help to understand if operationally and conceptually, it is possible to overcome gaps in key market infrastructure, like the RTGS system. For emerging economies, searching ways to promote a level playing field in financial market infrastructure is an aspect that central banks should be keen to look at, and this case is an interesting proposal under consideration.

## Looking forward

- I must confess that the establishment of the Innovation Hub at the Center has been a task with no precedents, but the results we have witnessed are noteworthy. Furthermore, we are just commencing to see how these innovative approaches can be wide spread along the region.
- But beyond this preliminary assessment, we identify areas of development that need to be addressed as well. Among these, let me spend a couple of minutes on Suptech as one of the most relevant.
- As reflected in some of the initial use cases, technologies can be useful to support monitoring and compliance tasks led by financial authorities. This is enabled by the present context of data availability and granularity set by the post-crisis reforms. Our goal is to dedicate space in the Hub to foster supervisory data analytics by using innovative approaches. To name a few: identifying cyber threats and enhancing financial intelligence (against crime, like money laundering) with Machine Learning or Artificial Intelligence developments, or building up systems to monitor financial risks with Financial Networks Analysis.
- The purpose of such developments is to become more effective and able to deal with financial stability challenges by establishing forward-looking systems at the hand of central banks and banking regulators. And for this, the Hub and this Course becomes a channel to build the capacity, having the support from top-class academics and practitioners. Dr. Kimmo Soramaki, for instance, have been working with a number of central banks to establish this type of innovative supervisory tools. In the context of the initial use cases of the Hub, CEMLA staff partnered with UCL Blockchain Centre who has trained UK financial regulators. So, I am confident in telling you that this is a great opportunity to raise policy questions in what respects your own domestic situation for financial stability issues.
- The hands-on sessions will help us to open up the discussion about the data, skills and techniques that new technologies required. I convey you to leverage your supervisory expertise to ask how the analyses to be showcased can be applied in your respective central banks.

## Conclusions

- Let me conclude. The world is witnessing a significant transition enabled by data-driven changes and related new technologies. As safeguards of the financial and monetary stability, central banks need to approach and better understand what the major implications could stem from such technologies, either to properly regulate them or to make them part of its supervisory and monitoring toolkit.
- With the establishment of a Regional Innovation Hub we have seen that it is plausible for central banks to equip with tools to anticipate distress in the financial system by building up on innovative techniques.
- Our contribution to the central banking community of the region is therefore, to encourage and foster the learning and testing of new technologies, with a practical approach in financial

stability activities.

- I would like to underline once more that the experience with the use cases have been very fruitful. After months of intense work we are proud to share with you that some of these cases have been escalated to Central Banks' Boards discussions on their potential to become part of the surveillance toolkit in their respective central banks, in addition to this, the impactful results obtained will be broadcasted to the central banking community once the use cases reach its publication as academic papers in the Latin American Journal of Central Banking, which I trust all of you have heard about.
- I am also certain that the presence of our colleagues from FNA in this training and your central banks will help us to identify new projects to incorporate in the Hub.
- I wish you a fruitful and successful virtual course and look forward to meeting you again in person when we have the opportunity.

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