



Project Number: [825215]
Project Acronym: [FIN-TECH]

Project title: [A FINancial supervision and TEChnology compliance training programme]



PERIODIC TECHNICAL REPORT – PART B

Activities M1 – M18

ABSTRACT

THE DOCUMENT DESCRIBES THE WORK DONE BY THE PARTNERS FOR EACH WORK PACKAGE, COVERING THE PERIOD M1-M18

THE FINTECH-HO2020 PARTNERS

Period covered by the report: from [01/01/2019] to [30/06/2020]
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I. Intermediate technical report

A. Abstract

The main goal of the project is to develop a knowledge exchange programme to enhance the European FinTech ecosystem, delivering uniform procedures for fintech compliance in risk management, dynamically updated with emerging state-of-the-art technologies, best practice business models, and international regulatory developments. A programme that is jointly built by universities, regulators, supervisors, fintechs, and fintech hubs, covering all 27 European Union countries, plus the UK and Switzerland. In other words, the goal of the project is to reduce barriers between supervisors and supervised entities, encouraging the development of uniform European technology-driven and regulatory compliant risk management procedures.

We aim at connecting FINancial supervision with TECHnological compliance, from which the acronym of the project: FIN-TECH.

The motivation, aims, methods and participants of the project can be summarised as follows.

Motivation. Technological Innovation in Finance (FinTech) brings several opportunities (competitive prices, better user experience, wider inclusion) but also risks (credit risks, market risks, cyber risks), amplified by the interconnectedness of fintech platforms, which generates systemic risks.

Aims. The FIN-TECH project, under the EU's Horizon2020 funding scheme, aims at building a fintech risk management platform, which measures risks to make fintech innovations sustainable. A platform that aims to automatize compliance of Fintech companies (RegTech) and to increase the efficiency of supervisory activities (SupTech).

Method. The aims have been and are achieved by creating a knowledge exchange hub, which will eventually lead to a European sandbox laboratory that evaluates risks and opportunities of fintech innovations.

Participants. The project participants are i) the project partners, who research and develop fintech risk management models; ii) the national supervisors of 29 European countries, who give feedback in SupTech workshops; iii) European fintechs and banks, who give feedback in RegTech workshops; v) international regulators and advisory board members, who supervise and evaluate the developed models.

B. Structure of the report

The Document has the objective to report the partner's activities for each of the seven work packages (WP).

Structure of the report

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The rationale chosen behind this document regards the style (presenting the WP leaders, with different task in each WP and in a separate section the Partner's with activities mainly on research, development of use cases for the whole consortium (in some cases) and deep understanding and training to regulators of those chosen for each research and workshops activities.

Specifically, the document is organised as follows.

Within Chapter I, Section C contains specific objectives guiding the FIN-TECH Project, as described in section 1.1 of the DoA; Section D contains the description of the related work packages and Section E summarizes the efforts spent by each partner, in the different work packages, to reach the stated objectives.

Chapter I is followed by two analytic Chapters. Chapter II reports the detailed activities of the Work package leaders.

Chapter III contains the description of work for the consortium's partners (not WP leaders) for each of the seven work packages.

Chapters II and III together describe the work carried out by each partner during the reporting period towards the achievement of each objective of the project.

Before moving ahead with the document, we would like to remark how we incorporated the main suggestions made by the reviewers during the preliminary review held in conjunction with the Vienna RegTech workshop.

In February 25th, 2020, a technical review has been held at the University of Vienna, the day before the scheduled RegTech workshop. The report from the reviewers and the related correction actions and suggestions have been used to build this document. The sections have been enriched to match the review comments covering the generalities of the project and the specific contributions from each partner of the Consortium as well. Let us see specifically how we address the reviewer's comments in this document.

- *Stronger communication, strategy and execution are needed. More emphasis on the content of social media as part of a social media strategy (not only pictures of events) would be helpful. (Section 1.1)*

The communication strategy is under revision and the next steps are part of a dissemination plan co-organised with ASE Bucuresti (the new WP7 leader from the ongoing amendment). The plan includes a focus on the communication and exploitation of the project's results within the engaged network

(consortium, fintechs, banks, supervisors, national regulators, etc.) through a dissemination plan of contents created by the partners aimed at increasing visibility, ensuring the positive impact and showing the added value of the different actions of the project. The detailed plan can be found under Dissemination-WP7.

- *Re-submit the deliverable D7.6 “Intermediate Evaluation report” and add more extensive information on the outcome of the workshops/presentations: who are the parties participating, their roles and their responsibilities, how will they stay involved, what is their feedback on the use cases presented, are the selected use cases, in the end, the ones that meet the expectations and requirements at most [....] Assess the impact of the workshops and the dissemination activities on supervisors and regulators. Reach of dissemination activities should be measured..(Section 1.4 &1.5)*

The above point concerns the insufficient feedback from the organized workshops: to achieve a better overview of the feedback strategy we included in the document a feedback section under each SupTech /RegTech event, with a detailed description and oriented replies plus an enriched section under the dissemination plan (Feedback generation and evaluation).

The strategy regarding the feedback, evaluations and dissemination has been extensively revised and specific actions were taken and scheduled starting from the Management Board held the 18th of May in London.

- *Is the contribution of each beneficiary in line with the work committed in the DoA? (applicable only to multibeneficiary projects)? (section 4.4)*

The document has been revised so that Partners' activities include the specific comments made by reviewers to each partner.

- *Not all use cases have the same level of innovation, also only the first part (BDA) was completed by the end of 2019. Therefore, this assessment applies mainly to Big Data Analytics (BDA), less to Artificial Intelligence (AI) and Blockchain (BC). The relevance of the „innovative results“ is questionable:* • Use case BDA I (Network based scoring models to improve credit risk management in peer to peer lending platforms): results show no significant impact according to the Area Under Curve measure (AUROC) • Use case BDA III (Network based scoring models to improve credit risk management in peer to peer lending platforms - Spatial regression models to improve P2P credit risk management): results show no significant impact according to the Area Under Curve measure (AUROC) • AI Use case I (Convergence and Divergence in European Bond Correlations): no real AI use case • AI Use case II (On the effectiveness of Portfolio Composition techniques to build stable and sound Robo Advisory Portfolios): inconclusive results for different values of gamma and in comparison to reference values • AI Use case IV (eXplainable AI in credit scoring and portfolio construction): The Google Trending is in fact negligible (after reproducing it), relevance of result for target group unclear • Blockchain Use case (Stable coin): pretty obvious result (multi-currency better than single currency) • Blockchain Use case (Blockchain as asset class): not surprising, reference to Phenotypic convergence is questionable and distracts from the lack of relevant results; also some methodological questions couldn't be answered (about the existence of

moments for fat tailed distributions) A structured approach to measure the relevance for the target group is missing. Scientific achievements in the selected use cases are not significant.

The above points concern the level of innovation and relevance of results in the Big Data Analytics (BDA), Artificial Intelligence (AI) and Blockchain (BC). We remark that the main objectives of the use cases are to provide innovative results in the fields of BDA, AI and BC.

In the BDA field, the consortium has worked on credit risk management, with particular focus to the new area of peer to peer platforms' scoring models. Use case BDA I (Network based scoring models to improve credit risk management in peer to peer lending platforms) proposes to enhance credit risk accuracy of peer-to-peer platforms by leveraging topological information embedded into similarity networks, derived from borrowers' financial information. Topological coefficients describing borrowers' importance and community structures are employed as additional explanatory variables, leading to the improved predictive performance of credit scoring models. The improvement in AUROC is indeed not very high. The model proposed, as opposed to many other emerging AI techniques, is interpretable and explainable, what is a high focus of financial Supervisors. Moreover, the use case does not apply to traditional banking systems, rather to new sources of peer to peer lending, whose credit scoring models need to be built soundly, given the lack of a third mediator party. The very same considerations apply to use case BDA II (Network based scoring models to improve credit risk management in peer to peer lending platforms) and BDA III (Spatial regression models to improve P2P credit risk management).

In the AI field, the consortium has developed use cases whose applications range across different fields, from the bond market to the cryptocurrency one. Indeed, the AI use case I (Convergence and Divergence in European Bond Correlations) uses noise-filtered partial correlation influences to evaluate time dependency and visualize using network graphs. The use case is computationally intensive when the frequency of time series observations is high, and therefore it could be classified as AI. We developed this use case together with the European Stability Mechanism (ESM) within their mandate to observe the bond market access of the Euro area countries. The CRM model is part of their early warning system regarding the loss of market access to specific countries. Our project is featured in this video on their website <https://www.esm.europa.eu/publications/european-government-bond-dynamics-and-stability-policies-taming-contagion-risks>, in their 2015 and 2016 annual reports and the technical appendix of the 2020 report from Almunia on the three financial assistance programme for Greece: <https://www.esm.europa.eu/publications/lessons-financial-assistance-greece-%E2%80%93-technical-appendix>. The authors are using hourly market data in weekly time windows to assess the short-term bond market sentiment. The case is an example to employ a machine learning method to extract the most important net correlations that reflect converging or diverging sentiment in the bond market. If machine learning is a subset of AI, the case could be classified as AI. But it certainly does not have a "self-learning" or autonomous component.

The AI use case II (Network Models to Enhance Automated Cryptocurrency Portfolio Management) proposes a novel approach to build efficient portfolio allocation strategies involving volatile financial instruments such as cryptocurrencies, by developing an extension of the traditional Markowitz model which combines Random Matrix Theory and network measures. This is done to achieve portfolio weights enhancing portfolios' risk-return profiles. The results show that the proposed model over-performs several competing alternatives, maintaining a relatively low level of risk. Results for different values of

gamma were compared and the best alternative for such a case is chosen. Of course, gamma is a parameter which can be tuned by the investor, given his/her risk preferences, the assets in which he/she is investing, and current market conditions. Indeed, there is no “right” choice of gamma, which should be evaluated upon the above-mentioned elements to yield positive results for all occasions. The AI use case III (eXplainable AI in fintech risk management) proposes an explainable AI model that can be used in fintech risk management and, in particular, in measuring the risks that arise when credit is borrowed employing peer to peer lending platforms. The model employs Shapley values so that AI predictions are interpreted according to the underlying explanatory variables. The results achieved are relevant as they are explainable. Indeed, differently from arising black-box models, the proposed technique is not only from the artificial intelligence field but also explainable, as results can be directly interpreted and each variable’s importance in discerning creditworthiness can be derived employing Shapley values.

As far as the BC use cases are concerned, the consortium has up to now developed use cases linked to the cryptocurrency space, which meets the expertise of partners and objectives of the projects. In particular, the use case BC I (Basket based stablecoins to mitigate foreign exchange volatility spillovers) aims to assess, from an empirical viewpoint, the advantages of a stablecoin whose value is derived from a basket of underlying currencies, against a stablecoin which is pegged to the value of one major currency, such as the dollar. To this aim, the paper first finds the optimal weights of the currencies that can comprise our basket and then employs volatility spillover decomposition methods to understand which foreign currency mostly drives the others. This result is fundamental for policymakers, and especially for emerging markets with a high level of remittances: a librae (basket based stable coin) can preserve their value during turbulent times better than a libra (single currency based stable coin). The conclusion is not so trivial, as some strong single currency stablecoin could still be better than a basket based stablecoin if that currency is stable enough and resilient to shocks. The case shows, however, that a basket based stablecoin is less volatile and more resilient to shocks with respect to all currencies analysed. This is a strong result which fosters financial inclusion and enhances the adoption of Central Bank Digital Currencies (CBDC).

The use case BC II (Blockchain as an asset class) derives the main factors that separate cryptocurrencies from the classical assets, by using various classification techniques applied to the daily time series of log-returns. The main result of the paper is the complete separation of the cryptocurrencies from the other type of assets, by using the Maximum Variance Components Split method. Also, we observe synchronicity in the evolution of the cryptocurrencies, compared to the classical assets, mainly due to the tails behaviour of the log-return distribution. The point on the existence of moments for fat-tailed distributions is beyond the scope of the present use case, although the authors believe this is a very good comment and they are eager to improve research on this side. Indeed, the authors may still improve the use case, which is currently under development, as the BC part has not been terminated yet.

The use case BC III (Initial Coin Offerings) fills the gap in the related literature, still limited and not consolidated. ICOs represent an alternative and innovative way of raising money to finance business ideas offering as reward tokens issued by the proponent. One of the main issue related to this phenomenon is the absence of a unique, harmonized and reliable database collecting all relevant information to assess and evaluate ICOs.

The authors have been working on building up a reliable and coherent dataset containing the most relevant variables describing ICOs: token issued, soft and hard cap, community engagement, social media channels, white papers characteristics, issuers profile, the status of the ICO (success, failure, scam), web site presence, sentiment-based indexes. Based on such wide dataset containing around 1000 observations, authors were able to implement supervised models (logistic regression, extreme value logistics, multinomial regression) to detect the significant drivers of success and failure of ICOs.

Moreover, the authors conducted an extensive textual analysis on Telegram chats data to produce a sentiment indexable to highlight the level of engagement of the audience possibly interested in investing in ICOs. Significant results show that The presence of a website, of a YouTube channel, size of the Telegram group, are all important and have a positive impact on the success probabilities of an ICO, thus suggesting that building a solid online presence, creating a broad community, interacting and receiving feedback from customers can considerably increase the probability of success of the ICO and its project. We also remark that all the above use cases are documented in papers published in a peer-reviewed international filed journal. The level of innovation, originality and contribution to the research field is implicitly given by the fact that the papers have been, after a refereeing process, and consequent improvement, published in scientific journals, with related impact factors.

C. Objectives

We intend to present the objectives that the consortium stated in the proposal, all of which have been pursued through a wide variety of activities during the 18 months of operations.

The vision of the project is to build a collaborative innovative environment from which both supervisory bodies and regulated institutions can benefit. Specifically, the project aims to connect the two sides of the coin by organizing knowledge exchange (training and coding) sessions, as well as research workshops, which have the purpose of sharing risk measurement solutions that fit the needs of both regulated institutions and regulators. These activities, organized by the FIN-TECH project, draw on the contribution from three types of project participants:

- Fintechs, banks and fintech hubs, who have a detailed understanding of business models based on financial technologies;
- Regulators and supervisors, who have a detailed understanding of the regulations and risks that concern financial technologies;
- Universities and research centres, which have a detailed understanding of the risk management models that can be applied to financial technologies.

Within the consortium, the participating universities and research centres, banks, fintechs and fintech hubs, regulators and supervisors, are presented in Figure 1.

UNIVERSITIES and RESEARCH CENTRES	FINTECH HUBS and ASSOCIATIONS	REGULATORS and SUPERVISORS

Fig1. The FIN-TECH project network

The stated goal of the FIN-TECH project can be subdivided in several main objectives, which correspond to different work packages:

- O1.** Create a panel of experts in fintech risk management, through the daily management and coordination of the project (**WP1-Management**);
- O2.** Create, through individual research activity and the organisation of a dedicated workshop, common standards for risk management in big data analytics, specifically for peer-to-peer lending applications (**WP2- Big Data Analytics Research**);
- O3.** Create, through individual research activity and the organisation of a dedicated workshop, common standards for risk management in artificial intelligence applications to finance, specifically for robo-advice consulting in asset management (**WP3-Artificial Intelligence Research**);
- O4.** Create, through individual research activity and the organisation of one dedicated workshop, common standards for risk management in blockchain technology applications to finance, specifically for Initial Coin Offerings (ICO) and crypto-assets (**WP4-Blockchain Research**);
- O5.** Develop and update pilot research sandboxes in each European country, connecting national supervisors with fintechs, banks and fintech hubs through knowledge exchange training programmes, according to the research developed in O2, O3 and O4, matching the monitoring needs of supervisors with the business needs of fintechs, banks and fintech hubs (**WP5-SupTech Workshops**);
- O6.** Develop and update a pilot European research sandbox, connecting fintech hubs through the production of open-source software for FinTech risk management, and consequent practical sessions, according to the research developed in O2, O3 and O4, matching the business needs of fintechs with the monitoring needs of supervisors (**WP6-RegTech Workshops**);

07. Communicate externally the advancement of the project, through dedicated website repositories and social networks activity; publications of papers and participation at conferences in financial technology (particularly to those organised by the European Supervisory Authorities, the European Central Bank and the Financial Stability Board); validation of the developed work with established banks, insurances and investment funds. (**WP7-Dissemination**).

D. Work Packages

In the following table, the Work package leaders are reported, along with their short name, that may help to navigate the document.

WORK PACKAGE	WORK PACKAGE TITLE	LEAD PARTICIPANT	LEAD PARTICIPANT SHORT NAME
WP1	Management	University of Pavia	UNIPV
WP2	Big Data research platform	Humboldt University of Berlin	UBER
WP3	Artificial Intelligence research platform	University College London	UCL
WP4	Blockchain research platform	ZHAW Applied Sciences	ZHAW
WP5	SupTech workshops	University of Pavia	UNIPV
WP6	RegTech workshops	Firamis	Firamis
WP7	Dissemination	Firamis	Firamis

Table D.1 1 Work packaged description

E. Project reporting

Effort reporting

The following table reports the effort for each partner, in terms of Man-Month granularity, during the period M1-M18. The following information is in line with the intermediate financial report and the individual partner's timesheets. The responsibility and accuracy of the reported data oversee each partner.

Note that the effort up to M18 already takes into account the requests of MM adjustment (if any), inserted in the ongoing amendment.

PARTNER	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total
UNIPV	23.50	7.00	5.30	5.40	11.60	2.30	6.00	61.10
UBER	0.19	3.30	4.01	-	0.79	0.05	0.13	8.47
ZHAW	0.53	1.38	0.84	0.72	2.66	1.89	0.46	8.48
UCL	0.29	0.88	2.62	0.64	1.68	-		6.11
ASE Bucuresti	0.69	1.90	1.41	0.84	3.43	-	0.64	8.91
MODEFINANCE SRL	0.25	0.75	0.50	0.50	-	1.75	0.25	4.00
FIRAMIS GmbH	1.00	1.00	1.00	1.00	8.00	8.00	12.50	32.50
PANTEION	1.25	5.25	3.75	3.75	3.75	-	-	17.75
INESC-TEC	0.45	0.75	-	0.55	1.66	-	-	3.41
UP1	1.85	3.10	4.06	3.64	4.21	1.21	-	18.07
POLIMI	0.89	1.21	4.13	0.32	3.40	-	1.35	11.30
UCD	0.5	0.50	0.50	0.50	1.50	-	0.50	4.00
UL	1.00	1.50	1.50	0.50	2.50	-	0.14	7.14
JSI	0.27	0.20	0.20	0.15	2.28	-	-	3.10
UNIWARSAW	0.69	0.53	0.99	0.43	1.81	-	0.68	5.13
UNI RIJEKA EFRI	0.80	1.00	0.80	0.80	2.50	-	0.80	6.70
UCM	0.71	2.00	2.00	2.94	5.34	1.50	0.74	15.23
EUBA	1.00	1.00		-	2.50	-	2.00	6.50
KTU	0.53	2.99	3.24	3.84	15.48	-	1.89	27.97
MU	0.75	0.91	1.00	-	5.51	-	0.86	9.03
B-HIVE	0.09	-	-	-	0.78	-	0.40	1.27
UE Varna	0.66	0.98	0.98	0.59	0.44	-	0.76	4.41
UTA	-	0.44	-	-	2.63	-	-	3.07
WU	0.35	1.00	1.25	-	2.00	4.00	0.40	9.00
Total	37.74	39.57	40.08	27.11	86.45	20.70	30.86	282.65

Project monitoring 1 Effort by partners M1-M18

We now summarize the project monitoring activities. The “financial Plan-monitoring” table summarizes the responsibility of each partner and what accomplished in M1-M18. Further details can be visualized in the tables “Activities control” Deliverables” and “Papers”.

Financial Plan- monitoring

Responsibility	Budget	Beneficiary partners	Controls
Training hubs (29)	50K	All partners (except Modefinance)	Two sets of SupTech completed: BDA and AI, for a total of at least 32 hours. A few partners underperformed: UCL, Panteion, Paris 1, UCD, KTU (see activities control table)
Regtech workshops (6)	50K	Firamis, Modefinance, ZHAW, UCM, Paris 1, WU	All Regtech for BDA and AI completed, by: Modefinance, Firamis, ZHAW, WU. In each all members of fintech hubs have been invited
Research Workshops (3)	50K	UNIPV, Ase Bucuresti, Firamis	Two (initial) research workshop completed, dedicated to preliminary discussion on BDA and AI, organized by UNIPV and Ase Bucuresti. All partners and international regulators have been invited, and management board meetings have been held
Management	250K	UNIPV	All deliverables due in the period submitted (see deliverables table); all events in BDA and AI completed as described above.
Research WP leadership (3)	50K	UCL, UBER, Paris 1	Research repositories have been populated with consortium papers in all three areas: BDA (26), AI (24), Blockchain (15) (see papers’ table); 37 papers have been published in scientific journals; 28 are preprints under review in journals.
Training hubs WP leadership	50K	UNIPV	Use cases with data, code, paper; as well as slides have been completed for BDA and AI and employed in SupTech sessions.
Coding hub WP leadership	50K	Firamis	Infrastructure completed and populated so far with nine use cases, in BDA (3), AI (3), Blockchain (3)
Dissemination WP leadership	100K	Firamis	Web site, social media channels, event participation, feedback repository completed.

Project monitoring 2 Financial plan

Activities control

The following table summarises the main activities performed by each Partner.

Note: the effort completion percentage is calculated based on person/months indicated in the current version of the GA. Changes in efforts required by Partners or corresponding to proposed changes in WP leadership are included in the amendment under evaluation.

Partner's Short name	# Publications	# Pre-prints	# Use Cases	Hours BDA (16)	Hours AI (16)	Research events	Regtech events	Effort (P/M)	% Effort completion
UNIPV	17	2	7	21	18.5	1		61.10	75.4%
UBER	2	15	1	17	18.5	1		8.47	40.3%
ZHAW (two regulators)	6	2	3	28	34.5	1	1	8.48	58.5%
UCL	5	2		6	17	1		6.11	28.4%
ASE Bucuresti	0	2	1	16	19	1		8.91	63.6%
MODEFINANCE (no regulators)	0	0		0	0		1	4.00	72.7%
FIRAMIS	1	1	1	14.5	14	1	1	32.50	100.0%
PANTEION (two regulators)	1	0		19.5	33			17.75	93.4%
INESC TEC	1	0		16	16			3.41	37.9%
Paris 1	0	0		11.5	9.5	1	1	18.07	62.3%
POLIMI	0	2		20	20			11.30	141.3%
UCD	1	0		19	9			4.00	50.0%
UL	0	0		16	17			7.14	89.3%
JSI	0	0		25	7			3.10	38.8%
UNIWARSAW	0	0		16	16			5.13	64.1%
UNIRIJEKA	0	1		26.5	19.5			6.70	74.4%
UCM	2	0		17	23.5		1	15.23	80.2%
EUBA	0	0		24	17			6.50	72.2%
KTU (three regulators)	1	0		13	56			27.97	103.6%

MU	0	1	19.5	20.5		9.03	112.9%
B-HIVE	0	0	16	16		1.27	8.5%
UE Varna	0	0	17	18		4.41	49.0%
UTA (two regulators)	0	0	43.5	36		3.07	38.4%
WU	0	0	17	16	1	9.00	100.0%

Project monitoring 3 Activities control for each partner.

Deliverables

Number	Title	Lead partner	Status
D1.1	Network Establishment	UNIPV	Approved
D7.1	Establishment of website and social media channels	Firamis	Approved
D6.1	Research and development environment	Firamis	Approved
D5.1	Repository of use cases and slides in big data analytics	UNIPV	Submitted
D7.6	Intermediate evaluation report	Firamis	Submitted
D5.2	Repository of use cases and slides in artificial intelligence	UNIPV	Submitted

Project monitoring 4 Deliverables

Papers

PARTNERS	Publications	Preprints	BDA	AI	BC
UNIPV	17	2	10	7	2
UBER	2	15	7	4	6
UCL	5	2	2	2	3

ZHAW	6	2	5	3	0
UCM	2	0	0	2	0
FIRAMIS	1	1	0	2	0
POLIMI	0	2	1	1	0
ASE	0	2	0	1	1
UCD	1	0	0	0	1
KAUNAS	1	0	0	1	0
PANTEION	1	0	0	1	0
MASARYK	0	1	0	0	1
RIJEKA	0	1	0	0	1
INESC-TEC	1	0	1	0	0
TOTAL	37	28	26	24	15

Project monitoring 5 Papers by research area

II. Work package leaders activities

A. Management-WP1

Objective: create a panel of experts in fintech risk management, through the daily management and coordination of the project (**WP1-Management**).

1. University of Pavia-WP1 leader



UNIPV has the role of PC and is the leader of the following work packages: Management (WP1) and SupTech workshops (WP5).

The overall Management structure is resumed in the following figure.

From the submission of the project, the role of the coordinator and WP1 leader (Management) is to ensure the efficient workflow, communication between the different internal and external players in the project network. The organization of the project is specified to allow swift communication between all the involved parties. In particular:

From the submission of the project, the role of the coordinator and WP1 leader (Management) is to ensure the efficient workflow, communication between the different internal and external players in the project network. The organization of the project is specified to allow swift communication between all the involved parties. In particular:

The website project platform works as both an internal communication and a dissemination tool, as it acts as a repository for all working documents and reports and contains the material related to the use cases produced by the Consortium within WP2, WP3, WP4, presented during the project events.

Internal communications are enhanced through daily meetings between the PC, PCM, PTM and PFM. Each of those has transversal managing tasks. The PCM assists the PC within the organisation, communication and dissemination activities needed within the internal consortium partners and the external project supporters. The PTM assists the PC by taking care of the technical content of the platform, produces the slides for the training activities and supports the partners from a content point of view.

Besides internal and external communication, UNIPV performed the following management activities during the M1-M18 period:

- The organisation of Management Board meetings
- Technical management - Financial management - Amendment preparation

The organisation of Management Board meetings

Specific issues were discussed within the Partners during formal events, specifically during the board meetings, at which all Partners need to be present with at least one representative.

For the first 18 months at every research workshop, official board management was held where every Partner attended and specific issues, amendments, workflows were presented. The four board meetings took place right before or during:

- 1) Kick-off Workshop, 1st of February 2019, Pavia (IT), official launching event of the project: the Management Board meeting was held on January 31st, 2019.
- 2) 1st Validation and Research Workshop on Big Data, 3rd September 2019, Winterthur (CH).
- 3) Mid-term Research Workshop, 15th November 2019, Bucharest (RO).
- 4) Fintech Workshop on AI, Financial Automation and Market Risk, 19th May 2020, an online meeting organised by UCL (London, UK): the Management Board meeting was held on May 18th.

Minutes of the meetings were prepared and shared by UNIPV, for Partners 'discussion and approval.

Technical management

UNIPV monitored the development of deliverables and their transmission to the EC and prepared a report of the Consortium activities for the M1-M12 period, discussed with project reviewers during the Vienna review meeting on February 26th 2020.

Financial management

UNIPV monitored Partners 'costs related to the project activities, asking the Partners to provide two internal financial reports, at M6 and M12 respectively.

Amendment preparation

UNIPV takes care of preparing and submitting amendment requests to the EC. In particular, during the M1-M18 period, an Amendment to the GA was prepared and signed in May 2019. At the date of writing, UNIPV is working at a further amendment, due to the consequences of the COVID-19 epidemic and changes in the leadership of WP4 and WP7.

UNIPV and the WP leaders put in place a control system over the duties of the parties. The controlling task on UNIPV and WP leaders side covers the compliance check of SupTech activities, the Use Case approval flow, the compliance check of the RegTech activities.

A website platform is acting as a repository for all working documents and reports, for disseminating the events and for allowing first entry to the research platform containing the material the Consortium produces and uses for the different activities in line with the WP2, WP3, WP4.

Internal communications are ensured through daily meetings between the PC, PCM, PTM and PFM. Each of those has transversal managing tasks. The PCM assists the PC within the organisation, communication and dissemination activities needed within the internal consortium partners and the external project supporters. The PTM assists the PC by taking care of the technical content of the platform, produces the slides for the training activities and supports the partners from a content point of view.

2. Humboldt University of Berlin

Humboldt University of Berlin (UBER) kept in close cooperation with the entire Project consortium. UBER participated in all management board meetings and actively helped the project to spread widely. UBER prepared all necessary information/analytics (e.g. reports, presentations etc.) concerning the state of the Project in Germany, which was used further by the Project's coordinator for decision making. UBER provided inputs into the development and adaptation of the Project's strategy.

In line with these developments, in the on-going amendment, UBER is set to organise the final research workshop, which will take place in Berlin on March 19, 2021. The date of this event can be reconsidered, due to the extension of the Project till June 2021 to ensure smooth development of upcoming Blockchain SupTech , Regtech and research activities.

3. University College London

University College London collaborated with the project leader and Pavia's team to ensure smooth management of the project. UCL participated at all management board meetings contributing to discussions and elaboration of strategies. UCL has actively helped the project to liaise with the actors in the City of London and with the Financial Conduct Authority. UCL organized the board meeting on 18 May 2020 that was (virtually) held in London before the "AI financial automation and market risk" workshop that was also virtually held in London on the 19 May 2020.

4. ZHAW University

ZHAW has been proposed for the role of work package leader for WP4 during the management board held in Bucharest. The consequent responsibilities of ZHAW can be summarized as follows.

- 1) WP1 Management: active participation in management board meetings, vertical and horizontal workshops;
- 2) WP2 Big Data Research: support of the research conducted, support the projects 'events through specialized talks and presentations; co-organizer of the 1st Validation and Research Workshop on Big Data and Risk Management at ZHAW, Winterthur;
- 3) WP3 Artificial Intelligence Research: support of the research conducted; support of the projects ' events through specialized talks and presentation;
- 4) WP4 Blockchain research: proposed WP leader;
- 5) WP5 SupTech Trainings: responsible for organizing research conferences and workshops in Hungary and Switzerland; support of the training sessions of other partners specifically support of Denmark Trainings with a talk by Peter Schwendner on "Financial Application of Network Analysis" at "Big Data Analytics Knowledge Exchange Platform", Horizon 2020 FIN-TECH project, Copenhagen, August 26, 2019;
- 6) WP6 RegTech: responsible for the organization of the 3rd RegTech workshop on Artificial Intelligence in Finance; support of the RegTech sessions organized by other partners:
 - a. 1st RegTech Workshop Milan, with a talk by Branka Hadji Misheva on "Network-based Scoring Models for P2P Lending Platforms";
 - b. 2nd RegTech Workshop in Frankfurt, with a talk by Branka Hadji Misheva on "Network Models to Improve P2P Credit Risk Management";
 - c. 4th RegTech Workshop in Vienna, with a talk by Peter Schwendner on "Convergence and Divergence in European Bond Correlations".
- 7) WP7 Dissemination: active internal and external promotion of the projects 'activities, outcomes and events.

Under the management WP, ZHAW has carried out a variety of activities. ZHAW has been in regular communication with the global coordinator and the other members of the Executive Board discussing the overall progress of the project, administrative tasks and pending issues. ZHAW has also participated to meetings with representatives from the EC, in Brussels (July 2019). The ZHAW team supports the global coordinator in the preparation of working documents and reports as well as presentations and promotional materials concerning the project. Furthermore, ZHAW has been supporting all vertical and horizontal workshops organized so far through active participation, giving specialized talks, presenting the project or panel moderations.

Note on effort. Reported MMs for ZHAW in Table II.D are lower than actually incurred because they were initially calculated with PhD salary, now employed scientific assistants and employees as well as lecturers and professors. Members of the team (lectures, professors, assistants and scientific

employees) have often not reported their hours in the system. Furthermore, among other things, due to the change in the exchange rate between EUR/ CHF and salary changes of the persons employed on the EU Fintech project, the initial calculation of the salary costs per man-month is not valid anymore. Finally, considering that the amendment that transfers the leadership role from Paris 1 to ZHAW is not yet official, ZHAW's team has not yet claimed any of the costs incurred for the activities described under 2.D.

5. FIRAMIS

Firamis worked in close collaboration to the entire management team of UNIPV. We supported most activities and helped to communicate the measures, instructions, planning status to the partners and the supervisors and evaluators. We conducted information and communication activities about the plans and activities of UNIPV to the partners, supervisors, evaluators and advisors. We collected feedback from all participants if they received the information given and if they have any questions or feedback regarding the activities.

Firamis set up a website and social media channels to spread the mission and content of the EU FIN-TECH project. We also implemented registration and evaluation forms and reporting engine/system for internal and external participants of the workshops. Furthermore, we implemented evaluation forms for Regulators and Supervisors and an evaluation feedback system for all partners and advisors.

In December 2019 we created an intermediate evaluations report, which included the interpretation of the results of the evaluations gathered thorough the feedback process.

We furthermore helped to create an international network by connecting with national and international (European) Regulators and Supervisors.

Firamis also helped to manage other partners 'workshops and content preparations and attended some of their workshops. This included those responsible for Bundesbank because it is an important supervisor to the project. It also included a journey to Hungary to prepare and support the partner there.

Also, Firamis analysed and evaluated the use cases plus code and made several important suggestions to improve them.

Firamis also observed some of the main project processes and gave feedback on their effectiveness and implementations to establish smooth processes in the project. Firamis also made sure that the technical systems provided (like the forms engine and platform) are in line with the overall project objectives and with the established workflows and processes given by UNIPV.

For internal and external communication Firamis permanently enlarged the project network by addressing banks, bank unions, insurance companies, fintech hubs, tech companies, supervisors, governmental agencies, fintech platforms, fintech investors and other fintech ecosystem participants across Europe and in the US. Those people received information about the activities and objectives of the project, and this created a recruiting base for workshop participation, evaluation and feedback. This activity was backed by social media activities, mailings, phone calls and physical visits. It also included the organisation and

execution of a special workshop in Brussels with speakers and guests from institutions like ECB, EBA and EBF.

The details of the activities of WP6 and WP7 are described in the corresponding chapters. There exist strong links of these WPs to the management WP.

During M13-M18 there was a resubmission of the intermediate evaluation report. It now also covers part of the AI block and was extended by all feedback sources to a large extent. The systematic collection of input by the partners had to be organised and managed where Firamis got support also from UNIPV and ASE.

B. Big Data Analytics Research-WP2

Objective: The main objective of Big Data Analytics Research is to create, through individual research activity and the organisation of a dedicated workshop, common standards for risk management in big data analytics, specifically for peer-to-peer lending applications (**WP2-Big Data Analytics Research**).

1. University of Pavia

Publication, use cases and presentations in external events

UNIPV has developed several publications in the field and contributed actively in the production of the three use cases for WP 2. Articles written with clear distinction between open access and not (only those related to the project and with the acknowledgement present in the paper.)

- Agosto, Giudici. (2020) A predictive model for COVID-19 dynamics. Risks. <https://doi.org/10.3390/risks8030077>. (open access)
- P. Cerchiello, R. Scaramozzino (2020) On the Improvement of Default Forecast Through Textual Analysis In Front. Artif. Intell., 07 April (open access)
- Adelfio, Agosto, Chiodi, Giudici. Financial contagion through space-time point processes. ETAS models in financial contagion. Stat Methods Appl (2020). <https://doi.org/10.1007/s10260-020-00538-2>. (open access)
- Agosto, A., Ahelegbey, D.F. (2020) Default count-based network models for credit contagion. Journal of the Operational Research Society (<https://doi.org/10.1080/01605682.2020.1776169>). (open access)
- Giudici, P., Hadji-Misheva, B., Spelta, (2019) A. Network-based credit risk models. Quality Engineering. (open access)
- Ahelegbey, D., Giudici, P. and Hadji-Misheva, (2019) B. Latent factor models for credit scoring in P2P systems. Physica A: statistical mechanics and its applications, 522, 112-121. (not open access)
- Ahelegbey, D., Giudici, P. and Hadji-Misheva, (2019) B. Factorial network models to improve P2P credit risk management. Artificial Intelligence in Finance, Frontiers. (open access)

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- Agosto, A., Giudici, P. and Leach, T. (2019) Spatial econometrics models to improve P2P credit risk management. *Artificial Intelligence in Finance, Frontiers*. (open access)
 - Giudici, P., Hadji-Misheva, B and Spelta, A. Correlation network models to improve P2P credit risk management. *Artificial Intelligence in Finance, Frontiers*. (open access)
 - Giudici, P. (2018). Fintech risk management: A research challenge for artificial intelligence in finance. *Frontiers in Artificial Intelligence*, 1, 1. (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

2017

27 September, Launch Fintech District Milan

26 October, Network Models Conference
Frankfurt

16/17 November, Crypto Conference Berlin

23 November, Consob Fintech Observatory

2018

19 January, Meeting with Partners in Winterthur

9 March, Meeting with Partners in Brussels

5 April, Fintech District Milan

16 May, Meeting/Workshop Kaunas

11 June, Workshop Fudan University

12 July, Set Up of AI in Finance Frontiers Board

6/7 September, Meeting Winterthur Ai In Finance

18/19 October, Conference Budapest

24/25 October, Workshop on Network Models Frankfurt

26/27 November, Workshop on fintech, Nottingham

7 December, Meeting With PO, DG-FISMA, Brussels

14 December 2018 Fintech Executive Committee Meeting

2019

24-25 January 2019 SIDE Conference, Use Cases dissemination, Lecce

31 January 2019 Executive Board Meeting, Pavia

1 February 2019 Kick-Off Meeting, Pavia

18 February 2019 Stuart Hunter Workshop on fintech quality, Varese

25 February Start AI Discussion At MISE

28 February 1 Mar SupTech Malta

5 February Meeting EBA Sandbox, London

21 Feb Call with EBA On Sandbox Practices

22 Feb Meeting with ABILAB to plan Validation

27 February Call with Ai In Finance Journal to Plan Synergies

11 March Meeting with Covip

5 March, Meeting with PO and Dg-FISMA Brussels

29 March Milan RegTech

9 April Meeting Basel

16-17 April SupTech Athens

14-15 May Meeting, Basel

16 May Siat Meeting, Milan

21 May Workshop ECB Fintech Dialogue, Frankfurt

22 May: AI WATCH Meeting (Collaboration Between Regione Lombardia And Joint

Research Center) At Regione Lombardia Premises, Milan	Conference On Systemic Risk And Financial Stability, Freiburg
01 June: Presentation of Paper "Tree Networks To Assess Financial Risk Contagion" At FMND (Financial Markets And Non-Linear Dynamics) Conference, Paris	26-27 September, BIS Fintech Laboratory Workshop, Basel
7 June, Workshop Fintech Lab, DG-FISMA, Brussels	8 October Start Meetings EIOPA Expert Group On Ethical AI, Frankfurt xl. 9 October Call with PO Chiara Mazzone (Last)
12 June Workshop Rome	11 October Regional Workshop Varna Bulgaria x
19 June: Presentation of Paper "Application and Validation Of Dynamic Poisson Models To Measure Credit Contagion" At SIS (Italian Statistical Society) Conference, Milan	15 October, Research Workshop, Montreal
24 Giugno, EURO Conference, Presentation paper BDA, Dublino	17 October Work Package Leaders Call
3 July Meeting with PO And Dg-Fisma Brussels	2 October Meeting with Bankit To Plan SupTech activities, Rome
4 July Meeting Of Wp Leaders	30 October ABI Data Driven banking workshop, Milano
18 July, Cebra Conference, New York	11 November Fintech Workshop, Varese
28 August Call with Open Access Government Journal	12 November Malaga Convergence Conference
30 August: Presentation Of Paper "Tree Networks To Assess Credit Risk Contagion" At Credit Scoring And Credit Control Conference, Edinburgh	11-12 November Fintech-Infinitech Talk
2 September, BIS Seminar In Cyber Risk, Basel	12 November, Blockchain Conference, Exhibition Stand, Malaga
3-4 September Research Workshop, RegTech Winterthur	14 15 November Intermediate Research Workshop, Bucharest li. 18 November SupTech on AI, Pavia
5 September, Fintech ho2020 Workshop, Aegina	19-20 November, SupTech on AI, Malta
10 September, Dissemination at Ministry of Economics and Finance of Italy, Rome	26 November Validation Workshop on BDA, Brussels liv.
13-14 September OECD Blockchain Conference, Paris	2 December Aspen Institute Fintech District
18 September Call With EBF	2020
20 September: Presentation Of Paper "Tree Networks To Assess Credit Risk Contagion" At	30 January 2020, ECB Validation Meeting, Frankfurt
	3 Feb, EBA & ESMA Validation Meeting, Parigi
	4 May 2020, SupTech with Digital Magics(virtual)
	7 May 2020, SupTech with Bank of Italy(virtual)

The 1st of February, UNIPV organized the launching event, the Kick-off, at which more than 100 participants from Accademia, institutions, international and national supervisors, consortium partners, fintechs, banks and insurances took part to a full day workshop where the focus was on the presentation of the project's objectives, the fintech opportunities and risk management models.

Among the invited speakers:

- FinTech and Blockchain: A digital (R)evolution? | Chiara Mazzone, European Commission
- FinTech: the EBA viewpoint | Slavka Eley, European Banking Authority
- FinTech: the ESMA perspective | Patrick Armstrong, European Securities and Markets Authority
- EIOPA's Insurtech activities | Andres Lehtmets, European Insurance and Occupational Pensions Authority
- The SSM approach to Fintech supervision | Giacomo Caviglia, European Central Bank
- Risk and opportunities: the FinTech growth | Caroline Malcolm, Organisation for Economic Cooperation and Development
- Big tech: opportunities and risks | Leonardo Gambacorta, Bank for International Settlements
- Fintech risk management: the international view-the IMF | Ashraf Khan, International Monetary Fund
- The Nottingham FinTech research network | Meryem Duygun, University of Nottingham
- FinTech initiatives in the United Arab Emirates | Charilaos Mertzanis, Abu Dhabi University

2. Humboldt University of Berlin-WP2 Leader

In order to achieve the objectives, the WP2 Big Data Analytics Research has accomplished the following tasks:

Technical coordination, by which the WP leader is responsible for:

- monitoring the progress of the research efforts of individual partners within the consortium
- creating and maintaining a repository containing state-of-art papers concerning the application of big data analytics in finance
- together with the global coordinator, selecting a sub-section of use cases coming from the FinTech-ho2020 network that propose novel approaches to fintech risk management tools specifically related to the application of big data analytics in finance.

1st Validation and Research Workshop on Big Data Analytics and Risk Management during which universities, regulators and FinTechs have met and where the focus has been on the discussion of a specific risk management aspect. Furthermore, the event was attended by the Project's advisory board

that provided independent input and advice on the direction of the project. The above event was organized through the collaboration with ZHAW partner, and by aggregating resources and effort, they delivered the 1st Validation and Research Workshop: Big Data Analytics, Peer-to-Peer Lending and Credit Risk at ZHAW premises the 3rd of September.

Feedback from the Validation and Research Workshop has been collected by the ZHAW team, therefore, refer to section 4 ZHAW University (page 24)

Development of BDA use cases

a. Objective and contents

The motivation of the use cases developed within the BDA project area is the need for new models which can properly assess credit risk in P2P lending, able to cope with risks arising from credit disintermediation and with the peculiarities of the new lending platforms with respect to traditional credit.

The main idea is to leverage the high interconnectedness characterising P2P platforms to improve the accuracy of credit default prediction. Indeed, the spread of P2P lending is making available a large amount of data coming from the continuous networking activity occurring in the new platforms. This “alternative” data can be used to estimate a network structure which can improve default prediction.

The network approach for the study of financial interconnectedness and contagion relates to a recent and fast expanding line of research which focuses on the application of network analysis tools for understanding flows in financial markets, as in the papers of Allen and Gale (2000), Leitner (2005), and Giudici and Spelta (2016).

All the three developed use cases employ financial data for a large sample of SMEs, supplied by a European External Credit Assessment Institution (ECAI) specialized in credit scoring for P2P platforms focused on SME commercial lending, and combine them with metrics defining the position of companies in the borrowers’ network: balance sheet similarities in the first study, comovements of latent factors in the second, trade relationships in the third.

Use case I-Network based scoring models to improve credit risk management in peer to peer lending platforms

This work (Giudici, Hadji-Misheva and Spelta, 2019) proposes to enhance credit risk accuracy of P2P platforms by leveraging topological information embedded into similarity networks, derived from borrowers’ financial information. Topological coefficients describing borrowers’ importance and community structures are employed as additional explanatory variables, leading to the improved predictive performance of credit scoring models.

Use case II-Factorial Network Models to Improve P2P Credit Risk Management

This work (Ahelegbey, Giudici and Hadji-Misheva, 2019) constructs a network of SMEs where links emerge from comovement of latent factors, which allows to segment the heterogeneous population into clusters. Then, a credit score model is built for each cluster via lasso logistic regression. The approach is compared with the conventional logistic model by analyzing the credit score of over 15,000 SMEs engaged in P2P

lending services across Europe. The results reveal that credit risk modelling using network-based segmentation achieves higher predictive performance than the conventional logit model.

Use case III-Spatial regression models to improve P2P credit risk management

This work (Agosto, Giudici and Leach, 2019) considers a spatial dependence between companies based on their business relationships and includes it into a credit scoring model. Specifically, the authors apply a binary spatial regression model to measure contagion effects arising from corporate failures. To derive interconnectedness measures, the World Input-Output Trade (WIOT) statistics between economic sectors are used. The application to a sample of 1,185 Italian companies provides evidence of high levels of contagion risk, which increases the individual credit risk of each company.

b. Dissemination

The network approach to credit risk, characterizing the BDA use cases, was first presented to partners, regulators and the other project stakeholders during the project kick-off. In the following months, the involved consortium partners finalised the related papers, all published in open access journals, and material (slides), presented to national supervisors during the SupTech events. Part of the effort was dedicated to preparing the code, making it available on the platform and easily understandable by external users. Coding sessions for the three use cases were then organised during the RegTech events held in Milan (March 29th, 2019) and Frankfurt (June 28th, 2019), to which practitioners from fintechs and banks took part.

The use cases were also presented during the research workshop in Winterthur (September 3rd, 2019), that was the chance to put together the views of academia and regulators on the big data and risk management topics.

Publications

- Gschöpf, Philipp and Härdle, Wolfgang K. and Mihoci, Andrija, TERES - Tail Event Risk Expectile Based Shortfall. Available at SSRN: <https://ssrn.com/abstract=2892597> or <http://dx.doi.org/10.2139/ssrn.2892597>, 20200612 Accepted Quantitative finance
- Melzer, Awdesch and Härdle, Wolfgang K. and Cabrera, Brenda López, An Expectile Factor Model for Day-ahead Wind Power Forecasting (March 31, 2019). Available at SSRN: <https://ssrn.com/abstract=3363164> or <http://dx.doi.org/10.2139/ssrn.3363164>
- Chao, Shih-Kang and Härdle, Wolfgang K. and Yuan, Ming, Factorisable Multitask Quantile Regression (January 17, 2020). Available at SSRN: <https://ssrn.com/abstract=3521887> or <http://dx.doi.org/10.2139/ssrn.3521887>
- Li, Xinjue and Zboňáková, Lenka and Wang, Weining and Härdle, Wolfgang K., Combining Penalization and Adaption in High Dimension with Application in Bond Risk Premia Forecasting (December 1, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3657337 (temporary link)

- Kim, Kun Ho and Chao, Shih-Kang and Härdle, Wolfgang K., Simultaneous Inference of the Partially Linear Model with a Multivariate Unknown Function (May 5, 2020). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2818410 (temporary link)
- Chen, Cathy Yi-Hsuan and Fengler, Matthias R. and Härdle, Wolfgang K. and Liu, Yanchu, Media-expressed tone, Option Characteristics, and Stock Return Predictability (June 12, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3658099 (temporary link)
- Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K. and Klochkov, Yegor, SONIC: Social Network with Influencers and Communities (September 30, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3657360 (temporary link)

Feedback and further research

As presented in the Intermediate Evaluation report, overall, the network methodology received positive feedback from the project evaluators. Risk managers from banks gave some technical suggestions for performance measurement and model comparison which will be useful to follow.

A crucial point for the improvement of the use cases 'contribution is their extension to data coming from actual financial transactions and credit flows in P2P platforms, that are "simulated", as not publicly available, in the present works.

Publications and presentations in external events

- Melzer, Awdesch and Härdle, Wolfgang K. and Cabrera, Brenda López, An Expectile Factor Model for Day-ahead Wind Power Forecasting (March 31, 2019). Available at SSRN: <https://ssrn.com/abstract=3363164> or <http://dx.doi.org/10.2139/ssrn.3363164> (open access) >
- Chao, Shih-Kang and Härdle, Wolfgang K. and Yuan, Ming, Factorisable Multitask Quantile Regression (January 17, 2020). Available at SSRN: <https://ssrn.com/abstract=3521887> or <http://dx.doi.org/10.2139/ssrn.3521887> (open access)
- Li, Xinjue and Zboňáková, Lenka and Wang, Weining and Härdle, Wolfgang K., Combining Penalization and Adaption in High Dimension with Application in Bond Risk Premia Forecasting (December 1, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3657337 (temporary link) (open access)
- Kim, Kun Ho and Chao, Shih-Kang and Härdle, Wolfgang K., Simultaneous Inference of the Partially Linear Model with a Multivariate Unknown Function (May 5, 2020). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3656321 (temporary link) (open access)
- Chen, Cathy Yi-Hsuan and Fengler, Matthias R. and Härdle, Wolfgang K. and Liu, Yanchu, Media-expressed tone, Option Characteristics, and Stock Return Predictability (June 12, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3658099 (temporary link) (open access)

- Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K. and Klochkov, Yegor, SONIC: Social Network with Influencers and Communities (September 30, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3657360 (temporary link) (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- Jan 2019 Haindorf Seminar, Hejnice, Czech Republic
- Mar 2019 13th International Conference on Business Excellence (ICBE), Bucharest University of Economic Studies, Romania
- Apr 2019 Energy Finance Workshop 2019, OT Stolberg, Germany
- Apr 2019 MathFinance Conference 2019, Frankfurt, Germany.

3. University College London

Publications and presentations in external events

Articles written with clear distinction between open access and not (only those related to the project and with the acknowledgement present in the paper.)

- J.D. Turiel, T. Aste (2019). P2P Loan acceptance and default prediction with Artificial Intelligence. arXiv preprint arXiv:1907.01800 (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- Apr 3 2019-1/2 day-Training on P2P banking and risk / Discussion session on AI at FCA
- Apr 5 2019-1/2 day-Presentation of the H2020 project and Training initiative at FCA

4. ZHAW University

Publications and presentations in external events

- Giudici, P., Hadji-Misheva, B., Spelta, (2019). Network based credit risk models. Quality Engineering. (open access)
- Ahelegbey, D., Giudici, P. and Hadji-Misheva, B. (2019). Factorial network models to improve P2P credit risk management. Artificial Intelligence in Finance, Frontiers. (open access)
- Giudici, P., Hadji-Misheva, B and Spelta, (2019) Correlation network models to improve P2P credit risk management. Artificial Intelligence in Finance, Frontiers. (open access)

Events (co)organized by ZHAW for a wider audience:

On 3rd of September 2019, in Winterthur, UBER and ZHAW co-organized the 1st Research and Validation Workshop titled: European Conference on Risk Management and Big Data Analytics in Finance. The conference was attended by 80-90 academics, Fintechs, national and international regulators from all over Europe. Among the speakers:

- Regulatory change and RegTech, Dr. Philipp Hartmann, Credit Suisse
- Building a big data and advanced analytics platform at the BIS, Dr. Rafael Schmidt, Bank for International Settlements
- Fintech and BigTech credit: A global overview, Dr. Jon Frost, Bank for International Settlements
- Predicting financial distress: Towards building an early-warning system, Dr. Bijan Sahamie, Deutsche Bundesbank
- Does Fintech crowd out banks: Evidence from China, Dr. Bihong Huang, Asian Development Bank

Furthermore, the following members of the advisory board attended the workshop:

- Daniel Heller (Washington DC)
- Simon Trimborn representing Chen Ying (National University of Singapore)
- Dror Kenett (Washington DC)

During the event, all use cases selected under the Big Data Research Package were presented. Consequently, the advisory board of the project, as well as other participants, were asked to provide their input concerning the relevance of the use cases and their impact. The use cases were validated by the project's advisory board.

Feedback

Research and Validation Research Conference

Location: ZHAW, Winterthur

Topics covered: Overview of the FIN-TECH project; Introduction of the Project's goal, activities and network;

- Participants and their roles:

The conference was attended by 80-90 academics, Fintechs, national and international regulators from all over Europe.

- How participants remain involved?

ZHAW is in regulator contact with the participants and speakers, sharing updates, new use cases, project materials, etc.

ZHAW has informed and invited participants from the event to all open events organized under the Fintech-ho2020 Network

- What is their feedback on the use cases presented?

The participants suggested that there is a great knowledge and technology gap between regulators and fintechs particularly in terms of the innovative technologies that are applied in the context of financial intermediation. They expressed great interest in novel methodologies that can address some of the main risks that emerge from the application of innovative technologies in finance- particularly in the context of network models which can be very useful in improving the predictive power of credit risk estimations.

- Are the selected use cases the ones that meet the expectations and requirements at most?

All three BDA use cases were presented during the event. Important feedback from some of the participants was that the network approach can be very useful for addressing some of the main risks that emerge from the P2P business model. Further extensions should focus on including real financial flows between participants on the platforms.

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- 3 April SupTech Switzerland
- 30 April 2019: Internal Workshop on Big Data for Finance, ZHAW, Winterthur
- 2 May 2019: Internal Workshop on Big Data for Finance, ZHAW, Winterthur
- 15-16 May, SupTech Hungary
- 17 June. SupTech Workshop Winterthur
- 28 June, RegTech 28 June, RegTech Workshop Frankfurt, Germany
- 8 July SupTech Winterthur
- 3 September Research Conference, Winterthur
- 4 September RegTech Workshop, Winterthur
- 5 September, AI in Finance and Industry, Winterthur
- 14 October, Enabling Alternative Finance Ecosystems-2nd International Best Practices Workshop, Utrecht, The Netherlands
- 15 October, European Alternative Finance Research Conference 2019, Utrecht, The Netherlands

5. FIRAMIS

Publications and presentations in external events

One of the core modelling technologies of Firamis during the past years is graph theory and network modelling in financial services. Firamis has its academic research and scientifically published papers in this field. Also, we could pioneer this subject in several well-known large financial institutions in Europe with applications in risk management, trading, fraud detection and AML.

Firamis, therefore, welcomed the 3 network-based BDA use-cases provided and analysed them in depth.

We made the following suggestions for improvement:

- The splitting of test and train data sets is critical when network analysis is used for feature engineering. For use case one, for example, it could make sense to strictly split the set in test and train of equal size because the size of the network has an impact
- For use cases 2 and 3 there are similar arguments. When building clusters for building separate models it is important to have a structured approach here when splitting the data in test and train. Those points are highly important as they make sure that there is no data leak.
- Firamis also made suggestions on computation performance. We propose for example another library to produce the Spanning Tree which increases the speed at high order.

Firamis uploaded the use cases to the platform on the FIN-TECH website.

The upload includes the implementation of every use case code to our browser RStudio solution. We have to make sure that every use case can be run without any problem. This includes the download and supply of every package, which is used in the code. It also includes tests of the online platform in every browser and we had to provide the needed server capacities during the coding sessions of the workshops.

Update for M13-M18: we received more feedback on the BDA use cases on various channels. These had to be understood and included in the feedback repos. For the London AI Research workshop and during the 2nd Bundesbank workshop and the Vienna RegTech and the 2nd Denmark workshop Firamis also prepared and presented updated material regarding network analysis and other BDA topics.

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- i. 26th of November 2019, XAI-presentation at FIRAMIS special workshop for bankers & insurers I BDA and AI in Brussels
- ii. 6th of December 2019, XAI-presentation at EIOPA InsurTech Task Force in Frankfurt
- iii. 11th of December 2019, representing FIN-TECH project at EU Fintech Lab in Brussels
- iv. in 2019 joining two meetings at EC in Brussels

Please also have a look at our activities in WP6 and WP7 which we combined with presentations on BDA, the BDA use cases and financial networks.

Dissemination (sharing with partners, conferences, workshops)

Firamis helped to organize and supported the workshops of other FIN-TECH project partners:

- SupTech workshop BDA of the ZHAW in Budapest (15th-16th of May 2019)
- SupTech workshop BDA of the Bundesbank in Frankfurt (26th-27th of June 2019)
- Mid-term Event in Bucharest, 15 November 2019 (network analysis)

Firamis also referred to the BDA network-based use cases in this editorial: R. Hochreiter, P. Giudici, J. Osterrieder, J. Papenbrock, P. Schwendner. Editorial: AI and Financial Technology. *Frontiers in Artificial Intelligence* 2, 25. 2019.¹

C. Artificial Intelligence Research-WP3

Objective: create, through individual research activity and the organisation of one dedicated workshop, common standards for risk management in artificial intelligence applications to finance, specifically for robo-advice consulting in asset management (**WP3-Artificial Intelligence Research**).

1. University of Pavia

Publications, use cases and Presentations in external events

Articles written with clear distinction between open access and not (only those related to the project and with the acknowledgement present in the paper.)

- Giudici, P., Pagntonni, P. (2019) High-frequency price change spillovers in bitcoin exchange markets. *Risks* 7, 111. (open access)
- Giudici, Abu-Hashish (2020) Hidden A hidden Markov model to detect regime changes in crypto asset markets. *Quality and Reliability Engineering International*. <https://doi.org/10.1002/qre.2673> (not open access)
- Giudici, P., Polinesi, G. (2019) Crypto price discovery through correlation networks. *Annals of operations research*. (not open access)
- Giudici, P., Pagntonni, P., & Polinesi, G. (2020). Network models to enhance automated cryptocurrency portfolio management. *Frontiers in Artificial Intelligence*, 3, 22. (open access)
- Bussmann Niklas, Giudici Paolo, Marinelli Dimitri, Papenbrock Jochen (2020). Explainable AI in Fintech Risk Management, *Frontiers in Artificial Intelligence*.
<https://www.frontiersin.org/article/10.3389/frai.2020.00026> (open access)
- Bussmann Niklas, Giudici Paolo, Marinelli Dimitri, Papenbrock Jochen (2020). Explainable machine learning in Credit Risk Management, Available at SSRN (open access), and under second revision in an international journal.

Development of Use Cases for Artificial Intelligence

UNIPV has prepared the following use case:

¹ <https://www.frontiersin.org/articles/10.3389/frai.2019.00025/full>

- Giudici, P., Pagnottoni, P., & Polinesi, G. (2020). Network models to enhance automated cryptocurrency portfolio management. *Frontiers in Artificial Intelligence*, 3, 22. (open access)

The authors have first defined the objective of the analysis, then conducted a literature review of the relevant sources for the topic. After that, they defined a methodology to address the issue, downloaded the data and coded in R to test their methods. Finally, they reported the results and their robustness and wrote a paper on the analysis conducted.

The code, dataset and open-source paper related to this work are available on the project platform. The content of the use case has been presented at the MFSA, Malta during the SupTech , at the Fintech district during an informal meeting and shared with all consortium partners.

All the actors gave feedback to the work and, besides, the paper has gone under the peer-review process of an international journal (*Frontiers in Artificial Intelligence*). This enabled the authors to consistently improve the quality of their output and reach what is the current version of the use case, available on the project platform.

2. Humboldt University of Berlin

Since initially in the Grant agreement signed in 2018 UBER was assigned with the role of the leader of WP3, the significant work on research and network building within the Consortium was conducted. In particular members of UBER published (submitted) research papers, gave talks at the external and internal events, as well as organised short term scientific visits for Partners 'members. Below details on all these activities are provided.

Short term research visits of partners in UBER:

- January 2019 Žiković, Saša (UNI RIJEKA EFRI)
- February 2019, Pele, Daniel (ASE Bucuresti)
- April 2019, Peter Schwendner (ZHAW)
- May 2019, Veni Ackerlian (PANTEION)
- June 2019, Maria Culjak (UNI RIJEKA EFRI)
- March 2019, Maria Paula Brito (INESC TEC)
- March 2019, Piotr Wojcik (UNIWARSZAWA)

Short term research visits of UBER members in partner universities:

- February 2019, Alla Petukhina at ZHAW
- February 2020, Ren Rui at ZHAW

Presentations in internal events:

- Kick-off Workshop, 1st of February 2019, Pavi, Italy, WK Härdle “Market risk in financial robot advisory”
- Mid-term Workshop, 15th November 2019, Bucharest, Romania, WK Härdle “FRM Financial Risk Meter”
- Mid-term Workshop, 15th November 2019, Bucharest, Romania, N Wesselhofft “Forecasting high-frequency stock market returns using embedded limit order book data”

Research:

- First Fintech Workshop on AI, Financial Automation and Market Risk, 19th May 2020, London, UK, WK Härdle “FRM@Europe: The Financial Risk Meter for European Assets”

Publications:

- Mihoci, Andrija and Althof, Michael and Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K., FRM Financial Risk Meter (July 30, 2019). Advances in Econometrics, Volume 42, The Econometrics of Networks. Available at SSRN: <https://ssrn.com/abstract=3429549> (open access)
- Petukhina, Alla and Trimborn, Simon and Härdle, Wolfgang K. and Elendner, Hermann, Investing with Cryptocurrencies – evaluating their potential for portfolio allocation strategies (May 25, 2020). Available at SSRN: <https://ssrn.com/abstract=3274193> or <http://dx.doi.org/10.2139/ssrn.3274193> RR minor 20200325, Quantitative finance (open access)
- Petukhina, Alla and Sprünken, Erin, Evaluation of Multi-Asset Investment Strategies with Digital Assets (2020). Available at: SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3664219 RR major 20200331, Digital Finance. (open access)
- Alla A. Petukhina, Raphael C. G. Reule & Wolfgang Karl Härdle (2020) Rise of the machines? Intraday high-frequency trading patterns of cryptocurrencies, The European Journal of Finance, DOI: 10.1080/1351847X.2020.1789684 (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- SDA Smart Data Analytics Lecture Series, Guangzhou, 18.09.2019, Financial Risk Meter (FRM)
- CENTRAL Workshop, Prague, LSTM Neural Network, 02.10.2019, Does tenure makes you Love your Job
- FinTech & RegTech Fundamentals, Techs and Apps, Taiwan, 20.02.2020, Financial Risk Meter for Asia
- May 2019 Joint Spring Conference – Systemic Risk and the Macroeconomy, Deutsche Bundesbank – ECB, Frankfurt, Germany
- July 2019 RTG Summer Camp, Buckow, Germany
- July 2019 XMU-HUB Partnership Conference, Oberbarnim, Germany

- August 2019, Singapore Economic Review conference 2019, Singapore
- August 2019, The 4th Berlin-Princeton-Singapore Workshop on Quantitative Finance, Singapore
- September 2019, Conference Stat of ML, Prague Czech Republic
- November 2019 Foundations of Modern Statistics Conference, Berlin, Germany
- December 2019 Cryptocurrencies Data, Statistics, Finance The First Yushan Conference Workshop in NCTU, Hsinchu, Taiwan

3. University College of London-WP3 leader

UCL, as leader of the AI work package (WP3), has been and still is one of the key contributors of content for the training sessions in artificial intelligence applied in finance. More specifically, UCL has established the state of art concerning AI technology, its application in finance, the related main risk concerns and the risk management tools which enable automatized compliance by FinTech companies and increased efficiency of the supervisory activities.

Various brainstorming sessions have been conducted, starting from the FCA to indagate its needs as a regulator. Besides that, several discussions took place in the different workshops, conferences, seminars and meetings described in the WP3 section of this report. All the inputs collected made it possible to gather ideas, suggestions and feedback on how to establish the state of the art regarding AI technology, its application in finance, the related risk concerns and the risk management tools to enable automatized compliance. In particular, the inputs were useful to build the activities of UCL as WP leader in this field.

Indeed, UCL has coordinated the research concerning the AI work package (WP3). Particularly, UCL disseminated the ideas, suggestions and feedback received during the various workshops, conferences, seminars and meetings to which it participated in the consortium partners. Furthermore, UCL has also gathered ideas, suggestions and feedback from the consortium partners themselves. This has ensured a comprehensive view of the needs of regulators, academics and practitioners in the field of artificial intelligence applied in finance and substantially helped in producing valuable research outputs for the project.

In this regard, the selection and assistance to the development of use cases for the AI WP have been one of the main tasks as WP3 leader. UCL has selected the use cases developed and proposed by the consortium as follows. Firstly, the pertinence of each use case with the WP field has been evaluated. Secondly, the use case paper, slides, codes and dataset have been examined and reviewed. Thirdly, only the use cases whose components and quality were compliant with the standards have been selected. Fourthly, throughout the different meetings and, through the RegTech sessions, ideas, suggestions and feedback on how to improve the use cases were collected. Finally, the use case authors were asked to improve their own use cases through the inputs received and produce a final revised version, compliant with both the standards and the new inputs.

Besides the WP3 activities, UCL is contributing to the development of research papers and use cases for the other research work packages. UCL has developed several research papers also in the WP2 and WP4

areas. Moreover, UCL is working on the development of the one-use case for the BDA WP (WP2). Information regarding the research papers is contained in the WP2 and WP4 sections of this report.

UCL, precisely Tomaso Aste and his team are responsible for organizing the second vertical workshop dedicated to research and validation where academics discuss with the advisory board the proposed models. The location and dates have been decided at the beginning of the project, the WP leader is now organizing the content and the invites. The event has taken place on **the 19th of May 2020 in London**.

Development of Use cases for Artificial Intelligence

a. Objective and contents

The motivation of the use cases developed within the AI project area is the need for new models which can properly help risk management, portfolio construction and support supervision and decision-making.

Use case I-Network models to enhance automated cryptocurrency portfolio management

A novel approach to build efficient cryptocurrency portfolio allocation was clarified by the use case (Giudici, Pagnoncelli and Polinesi, 2019). The model is an extension of the traditional Markowitz model which combines Random Matrix Theory and network measures, to achieve portfolio weights enhancing portfolios' risk-return profiles. The results show that overall our model overperforms several competing alternatives, maintaining a relatively low level of risk. These outcomes suggest that a sound combination of the proposed models should be employed to achieve an efficient cryptocurrency allocation strategy, which could be also used as robo-advisory toolboxes to improve automated financial consultancy.

Use case II-Convergence and Divergence in European Bond Correlations

This work (Schwendner, Schüle and Hillebrand, 2019) discussed the European bond market return correlations in three prominent events during 2016-2018. In contrast to the frequent spillover patterns that happened during the negotiation between the Eurogroup and Greece in 2015 (Schwendner et al., 2015) about the third financial assistance programme, the patterns around the 2016 Brexit referendum, the 2017 French presidential election and the 2018 budget negotiations in Italy were different.

Use case III-eXplainable AI in credit scoring and portfolio construction

Artificial Intelligence (AI) is becoming increasingly important in the financial industry. But in many decision-making applications, regulatory and transparency concerns slowed down the industry from embracing these new technologies due to the nature of the black box of AI models. To overcome this problem, this work (Marinelli, Papenbrock, Schwendner, Bussmann and Giudici, 2019) provide details or reasons to make the functioning of AI clear or easy to understand, thus they are potentially suitable in regulated financial services.

b. Dissemination

The use cases were presented during the research workshop in Winterthur (September 3rd, 2019), in Frankfurt (February 10-11, 2020), that was the chance to put together the views of academia and regulators on the AI and risk management topics.

Publications

- Burnie, A., Yilmaz, E., & Aste, T. (2020). Analysing Social Media Forums to Discover Potential Causes of Phasic Shifts in Cryptocurrency Price Series. *Frontiers in Blockchain*, 3, 1. (open access)
- T Aste. Cryptocurrency market structure: connecting emotions and economics, *Digital Finance* <https://doi.org/10.1007/s42521-019-00008-9>; arXiv preprint arXiv:1903.00472 (2019) (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

2019

- Poster presentation on Sector neutral portfolios at Netsci 2019, Burlington, Vermont USA (<https://vermontcomplexsystems.org/events/netsci/>) 27-31 May
- Complex Networks 2019 December 10-12, 2019-Lisbon, Portugal (<https://www.complexnetworks.org/>)-presentation on sector-neutral portfolios, won the award for best presentation.
- Meeting on 1 February in Brussels, International Association for Trusted Blockchain Applications (INATBA).
- UK HM Treasury Consultation on the transposition of the Fifth Anti-Money Laundering Directive (5AMLD): regulation of cryptoasset, participation in national consultation, 2019.
- Participated in consultation meeting, 10 May.
- Participated in the drafting session, 13 June. Submitted formal written comments, 10 June
- International Organisation for Standardisation (ISO)
- Conference in Dublin, 27-31 May
- Conference in Hyderabad, 18-22 November
- Development of Vocabulary (ISO/DIS 22739) for an international standard on Blockchain and Distributed Ledger Technology
- Development of Reference Architecture (ISO/CD 23257) for Distributed Ledger Technology
- Development of technical specification on Blockchain and Distributed Ledger Technology-Reference Architecture (ISO/WD TS 23258).

- Participation to All-Party Parliamentary Groups (UK)
- Leaders of Subcommittee on the Future of Payments, Whitechapel Think Tank
- Invited talk Smartex workshops Payment Systems, 10 September
- Invited talk Smartex workshops Identity, 15 October
- Poster Presentation at Future of DLT workshop, Isaac Newton Institute, Cambridge, 6 November.
- Invited talk, 28 January at Centre for Business Innovation (based in Cambridge)
- Invited Talk and Debate on Identity at Oxford Prospects Programme, Oxford, 31 October.
- Invited Talk, SIBOS London, sponsored by NTT DATA, 24 September.
- Invited Keynote Presentation at Blockchain Turkey-Istanbul, 24 October.
- Participation in Rustat Conference on Blockchain and Distributed Ledger Technology, Jesus College, Cambridge, 13 June
- Presentation by Jeremy Turiel at the AI and Data Science in Trading conference - June 22, 2020, 13:00-14:00, AI

Activities with Financial Conduct Authority, London:

- UK Financial Conduct Authority Consultation on Cryptoassets, participation in national consultation, 2019
- 27 February 2019 contribution to Cryptoassets Roundtable at FCA
- May 16, 2019-1/2 day-Participation of FCA members at BARAC meeting on Technology in Finance, Law and Regulation, <http://www.systemicrisk.ac.uk/TechBARAC>.
- Sept 11, 2019-1/2 day-Participation of FCA members at BARAC meeting on Blockchain ad distributed systems for the digital economy

4. ZHAW UNIVERSITY

Publications:

- o Schwendner, Peter; Schüle, Martin; Hillebrand, Martin, 2019. Sentiment analysis of European bonds 2016-2018. *Frontiers in Artificial Intelligence*. 2(20). (open access)
- o P. Giudici, R. Hochreiter, J. Osterrieder, J. Papenbrock, P. Schwendner, 2020, AI and Financial Technology. Editorial. *Frontiers in Artificial Intelligence* 2 (25). (open access)

- Papenbrock, Jochen and Schwendner, Peter and Jaeger, Markus and Krügel, Stephan, Matrix Evolutions: Synthetic Correlations and Explainable Machine Learning for Constructing Robust Investment Portfolios (July 29, 2020) ssrn.com/abstract=3663220
- Jaeger, Markus and Krügel, Stephan and Marinelli, Dimitri and Papenbrock, Jochen and Schwendner, Peter, Understanding Machine Learning for Diversified Portfolio Construction by Explainable AI (January 30, 2020). Available at SSRN: ssrn.com/abstract=3528616
- Osterrieder, J. Kucharczyk, D. and Rudolf, S and Daniel Wittwer. 2020. Neural networks and arbitrage in the VIX. *Digital Finance*, 2, 97-115 (open access). <https://link.springer.com/article/10.1007/s42521-020-00026-y>

Presentations in external events:

- Jörg Osterrieder, April 2, COST Mathematics for Industry Conference, Bath, UK.
- Jörg Osterrieder, The Third International Conference on Mathematics and Statistics AUS-ICMS '20 February 6-9, 2020, American University of Sharjah.
- Jörg Osterrieder, 2nd Berlin Conference, Crypto-Currencies in a Digital Economy, November 29/30, Berlin, Germany.
- Schwendner, Peter, "Convergence and Divergence in European Bond Correlations" at "4th RegTech Workshop on AI in Finance", WU Vienna, February 26, 2020.
- Schwendner, Peter, "Current European sovereign bond dynamics", Centre for Financial Markets (CFM) Research Seminar, Michael Smurfit Graduate Business School, University College Dublin, October 31, 2019.
- Schwendner, Peter, "Current European bond market dynamics" at "Zurich Volatility Investing", Zurich, October 24, 2019.
- Schwendner, Peter, "Convergence and Divergence in European Sovereign Bonds" at "1st European Workshop on ML-Based Solutions in Finance", Winterthur, September 4, 2019.
- Schwendner, Peter, "Financial Application of Network Analysis" at "Big Data Analytics Knowledge Exchange Platform", Horizon 2020 FIN-TECH project, Copenhagen, August 26, 2019
- Schwendner, Peter, "Correlation Influence Networks for Sentiment Analysis in European Sovereign Bonds" at Financial Revolution-Sentiment Analysis, AI and Machine Learning, London, June 25, 2019.
- Schwendner, Peter, "European Sovereign Bond Network Dynamics", Humboldt-University Berlin, April 18, 2019.
- Schwendner, Peter, "Active risk-taking in investment management", International Week, ISCTE Business School Lisbon, April 1-4, 2019.

- Jörg Osterrieder, Schwendner Peter, Branka Hadji Misheva, Special SupTech , ZHAW, 31st January 2020.

Development of Use Case for Artificial Intelligence

a. Objective and contents

ZHAW developed the use case “Convergence and Divergence in European Bond Correlations” together with the funding and investor relations desk of the European Stability Mechanism (ESM) to analyze the relative behaviour of Euro area sovereign bonds.

As there is no Euro area “safe asset” analogous to US treasuries, Euro area member states issue their bonds to fund their budget deficit. De facto, German bunds are perceived as the “safe asset” of the Euro area, as they are also the benchmark bonds denominated in Euro and the underlying of the Euro Bund future, but they do not provide funding available to the budget of other nations. Therefore, asymmetric shocks to the Euro area member states can lead to a divergence of sovereign funding cost in the Euro area cross-section. This diverging behaviour is visible in the bond market in the form of rising core/periphery bond spreads and negative correlations between core and periphery bonds return especially during the European sovereign debt crisis 2010-2012. Since the setup of the European rescue and stability framework that includes ECB measures and the ESM financial assistance programmes, the market turbulences calmed down and spreads converged, but occasionally they flare up again as during the 2015 negotiations between the Eurogroup and Greece or as during the Covid-19 crisis.

b. Literature review and methodology

The literature about the cross-sectional bond price dynamics in Europe primarily addresses the viewpoint of central bank economists who work in a mental framework of fundamental crisis causes that are measurable by macro variables in specific countries and sectors, and a contagion behaviour across countries and sectors that happens with a time lag. This mental framework leads to models to decompose the variance propagation in time of a cross-sectional dataset of financial market variables from different countries like the Diebold and Yilmaz (2014) framework. In contrast to this mental framework based on fundamental cause-effect relationships, many market practitioners regard secondary market prices of liquid financial instruments as incorporating expectations that are not yet reflected by actual news about macro variables and thus financial markets are running ahead of the economical facts. Our use case (Schwendner, Schüle and Hillebrand 2019) starts from this viewpoint of market practitioners and extracts the statistically significant average correlation influences (Kenett et al. 2010) between all European bond market return time series. This leads to a network that points to the most important correlation relationships that statistically explain all other correlations. Noise is filtered out using a bootstrap approach. In contrast to the Diebold-Yilmaz framework, our approach explicitly addresses also negative correlations. In the case of the European cross-section, negative correlations signal diverging movements between core and periphery, i.e. synchronous opening or widening spreads.

The approach can be applied to an intraday timescale, but also to daily or monthly data. Whereas daily or monthly data reflects the secondary market impact of actual portfolio rebalancing, intraday data reflects the parametrization of market makers for their quote machines and therefore the sentiment of market makers rather than the actions of large investors. On the project platform, source code in R and monthly

data from the ECB data warehouse is available. The resulting networks are displayed using the “Contagion Risk Monitor” application available on the platform.

References:

- Kenett, D. Y., Tumminello, M., Madi, A., Gur-Gershgoren, G., Mantegna, R. N., and Ben-Jacob, E. (2010). Dominating clasp of the financial sector revealed by partial correlation analysis of the stock market. PLoS ONE 5:e15032.
- Diebold, F.X.; Yilmaz, K., (2014). On the network topology of variance decompositions: Measuring the connectedness of financial firms. J. Econom. 2014, 182, 119-134.
- Schwendner, Peter; Schüle, Martin; Ott, Thomas; Hillebrand, Martin, (2015). European government bond dynamics and stability policies: taming contagion risks. Journal of Network Theory in Finance. 1(4), S. 1-25.
- Keskin, Zac; Aste, Tomaso (2019). Information-theoretic measures for non-linear causality detection: application to social media sentiment and cryptocurrency prices. arXiv:1906.05740
- Schwendner, Peter; Schüle, Martin; Hillebrand, Martin, (2019). Sentiment analysis of European bonds 2016-2018. Frontiers in Artificial Intelligence. 2(20).

c. Dissemination

The approach was presented during workshops and conferences targeted at financial market practitioners, academics and regulators.

- "Convergence and Divergence in European Bond Correlations" at "4th RegTech Workshop on AI in Finance", WU Vienna, February 26, 2020.
- "Current European sovereign bond dynamics", Centre for Financial Markets (CFM) Research Seminar, Michael Smurfit Graduate Business School, University College Dublin, October 31, 2019.
- "Current European bond market dynamics" at "Zurich Volatility Investing", Zurich, October 24, 2019.
- "Convergence and Divergence in European Sovereign Bonds" at "1st European Workshop on ML-Based Solutions in Finance", Winterthur, September 4, 2019.
- "Financial Application of Network Analysis" at "Big Data Analytics Knowledge Exchange Platform", Horizon 2020 FIN-TECH project, Copenhagen, August 26, 2019.
- "Correlation Influence Networks for Sentiment Analysis in European Sovereign Bonds" at Financial Revolution-Sentiment Analysis, AI and Machine Learning, London, June 25, 2019.
- "European Sovereign Bond Network Dynamics", Humboldt-University Berlin, April 18, 2019.

With our bond correlation analysis, we also contributed to the Evaluation Report “Lessons from the Financial Assistance to Greece” that was published on June 11, 2020. The Independent Evaluator, Joaquín Almunia, presented his report to the Board of Governors of the ESM, after more than a year of work and consultation. His evaluation assesses the financial assistance to Greece in terms of relevance, effectiveness, sustainability, efficiency and cooperation. It strongly focuses on the European Stability Mechanism (ESM) supported programme from 2015 to 2018, while taking into account the preceding

Greek financial assistance by the European Financial Stability Facility (EFSF). It also assesses the post-programme developments up to end-September 2019.

Reference:

- Hillebrand, Martin and Schwendner, Peter: Contribution of Greek financial assistance programmes to reduce spillover risks. Technical Appendix (p.39-43) of: Lessons from Financial Assistance to Greece. Report from the Independent Evaluator Joaquín Almunia (11.6.2020).

e. Feedback and improvement

The feedback of the audience from workshops and conferences was consistent to their background: financial market practitioners and the regulators during the Copenhagen workshop (August 2019) pointed out the usefulness for the practical assessment of short-term market sentiment. Academic economists were usually hesitant to consider a model without a lag structure. They prefer the standard Diebold-Yilmaz framework or similar approaches.

The reviewers from the project questioned if the method qualifies as “AI”, as it does not implement a self-learning system. Our working definition of AI includes supervised and unsupervised learning. The suggested use case approach belongs into the group of unsupervised learning methods. Tomaso Aste (UCL) suggested to complement the correlation influence method with transfer entropy (Keskin and Aste 2019). We will follow up on this idea.

5. FIRAMIS

Firamis was strongly engaged in research to identify obstacles that prevent fintechs from scaling in Europe. This is one of the objectives of this project. We screened hundreds of internet articles and papers to find answers, besides raising this question in network across academics and financial industry experts.

We identified some hints in the publications by German BaFin: Big data meets Artificial Intelligence: Challenges and implications for the supervision and regulation of financial services² and the expert's article³: Big Data and Artificial Intelligence: “The machines can't be allowed to assume responsibility, even in automated processes.”

Concerns were raised by using black-box AI/ML models in the financial service industry.

We started to find answers and identified approaches to eXplainable AI which we studied. In our RegTech in Frankfurt in Summer 2019 we presented some XAI prototypes and checked the reactions by the audience. There was a large interest by ECB and many other participants.

Therefore, we kept on doing our research and collecting feedback. We further developed our presentation slides and created a blog entry: <https://firamis.de/ai-fintech-riskmanagement-regulation/>

²https://www.bafin.de/SharedDocs/Downloads/EN/dl_bdai_studie_en.pdf?blob=publicationFile&v=11

³https://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2018/fa_bj_1806_BDAI_Interview_en.html

Then we tried to combine approaches from XAI with the network/graph-based use cases from the BDA block. The results is a paper:

- Bussmann, N., Giudici, P., Marinelli, D., Papenbrock, J., (2019): Explainable machine learning in Credit Risk Management. (open access), under second revision in an international journal.
[\(https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3506274\)](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3506274)
- Bussmann, N., Giudici, P., Marinelli, D., Papenbrock, J., (2020) Explainable AI in Fintech Risk Management
<https://www.frontiersin.org/articles/10.3389/frai.2020.00026/full>

It visualises the ‘brain’ of a black-box AI model. The links connect similar AI-decision-making for groups of customers. Similar decision making is colour coded in the nodes. We also created a dashboard to interact with the XAI results so the user could fully open a formerly closed black box AI model.

Also, this editorial has been created in M1-M12: P Giudici, R Hochreiter, J Osterrieder, J Papenbrock, P Schwendner, 2020, AI and Financial Technology. Editorial. Frontiers in Artificial Intelligence 2 (25). (open access)

We communicated this approach to many experts in Europe, including ECB, EIOPA, ESMA, EBA, EBF and many others to receive feedback and to inform people about the technological potential to explain black box AI models. The benefits are a more human-centric, responsible and trustworthy AI that improves risk management, governance, audit, reporting and consumer protection, also addressing GDPR requirements and the recommendations of the high-level expert group in the EU. XAI clearly helps in several ways to scale the European Fintech industry, protecting the consumers at the same time.

Firamis uploaded the use cases to the platform on the FIN-TECH website. The upload includes the implementation of every use case code to our browser RStudio solution. We have to make sure that every use case can be run without any problem. This includes the download and supply of every package, which is used in the code. It also includes tests of the online platform in every browser and we had to provide the needed server capacities during the coding sessions of the workshops.

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- 26th of November 2019, XAI-presentation at FIRAMIS special workshop for bankers & insurers I BDA and AI in Brussels
- 6th of December 2019, XAI-presentation at EIOPA InsurTech Task Force in Frankfurt
- 11th of December 2019, representing FIN-TECH project at EU Fintech Lab in Brussels
- in 2019 joining two meetings at EC in Brussels

Please also have a look at our WP6 RegTech and WP7 Dissemination related to our XAI activities.

Firamis helped to organize and supported the workshops of other FIN-TECH project partners:

- SupTech workshop BDA of the ZHAW in Budapest (15th-16th of May 2019)

- SupTech workshop BDA of the Bundesbank in Frankfurt (26th-27th of June 2019)

Firamis also produced two dashboard visualisations for the FRM (Prof. Härdle from UBER) and CRM (Prof. Schwendner from ZHAW) which are available on the project platform. These cover two AI use cases and have been presented at several FIN-TECH events, so these dashboards were also shown.

In the period from M13 to M18, we received more feedback on the AI use cases on various channels. These had to be understood and included in the feedback repos. For the London AI Research workshop and during the 2nd Bundesbank workshop and the Vienna RegTech and the 2nd Denmark workshop Firamis also prepared and presented updated material regarding network analysis and other AI topics.

The blog on XAI was also created and updated: <https://firamis.de/ai-fintech-riskmanagement-regulation/> including the research of >100 papers, article, white papers and blog on the topic XAI to check where the industry and the academic world stands and what impact XAI has on the Fintech landscape.

D. Blockchain Research-WP4

Objective: create, through individual research activity and the organisation of one dedicated workshop, common standards for risk management in blockchain technology applications to finance, specifically for Initial Coin Offerings (ICO) and crypto-assets (**WP4-Blockchain Research**).

1. University of Pavia

UNIPV is contributing to the WP4 through the creation of two use cases. The use cases in progress are on the cyber risk topic and fraud detection in the blockchain field. One of the use cases is already published in an open access journal. UNIPV has prepared the following use cases:

- Giudici, P., Leach, T. & Pagnottoni, P. (2020). Libra or Librae? Basket Based Stablecoins to Mitigate Foreign Exchange Volatility Spillovers. Available at SSRN at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3546779 (open access)
- Toma, A. M., & Cerchiello, P. (2020). Initial Coin Offerings: risk or opportunity? Frontiers in Artificial Intelligence, 3, 18. (open access)

Firstly, the authors discussed and developed the objective of the analysis. Secondly, a literature review of the relevant sources for the topic has been performed. After that they defined a methodology, they scraped the data and coded in R to test their methods. Finally, they reported the results and wrote a paper to demonstrate the usefulness of the solution implemented.

The code, dataset and open-source papers related to these works are available on the project platform. The content of the use cases has been presented on different occasions, both formal and informal meetings. The use case on stablecoins has been presented, for example, at:

- the AI, Financial Automation and Market Risk workshop hosted by the consortium partner UCL (virtual meeting, 19 May 2020),
- the Department of Economics and Management Seminar Series of the University of Pavia (virtual meeting, 7 May 2020),
- the Research Seminar of the Department of Economics, Statistics and Finance of the University of Calabria (virtual meeting, 25 June 2020).

The use case on Initial Coin Offerings as finalized in the platform and also the previous versions have been presented at the following conferences:

- 2020 Fintech-HO2020 SupTech at EBA and ESMA, Paris (France)
- 2019 "Convergence. The Global Blockchain Congress", Malaga (Spain)
- 2019 "OECD Blockchain Forum Policy", Paris (France)
- 2019 "Reinventing banking and sustainable finance, International Finance and Banking Society (IFABS) Conference" Angers (France)
- 2019 "Smart Statistics for Smart Applications", University of Cattolica (Italy)
- 2018 "Frankfurt Summit on Network Analysis", Frankfurt School of Management, (Germany)
- 2018 "3rd COST Conference on Mathematics for Industry", Zurich University of Applied Science, (Switzerland)
- 2018 "29th (EC)2 on Big Data Econometrics with Applications", Bank of Italy, Rome (Italy)
- 2018 "Third Entrepreneurial Finance Conference", Politecnico of Milan, (Italy)

All the actors gave feedback to the work and, in addition, the papers have gone and are going under the peer-review process of international and widely recognized journals. This enabled the authors to consistently improve the quality of their output and to continuously develop the use cases, with constant updates available on the project platform.

Another publication in the field of Blockchain:

- Chen, Y., Giudici, P., Hadji Misheva, P. and Trimborn, B. (2019). Detecting Lead Behaviour in Cryptocurrency Markets. Risks. (open access)

2. Humboldt University

Publications and Presentations in external events

- Pele, Daniel Traian and Wesselhöfft, Niels and Härdle, Wolfgang K. and Kolossiatis, Michalis and Yatracos, Yannis G., A Statistical Classification of Cryptocurrencies (March 4, 2020). Available at SSRN: <https://ssrn.com/abstract=3548462> or <http://dx.doi.org/10.2139/ssrn.3548462> submitted to Journal of Empirical finance (open access)
- Kim, Alisa and Trimborn, Simon and Härdle, Wolfgang K., VCRIX - A Volatility Index for Cryptocurrencies (November 4, 2019). Available at SSRN: <https://ssrn.com/abstract=3480348> or <http://dx.doi.org/10.2139/ssrn.3480348> submitted to Quantitative Finance (open access)
- Guo, Li and Tao, Yubo and Härdle, Wolfgang K., A Dynamic Network for Cryptocurrencies (June 13, 2020). Available at SSRN: <https://ssrn.com/abstract=3185594> or <http://dx.doi.org/10.2139/ssrn.3185594> (open access)
- Hou, Ai Jun and Wang, Weining and Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K., Pricing Cryptocurrency Options: The Case of Bitcoin and CRIX (June 12, 2019). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3159099 (temporary link) (open access)
- Hu, J., Härdle, W. K., & Kuo, W. Risk of Bitcoin Market: Volatility, Jumps, and Forecasts. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3658078 (temporary link) (open access)

Development of Use Cases for Blockchain Research

UBER is developing the following use cases to be considered furtherance for SupTech and RegTech events in Blockchain research WP:

- Mihoci, Andrija and Althof, Michael and Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K., FRM Financial Risk Meter (July 30, 2019). To appear in Advances in Econometrics, Volume 42, The Econometrics of Networks. Available at SSRN: <https://ssrn.com/abstract=3429549> (open access)

Financial Risk Meter (FRM) aims to measure tail event co-movements by one index. Furthermore, it can detect the interdependencies between different entities e.g. financial institutions or cryptocurrencies. FRM is based on Lasso quantile regression designed to capture spillover effect. FRM lies on understanding active set data characteristics and the presentation of interdependencies in a network topology. The FRM indices detect systemic risk at selected areas and identify risk factors. The FRM applied to cryptocurrencies market on a daily basis, we identify coins exhibiting extreme "co-stress", as well as "activators" of stress.

- Pele, Daniel Traian and Wesselhöfft, Niels and Härdle, Wolfgang K. and Kolossiatis, Michalis and Yatracos, Yannis G., A Statistical Classification of Cryptocurrencies (March 4, 2020). Available at SSRN: <https://ssrn.com/abstract=3548462> or <http://dx.doi.org/10.2139/ssrn.3548462> submitted to Journal of Empirical finance

This paper aims to derive the main factors that separate cryptocurrencies from the classical assets, by using various classification techniques applied to the daily time series of log-returns. In this sense, a daily time series of asset returns (either cryptocurrencies or classical assets) can be characterized by a multidimensional vector with statistical components like variance, skewness, kurtosis, tail probability, quantiles, conditional tail expectation or GARCH parameters. By using dimension reduction techniques

(Factor Analysis) and classification models (Binary Logistic Regression, Discriminant Analysis, Support Vector Machines, K-means clustering, Variance Components Split methods) for a representative sample of cryptocurrencies, stocks, exchange rates and commodities, we can classify cryptocurrencies as a new asset class with unique features in the tails of the log-returns distribution. The main result of our paper is the complete separation of the cryptocurrencies from the other type of assets, by using the Maximum Variance Components Split method. In addition, we observe synchronicity in the evolution of the cryptocurrencies, compared to the classical assets, mainly due to the tails behaviour of the log-return distribution.

The content of the use cases has been presented in different occasions, both formal and informal meetings, for example, at:

- SUPTECH WORKSHOP AI, Market Risk in financial Robo-Advisory at Deutsche Bundesbank (10 -11, February 2020)
- The AI, Financial Automation and Market Risk workshop hosted by the consortium partner UCL (virtual meeting, 19 May 2020)
- 13th International Conference on Business Excellence (ICBE), Bucharest University of Economic Studies, Roumania (March 23, 2019)

Also, members of UBER will actively participate in BC seminars, organised by ZHAW (see details below) and give the following talks:

1. CRRIX-CRypto Regulation IndeX, X Ni
2. Forecasting in Blockchain-Based Local Energy Markets, M Kostmann
3. Clustering of Smart contracts, R Reule, E Zinovieva
4. Benefits of sectoral cryptocurrency portfolio optimisation, M Culjak (UBER/UNI RIJEKA EFRI)

3. University College London

Publications and Presentations in external events

- G Goodell, T. Aste (2019) A Decentralised Digital Identity Architecture. Available at SSRN 3342238 (open access)
- G. Goodell, T. Aste (2019). Can Cryptocurrencies Preserve Privacy and Comply with Regulations? Frontiers in Blockchain 2, 4. (open access)
- Burnie, A., Yilmaz, E., & Aste, T. (2020). Analysing Social Media Forums to Discover Potential Causes of Phasic Shifts in Cryptocurrency Price Series. Frontiers in Blockchain, 3, 1. (open access)

4. ZHAW University-WP4 leader

Zhaw's activities, as WP leader include:

- 1) monitoring the progress of the research efforts of individual partners within the consortium:
 - i) for this purpose, ZHAW has organized a variety of meetings with partners within the network that work on Blockchain to individually discuss the topic as well as the specific use cases we should focus on. Furthermore, ZHAW will organize monthly research webinars at which academics, Fintechs and regulators, both internal and external to our network, can present their working papers on the financial applications of blockchain technology. Up to 31st of August 2020, ZHAW organized two research seminars: (1) on 19th June 2020: Momentum and contrarian effects on the cryptocurrency market - an interactive shiny application with a talk by Ass. Prof. Paweł Sakowski and (2) on 1st of July 2020: Explainability of a Machine Learning Granting Scoring Model in Peer-to-Peer Lending with a talk by Ass. Prof. Javier Arroyo.
- 2) Creating and maintaining a repository containing state-of-art papers concerning the application of blockchain in finance.
 - a) The initial repository is available on the Fintech-ho2020 platform. We will conduct quarterly updates on the repository.
 - 3) together with the global coordinator, selecting a sub-section of use cases coming from the FinTech-ho2020 network.
 - 4) ZHAW will organize the 3rd (and final) validation and research workshop on Blockchain and Risk Management at which universities, regulators and Fintechs will meet and discuss various fintech risk management tools that can address the risk concerns surrounding the fast adoption of blockchain technology in finance. The validation and research workshop on Blockchain in Finance will be organized by ZHAW and will be held in Winterthur in March 2021.
 - 5) In line with the overall extension of the project, ZHAW will extend the call for papers focusing on the financial applications of the blockchain technology. The new deadline to send full use cases is 31 December 2020. The use-cases will be evaluated on a rolling basis.

Preparation of Use cases

Concerning the specific procedure:

- Within the network, ZHAW opens a call for papers that focus on the application of blockchain technology in finance with the following conditions: (i) the paper should be published in an open-source journal; (ii) data used in the paper should be publicly available; and (iii) the availability of a script written in open source program (R or Python);
- The network submits papers for consideration;
- ZHAW selects a subsection of use cases coming from the FinTech-ho2020 network that propose novel approaches to fintech risk management tools specifically related to the application of blockchain in finance.

Progress report:

Use cases received from partners:

- Toma, A. M., & Cerchiello, P. (2020). Initial Coin Offerings: risk or opportunity? *Frontiers in Artificial Intelligence*, 3, 18. (open access)
- Goodell, G. and Aste, T. (2019). A Decentralized Digital Identity Architecture. *Frontiers in Blockchain*; doi: <https://doi.org/10.3389/fbloc.2019.00017>
- Guegan, D. and Henot, C. (2018). A Probative Value for Authentication Use Case Blockchain. CES Working Papers
- Pele, T.D. and Pele, M.M. (2019). Metcalfe's law and log-period power laws in the cryptocurrencies market. *Economics*, The open-access, open assessment e-journal. doi: <http://www.economics-ejournal.org/economics/journalarticles/2019-29>
- Pele, D.T. et al. (2019). Phenotypic convergence of cryptocurrencies. IRTG 1792 Discussion Paper 2019-018
- Abraham, L. and Guegan, D. (2019). The other side of the coin: Risks of the Libra blockchain
- Kosc, K., Sakowski, P. and Slepaczuk. Momentum and contrarian effects on the cryptocurrency market. *Physica A*. 523: 691-701
- Pele, D.T. and Pele, M.M. (2019). Using High-Frequency Entropy to Forecast Bitcoin's Daily Value at Risk. *Entropy*
- Chen, Y., Giudici, P., Hadji Misheva, P. and Trimborn, B. (2019). Detecting Lead Behaviour in Cryptocurrency Markets. Accepted in Risks.
- Mihoci, Andrija and Althof, Michael and Chen, Cathy Yi-Hsuan and Härdle, Wolfgang K. (2019) FRM Financial Risk Meter. To appear in *Advances in Econometrics*, Volume 42, The Econometrics of Networks

Three use cases are already selected and available on the platform.

In line with the overall extension of the project, ZHAW will extend the call for papers focusing on the financial applications of the blockchain technology. The new deadline to send full use cases is 31 December 2020.

ZHAW is in the process of establishing a collaboration with Frontiers in Blockchain for a Special Issue on Blockchain in Finance which in turn can result in an e-book.

5. FIRAMIS

Firamis is contributing to the blockchain part of the project on several levels. The main contribution is to comprehend and check the delivered use cases. The corresponding codes are implemented in the platform and reconciled against the corresponding paper content (for more information on the platform and code-based use cases please refer to the chapter on WP6).

For the project's blockchain activity we activated our contact to Prof. Dr. Philipp Sandner, Frankfurt School Blockchain Center⁴. He is a member of our association of AI in Financial Services where we establish the link between AI and blockchain: <https://aiinfs.com/sponsors/>

In our AI SupTech in Denmark we invited Rafael Reule from UBER to deliver the following presentation:

- 'Smart Contracts Smart Contracts and the pursuit of an interdisciplinary technical cure-all. What do we have at hand? Where can we (not) apply such blockchain applications? Legal implications and discussion.'

E. SupTech Workshops-WP5

Objective: develop and update pilot research sandboxes in each European country, connecting national supervisors with fintech hubs through knowledge exchange training programmes, according to the research developed in O2, O3 and O4, matching the monitoring needs of supervisors with the business needs of fintechs (**WP5-SupTech Workshops**).

1. University of Pavia-WP5 leader

Organization of SupTech events:

- 1) SupTech I BDA, Malta Financial Services Authority, 28 February and 1st of March 2019. Topic covered: Big Data Analysis; three Use-Cases presented
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) UseCase III: Spatial Regression Scoring Model

Feedback

- Parties participating, their roles and their responsibilities:

Participants to the MFSA BDA SUPTECH were:

- MFSA officers: such as analysts of the securities and markets supervision unit, the fintech and dlt department, the blockchain and financial services, the insurance and pension supervision unit, the banking supervision;
- VFA agents
- University of Malta: department of statistics and operations research, department of banking/finance
- Fintechs
- Financial service providers: such as MDIA, CHALESR CHERRI & associates
- Financial industries located in Malta.

⁴ (<https://www.frankfurt-school.de/en/home/research/staff/Philipp-Sandner~0000006611291~~~>)

The role of the participants varies among analysts, managers, lecturers, professors, lawyers, legal advisors. The background of the participants was mainly related to statistics, econometrics, finance, AI.

- How will they stay involved?

Participants are involved through the portal where they can ask to access and with the website and social media tools. Moreover, the contact point from MFSA oversees sharing our material, events, invitation, to the internal officers and asking them to provide feedback for the use cases heard.

Specifically, they have been invited to the SupTech and RegTech events in Italy and they will participate to oncoming European events.

- What is their feedback on the use cases presented?

The feedback as reported by the single participants and by the contact point at MFSA is overall good and they showed particular interest in the application of network scoring models.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, although they recommended a more focused audience with a quantitative background to follow the technicalities of the presented use cases.

- 2) SupTech on AI, Bank of Italy, 12 June 2019. Topic covered: Measuring credit risk and systemic risk in peer to peer lending and invoice trading.
 - a) Use Case I Network Based Scoring Models
 - b) UseCase III: Spatial Regression Scoring Model

Feedback

- Parties participating, their roles and their responsibilities

Politecnico di Milano, Cineca, IVASS, Bank of Italy Officers, Cineca, Modefinance (fintech Startup)

- The role of the participants

Expert, Deputy Head of Financial Stability Directorate, PhD candidates, Economist IT Manager, Researchers, Director, Advisor, head of Big Data Analytics team, Director, Head of Macroprudential Analysis Division, Head of Money an Financial Markets Division, Head of Regulation and Macroprudential Analysis Directorate, Financial Risk Management Directorate-Credit Risk Assessment Division, officer, Deputy Head External Relations Department.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by Bank of Italy or by the University of Pavia.

- What is their feedback on the use cases presented?

Highly valuable the perspective of a dialogue between supervisors and academia.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, the use cases and topics have been commonly chosen. Particular interest in network models as a transparent AI application and on Supervision challenges.

3) AI SPECIAL SUPTECH WORKSHOP ON FINTECH CHALLENGES 18.11.2019, University of Pavia, Italy

Feedback

- Parties participating, their roles and their responsibilities:

The role of the participants: Academics from the University of Pavia, University of Trento, An-Najah National University (including Shatha Hashem, advisor of the FIN-TECH project).

- How will they stay involved?

Participants were able to present their papers and to see others' presentations. Presentations are available on the platform and selected papers were included in a special issue of AI in Finance: "Financial intermediation versus disintermediation: Opportunities and challenges in the FinTech era". The editors Meryem Duygun (University of Nottingham, UK), Shatha Qamhieh Hashem (An-Najah National University, Nablus, Palestine) and Alessandra Tanda (University of Pavia, Italy) selected contributions from those presented at the workshop included them in the peer-review process for the special issue.

- What is their feedback on the use cases presented?

After the presentation, a very interesting discussion emerged, with Q&A from the audience both on the methodological approach and on the implications of Fintech risk management issues for policymakers, investors, and the industry. Additionally, some participants engaged in further research discussion on the papers presented at the workshop. The papers included in the special issue also received feedback from the Editors and the reviewers.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?
- Papers presented covered many topics and took different perspectives in line with the main topics covered by the project. It was a multidisciplinary plenary approach as well, with contributions coming from researchers with a different background. All the discussed issues had a relevant application to the main topic of fintech risk management.

4) SupTech II Workshop AI, Malta Financial Services Authority, 20 November 2019. Topic covered: AI, Market Risk and Robo Advisory; two use cases presented:

- a) Use case I: Convergence and Divergence in European Bond Correlations

- b) Use case IV: Network models enhance automated cryptocurrency portfolio management.

Feedback

- Parties participating, their roles and their responsibilities:

Participants to the MFSA AI SUPTECH were: MFSA OFFICERS: such as analysts of the Securities and Markets Supervision Unit, the FINTECH and DLT department, the Blockchain and financial services, The Insurance and Pension Supervision Unit, the Banking Supervision.

Members from the University of Malta: department of statistics and operations research, department of banking/finance.

- The role of the participants varies from the analyst, manager, lecturer, professor, lawyer, legal advisor.
- How will they stay involved?

Participants will stay involved through the portal where they can ask to access and with the website and social media tools. Moreover, the contact point from MFSA oversees sharing our material, events, invitation, to the internal officers and asking them to provide feedback for the use cases heard. Specifically, they have been invited to the SupTech and RegTech events in Italy and they will participate to oncoming European events.

- What is their feedback on the use cases presented?

The feedback as reported by the single participants and by the contact point at MFSA is overall good and they showed interest in the topics of peer to peer and network models for robot advisory.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, especially the ones that concern network models, and their application to robot advisory and, possibly, blockchain applications.

2. Humboldt University of Berlin

Organization of SupTech events

- 1) SupTech I, Smart Data Analytics, 26-27 June 2019, Bundesbank, Frankfurt.

- a) Lecturers:

- i) Prof. Wolfgang Karl Härdle (UBER)
- ii) Prof. Cathy Ying Chen (UBER/University of Glasgow)
- iii) Dr. Jochen Papenbrock (FIRAMIS)
- iv) Dr. Alla Petukhina (UBER)

- b) Topics presented:
- i) Scagnostics-Scatterplot diagnostics: methodology, application to SME default data
 - ii) Network analysis: methodology
 - iii) Introduction to P2P lending platforms
 - iv) ML and network analysis: applications in Credit Risk Modelling. FINTECH use cases:
 - v) Use Case I: Network Based Scoring Models
 - vi) Use Case II: Clustered Scoring Models
 - vii) Use Case III: Spatial Regression Scoring Mode
 - viii) Use Case IV: Loan screening and default prediction
 - ix) Introduction to text mining: LDA Latent Dirichlet Analysis, Sentiment
 - x) Training included coding examples in R and Python for all topics presented.

Feedback

- Parties participating, their roles, and their responsibilities:

25 participants from 15 European financial supervisors: Deutsche Bundesbank, BaFin, Nationale Bank van Belgie, National Bank of Bulgaria, Banco de Espana, Banque de France, Croatian Financial Services Supervisory Agency, Banca d'Italia, Latvijas Banka, Lietuvos Bankas, Banque Nationale du Luxembourg, Central Bank of Malta, FMA Österreich, National Bank of Slovakia, European Central Bank.

- The role of the participants:

All participants hold analytical positions in their institutions. All listeners have strong quantitative skills and experience in data description, building models for risk estimation in different areas: scoring, market risk, operational risk, etc. Almost all participants had a doctoral or comparable degree in finance, economics, mathematics, or physics.

- How will they(participants) stay involved?

The participants of the workshop are involved by participating in the FIN-TECH events as listeners as well as speakers or experts at panels. Also, they supported other complementary initiatives of the Consortia, becoming active members of Grant applications or research proposals. The broad discussion on different issues of applied methods is still ongoing. Specifically, they have been invited to the SupTech and RegTech events in Germany, and they did participate in oncoming European events.

- What is their feedback on the use cases presented?

The participants were very motivated to discuss models; all of them were actively involved in the description of the parametrization of models and interpretation of results. There was an active discussion about the necessity to test the significance of the difference between use cases and traditional benchmarks. The feedback, in general, was positive; the participants found all presenters well prepared, informative, and easy to follow.

- Are the selected use cases, in the end, the ones that meet the expectations and requirements at most?

Yes, the main feedback is that the material presented was fascinating, and all presenters were very informative. Almost all participants would be glad to have a more extended workshop at least three days to cover, e.g., why the authors used this method instead of other ways. They would also talk more about the advantages and disadvantages.

2) SupTech II, AI, Market Risk in financial Robo-Advisory, 10-11 February 2020, Bundesbank, Frankfurt.

a) Lecturers:

- i) Prof. Wolfgang Karl Härdle (UBER)
- ii) Prof. Stefan Lessmann (UBER)
- iii) Dr. Jochen Papenbrock (FIRAMIS)
- iv) Dr. Rui REN (UBER)

b) Topics presented:

- i) Financial Risk Meter (FRM)
- ii) Use Case: eXplainable AI (XAI) in Regulated Financial Services
- iii) Introduction to Deep Learning
- iv) Introduction to Interpretable Machine Learning and Network Analysis
- v) Use Case: Network Models to Enhance Automated Portfolio Management

Training included coding examples in R and Python.

Feedback

- Parties participating, their roles, and their responsibilities:

13 participants from Deutsche Bundesbank took part in the workshop.

- The role of the participants:

All participants hold analytical positions in their institutions. All listeners have strong quantitative skills and experience in data description, building models for risk estimation in different areas: scoring, market risk, operational risk, etc. Almost all participants had a doctoral or comparable degree in finance, economics, mathematics, or physics.

- How will they(participants) stay involved?

The participants of the workshop are involved by participating in the FIN-TECH events as listeners as well as speakers or experts at panels. The broad discussion on different issues of applied methods is still ongoing.

- What is their feedback on the use cases presented?

The participants agree with most of the ideas and consider the possibility that FRM could be used as an alternative for measuring financial risk. They also show interest in machine learning, automated portfolio management and explainable AI. For example, if explainable AI can report the reasoning to make its functioning clearer to understand by humans, it would be potential to improve regulated financial services.

- Are the selected use cases, in the end, the ones that meet the expectations and requirements at most?

Yes, the main feedback is that the material presented was fascinating, and all presenters were very informative. They would like to talk more about the advantages and disadvantages of the models presented.

3. University College of London

Organization of SupTech activities

1) Discussion and preparation work - 16 January 2019 10:00-13:00, BDA

- Parties participating:
 - Tomaso Aste
 - Fabio Caccioli
 - Mattias Bauer
 - IT & Security team
 - 3 representatives from FCA innovate Reg Tech division

2) Discussion and preparation work - 12 February 10:00-13:00 BDA

- Parties participating:
 - Tomaso Aste
 - Fabio Caccioli
 - Mattias Bauer
 - IT & Security team
 - 3 representatives from FCA innovate Reg Tech division

3) Regulation and FinTech - Financial Conduct Authority - London - 05/03/2019 BDA

- Parties participating, their roles and their responsibilities:

University College London (UCL) - Tomaso Aste, Jerem Turiel, Fabio Caccioli, Paolo Barucca

Financial Conduct Authority (FCA), Innovate Division - Mattias Bauer (FCA organizer), IT & Security team, FCA innovate, two managers from RegTech

Total of 22 participants

Agenda:

- 9:00 Matthias Bauer Welcome

- 9:15 Tomaso Aste Introduction to the training programme and the European project
- 9:30 Fabio Caccioli Introduction to machine learning
- 10:00 Rodrigo Mazorra Data science, an industry perspective
- 10:30 - Break
- 10:45 Giacomo Livan, Complex Network Approaches for the digital economy
- 11:15 Jeremy Turiel P2P lending: a case study
- 11:30 -Discussion, design of the next session and identification of case studies
- 12:00 -16:00 Lunch, working groups and discussions

- The role of the participants

Head of division, Researchers team, IT & Security head.

- How will they stay involved?

Preparation work was undertaken by both UCL team and FCA team. UCL presented research results on Fintech and regulation reporting on some of the cutting edge research activities done in the group. FCA also presented research outputs and case studies on this topic.

- What is their feedback on the use cases presented?

There was great interest from both sides. We identified network approaches and systemic risk as a common ground interest. We identified the issue of lack of access to data from academia as an enormous limitation to advancement in the field. Discussions on generation of artificial data via natural networks were undertaken.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? The use-cases were perfectly centred onto the FCA interest and vice-versa. But this was not by chance or luck. A large preparation work was done before the meeting.

3) Data Analytics: Machine Learning in Financial Systems, a P2P lending use case - Financial Conduct Authority - London - 03/04/2019 (moved from 6/03/2019)

- Parties participating, their roles and their responsibilities:

University College London (UCL), Financial Conduct Authority (FCA), Innovate Division, Fintech Start-up Refinery

Agenda:

- 9:00 - 9:30 Matthias Bauer Welcome
- 9:30 -11:30 Tomaso Aste & Jeremy Turiel - Use-case on credit risk in P2P lending
- 11:30 -13:30 Isobel Seabrook, Giorgio.Saladino, Marek Biernacki, Simone Pedemonte,
- RegTech and Advanced Analytics at FCA
- 13:30 - 16:00 Lunch and discussion.

- The role of the participants

Head of division, Researchers team, IT & Security head.

- How will they stay involved?

Personal relations and scientific collaborations have been established. One employee of FCA has started a part-time PhD with the UCL team. Communications are on weekly basis. FCA members participate to UCL

- What is their feedback on the use cases presented?

The FCA innovation team has expressed great interest in the UCL academic activities and great curiosity for the European Project that they see as an important academic initiative that is moving in the same direction of coordination initiatives that are put forward by the European central banks and regulators. However, their value the academic side because there is a larger intellectual freedom, open communication and independence.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? The use-cases were discussed in details and a lot of interest was raised. Plans to have a two-way interaction with Academics and FCA presenting their respective use-cases were made.

4) Presentation / training by Tomaso Aste at the FCA innovate away day on “Future of AI” -September 17th, 2019, 10:00-13:00, AI.

- Parties participating, their roles and their responsibilities:

University College London (UCL), Financial Conduct Authority (FCA), Innovate Division (whole division)

- The role of the participants:

Head of division, Researchers team, IT & Security head and rest of division.

- How will they stay involved?

This was an invited presentation at their away day where they wanted to learn more about AI in financial risk and regulation.

- What is their feedback on the use cases presented?

Long debate followed by informal discussions. Some research collaborations in this domain started.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? Yes, there was great interest on the presented use case and new use cases were proposed.

5) Workshop AI, Financial Automation and Market Risk, - London - 19/05/2020 9-18

- Parties participating, their roles and their responsibilities:

- All Fintech HO2020 participating organizations, plus:
- Financial Conduct Authority (FCA)
- Barclays
- HSBC
- Santander
- Bank of England
- National University of Singapore
- Asian Development Bank
- FINRA

- An Najah National University

- The role of the participants

Regulators, Central Bankers, Head of divisions, Professors, Researchers, IT, Security, technologists, students.

- How will they stay involved?

The initiative was a great success with strong covering on social media, on the UCL website, and creating a community that is still actively interacting. Slides related to the presentations held are uploaded on the project platform.

- What is their feedback on the use cases presented?

Comments were extremely positive. The main feature that has been appreciated by Participants is the high quality and well mixed relators, coming both from the academia and the industry, and the variety of topics dealt with.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? Use-cases and research topics were selected in order to cover interest and heterogeneity of the participants. Feedback has been overwhelming with attendees and speakers actively engaging in area outside their comfort zone.

NOTE: the higher number of AI-related hours was requested by the regulator and different events we were invited to.

4. ZHAW University

ZHAW is responsible for organizing SupTech training sessions in Hungary and Switzerland. Furthermore, ZHAW supported other partners with their respective SupTech training. Details:

1) SupTech Hungary

a) 15-16 May 2019

The event was attended by 40-50 participants. All participants were from the Central Bank of Hungary and they were from a variety of departments including but not limited to: Central Bank Statistics Department; Risk Management Department; Economic Analysis Department; Financial Market Analysis Department; Digitalization technology Department; MNB FinLab etc. The two-day training was organized by ZHAW and was supported by Firamis. Specifically, the speakers were:

- Branka Hadji Misheva, ZHAW
- Prof. Dr. Jörg Osterrieder, ZHAW
- Dr. Jan-Alexander Posth, ZHAW
- Dr. Jochen Papenbrock, FIRAMIS

Topics Covered:

- a) Overview of the FIN-TECH project; Introduction of the Project's goal, activities and network; Introduction of MNB's team and the FinTech's lab activities
- b) Big data analytics: Introduction to the technology; Opportunities and risks in the financial sector; Big data and Central Banks; Big data and FinTech; Regulatory Concerns
- c) The case study of peer-to-peer lending platforms; The platforms' working mechanisms; Advantages and main risk concerns
- d) Introduction to Network Models; Sustainable and explainable AI; Regulatory Issues
- e) Credit risk management
- f) Presentation of use cases with hands-on coding examples in R

Feedback

- How participants remain involved?

ZHAW is in regulator contact with the Central Bank of Hungary, sharing updates, new use cases, project materials, etc.

ZHAW has informed and invited participants from the Central Bank of Hungary to all open events organized under the Fintech-ho2020 Network.

- What is their feedback on the use cases presented?

The participants were very much interested in the use cases presented. It is important to note that majority of the participants expressed their interest for high-level examples of the application of the big data technology in finance. A smaller group, focused on quantitative research, was able to follow the use cases and the practical implementation in R. Many participants requested platform access following the training.

2) SupTech Switzerland:

- a) 3 April 2019, State Secretary for International Finance (SIF), Topics Covered: Project overview, Network and Big data analytics, description of use cases.
- b) 24 May 2019, Swiss Financial Market Supervisory Authority (FINMA), Topics Covered: Project overview, Network and Big data analytics, description of use cases
- c) 17 June 2019, ZHAW: Topic Covered: Big Data Analytics and Risk Management
- d) 8 July 2019, ZHAW: Topic Covered: Big Data Analytics and Risk Management

Feedback

- How participants remain involved?

ZHAW remains in periodic contact with the SIF and other participants of the events by sharing updates and inviting participants from SIF to other open events organized by ZHAW.

SIF has access to the project's platform where they can review the use cases in detail.

SIF furthermore suggested that they cannot commit currently to future workshops but are willing to keep up with the updates and the platform where they can access the outcomes and the use cases.

ZHAW did not remain in contact with representatives from FINMA as they expressed no interest to participate in workshops, conferences and training sessions organized under the Fintech-ho2020 project

- What is their feedback on the use cases presented?

The participants were interested in the general topic of the project but have no clear focus on our technical papers. SIF expressed more interest in the Blockchain topic. FINMA's participants suggested that their legal mandate does not focus on the precise technological mandate at the moment.

5. FIRAMIS

Organization of SupTech events

- 1) SupTech Denmark BDA, Danish Financial Supervisory Authority, 26th to 27th of August 2019
 - a) Analysing Complex Relationships Scatterplot diagnostics "Scagnostics"; Introduction to network models, complexity in network, Jochen Papenbrock and Peter Schwendner
 - b) Data Analytics Introduction of the technology; Opportunities and risks in the financial sector, Jochen Papenbrock
 - c) Financial Application of Network Analysis Correlation Influence Networks applied to European Sovereign Bond Markets Network Analysis in (Systemic) Risk Management and Fraud Detection, Peter Schwendner and Jochen Papenbrock
 - d) Machine Learning and Credit Risk Modelling SVM credit scoring, Boosting & random forests, Jeremy Hu
 - e) Deep Learning and LSTM with an example of crypto market forecast Jeremy Hu
 - f) The concept of Explainable AI (XAI) Jochen Papenbrock

Feedback

- Parties participating

Bank Division, Capital Market Analysis Kontor for Fintech, Betalingstjenester og Governance, Consumer protection, Pension funds division, Fintech, Payment Services and Governance Division for Fintech, Kapitalmarkedsanalyse, Economic Secretariat, Investor Protection Division.

- Their roles

Special Advisor, Deputy Financial Inspector, Advisor, Chief Special Adviser, Financial Inspector, Head of section, Special Advisor, Specialkonsulent, Projektleder, Chief Special Advisor, Deputy Financial Inspector, Special Adviser, Student, Economist, Deputy Financial Inspector, Chief special advisor, Head of Section, Deputy director, Deputy financial inspector

- How will they stay involved?

They received all slides presented plus additional material they asked for. They also planned to prepare data and use cases that we could analyse in a team and potentially discuss in the next session. We also agreed to split the audience for the next workshop into more economics/law and tech/data science.

We gave a longer introduction to the project and explained how they can get involved, e.g. by the platform and attending other workshops. They planned to send people to other workshops as well what they did for example with Bundesbank.

- What is their feedback on the use cases presented?

Are the selected use cases in the end the ones that meet the expectations and requirements at most? The good introduction to Big Data Analytics was appreciated. The audience liked the network analysis and clustering use cases; they saw that the method can be generalised and that the visual representation of complex information is highly useful.

XAI was high on their agenda and the subject has priority for them. They are now informed about the potential of XAI in banks and planned to include it into their supervisory checklists with our help. They recognised that many other supervisors have XAI on their agenda.

2) **SupTech Bundesbank BDA, 26-27 June 2019**

- a) Session 3 Network analysis Wolfgang Karl Härdle & Jochen Papenbrock
 - i) Contribution of Dr. Jochen Papenbrock: A longer presentation on Financial Network Analysis similar with links to the presentation 'Workshop der Bundesbank zur Digitalisierung mit externen Referenten, 9. August 2018'
 - ii) Supporting the preparation, execution and postprocessing of the workshop including several visits to Bundesbank

For further details and feedback regarding this workshop please refer to the UBER documentation and contribution to the intermediate evaluation report. My impression was that participants found our

presentation on network analysis for complex financial data very useful and saw its potential also in generalisation and visualisation as well as in practical use.

3) **SupTech workshop BDA of the ZHAW in Budapest, 15th-16th of May 2019**

- a) Presentation:
 - i) Network Models and Practical Session II
 - ii) Introduction to network models and presentation of use cases with hands-on coding examples I, Dr. Jochen Papenbrock
 - iii) Representation of the FIN-TECH project to the supervisory authorities

For further details and feedback regarding this workshop please refer to the ZHAW documentation and contribution to the intermediate evaluation report. My impression was that participants found our presentation on network analysis for complex financial data very useful and saw its potential also in generalisation and visualisation as well as in practical use.

4) **Bucharest Midterm-Workshop, 5 November 2019**

- a) Presentation:
 - i) “eXplainable AI (XAI) in regulated financial services-Jochen Papenbrock, Firamis, Panel session 1- Credit and market risk in peer to peer lending”

For further details and feedback regarding this workshop please refer to the ASE documentation and contribution to the intermediate evaluation report. My impression was that participants found the topic XAI very important and several workshop participants approached us afterwards to discuss and confirm this impression.

F. RegTech Workshops-WP6

Objective: Develop and update a pilot European research sandbox, connecting fintech hubs through the production of open source software for FinTech risk management, and consequent coding exchange sessions, according to the research developed in O2, O3 and O4, matching the business needs of fintechs with the monitoring needs of supervisors (**WP6-RegTech Workshops**).

1. Firamis- WP6 leader

The following section reports the description of work related to Firamis, as WP leader and the activities of partners involved in specific activities within the work package (organizers of RegTech workshops).

At the beginning of the project, Firamis had to set up a development environment for all the partners. We, therefore, implemented a data science platform, which is connected to the FIN-TECH website and secured by a login. This platform provides a coding technical infrastructure, which is scalable and extendable in a modular approach. This platform is based on R. In the following abstract, we will describe the platform and its possibilities in detail.

The platform is only available for partners and participants of the coding sessions. The login credentials are created by Firamis, so we can make sure that only partners and participants of the workshops can log in. After the end of the FIN-TECH project (2021), the platform won't be secured anymore and will be open access for everyone. On the platform we upload and provide:

- A manual, how to use the platform, including descriptions and screenshots
- All the material of the use cases
 - This includes the corresponding papers, the necessary data and the code
 - The platform can let users run the code in R Studio, which opens in a new tab in the browser. To make sure participants of the workshops can use the use case's code immediately, we had to download and implement all the packages to this online RStudio application.
- Some Network Visualisations
- The Event Map, which shows all the upcoming events of the project, with dates and venues
- A Bibliography, which contains all the material the papers are based on
 - Videos of the past workshops and image videos of the project
 - The workshop agendas
 - The app of the Contagion Risk Monitor, which represents also one of the use cases

To let this Platform run, we needed to implement an IT infrastructure, which contains also a lot of server capacities.

The code-based use cases are prepared and maintained in a login-protected platform which has been created in line with the so-called RegTech framework.

The RegTech framework aims to create an operational fintech risk management expertise through knowledge exchange workshops dedicated to fintechs. Each workshop will allow participants to test possible solutions for automated compliance. The RegTech material is based on the same material shared in WP5 and will add practical aspects through the development of coding examples on the project use cases. During the RegTech sessions, open source language software will be used, thus ensuring the project's overall neutral and non-commercial nature. While the SupTech workshops are decentralised in each of the considered European countries, RegTech workshops will be organised at the European level, at the premises of fintech hubs, to encourage uniform fintech risk management practices across Europe.

The objectives of the work package are: To develop technical solutions to automate compliance of fintech companies (RegTech); to test different technical solutions for automated compliance using open source papers, software and real data.

The work is divided into the following tasks: the creation of a unified content.

To develop common understanding concerning the technical aspects of fintech risk management models, the content of the RegTech workshops will be material relative to the use cases (as in WP5), divided into three topics: big data analytics, artificial intelligence and blockchain application.

Creation of a research and development environment, creating a coding technical infrastructure that is scalable and extendable in a modular approach. The basis for the infrastructure will be open-source projects like R which gives access to developed machine learning projects. These research and development environments will be made available in a dedicated cloud server environment to manage the code, scripts, GUIs, models, users' access rights, software interaction and workflows.

The following languages and (open source) tools are combined:

- | | |
|---------------|-------------------|
| - Ubuntu | - RStudio |
| - Nginx | - Rshiny |
| - Docker | - Hugo/R-blogdown |
| - Shiny proxy | - LDAP server |
| - R | |

The platform uses Ubuntu as OS and Docker for containerization of the applications. We use modular docker containers that contain R code, files, input data and all environment packages and variables needed. Each use case exists in such a container and also has an Integrated Development Environment (IDE) like RStudio.

Each use case is prepared in a way that all libraries and packages required for its execution are already provided in the same container. This provides an infrastructure with the least possible entry barriers to run the use cases. This is important as can be seen from the feedback as many users see the code and a modern coding infrastructure for the first time. Users only need a modern Web browser and platform access to instantly run the code.

Besides the code, there are other containers whose purpose is to run R-Shiny applications. This is used for flexible dashboarding, interactive visualization, file browsing, file previews and file downloading.

The modular platform can scale by using Docker Swarm technology. For example, there can be several hundred nodes each of which is reserved for one or more users. In this way, there can be live and online training for several hundred people at the same time. The amount of nodes has to be reserved and managed during the event.

The platform has served hundreds of users since the beginning of 2019, supporting RegTech and SupTech workshops as well as the evaluation and dissemination process. It had almost zero downtime since the beginning of 2019. For information about the platform, architecture can be found here: https://firamis.de/data_science_platform/

The workflow for new code-based use cases is the following:

- Firamis receives the new code from the partners and checks which open-source software packages and libraries are involved in total. A docker container is then created that contains the

downloaded libraries. Additionally, some extra packages for Ubuntu have to be installed to be able to run those libraries. In a first test, it is checked if all libraries load properly.

- Then the partners' code is added in a second docker container that includes the first one. The code is checked line by line and analysed in two directions: 1) to see if it executed properly or if there are conflicts with package versions, or errors or warnings. 2) the code results are compared to the underlying paper results. At this point, the paper also has to be understood regarding the AI, BDA or blockchain use case. Graphics and figures have to be checked and a welcome text has to be created that points to the right file to start and execute the use case.
 - After the use case is checked and finished, we upload the docker container to the platform and link it to the general file structure. We then ask the responsible partners to check their use case on the platform. If positive the new use case can be officially added to the use case portfolio and it can be picked by the workshop organisers.
 - In some cases, we enrich the use case by an interactive dashboard and visualisation as in the case of FRM and CRM.

internal.fintech-ho2020.eu/app/fintech-ho2020_platform

fintech-ho2020.eu platform v1.5

Material for Sessions

Use Cases and Slides

Download

Open Use Case in RStudio

Use cases and slides

- 0 - Intro
- 1 - Use_Cases
 - Use Cases_AI
 - Use Cases_BDA
 - Use Case I
 - Replication_code_BDA_I
 - main_use_case_I.R
 - Metadata bd
 - model_perf.R
 - RPackages.R
 - smaller_dataset.csv
 - Use_case_BDA_I.pdf
 - Use Case II
 - Use Case III
 - Metadata bd
 - Overview_Use_Cases_BDA.pdf
 - 2 - SupTech_Workshops
 - 3 - RegTech_Workshops
 - 4 - Research_Workshops

```
# Clean the environment
graphics.off()
rm(list = ls(all = TRUE))

# set working directory to folder "Tutorial"
setwd("C:/Users/rtutuza/Desktop/Fintech-ho2020/experiments/filenavigation/files/1 - SupTech_material/SUPRETEC
H BDA Use Cases/the Case I/Replication code BDA_I")

# Pre-load the packages and model_perf function

library(c("readr", "e1071", "Metrics", "stringr", "dplyr", "purrr", "stable", "base", "ggplot2", "Dose
Tools", "style", "igraph", "MASS", "ROCR", "rpart", "e1071",
"SMOTEN", "caret", "Metrics", "igraph", "cluster", "randomForest", "NMF", "networkD3",
"mnormtest"))
lapply(library, library, quietly = TRUE, character.only = TRUE)

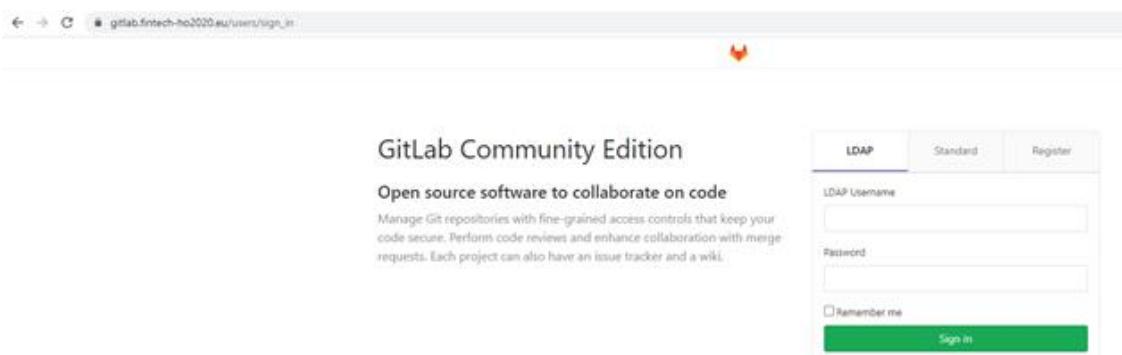
source("model_perf.R")

# GENERATE THE DATASETS
# Import the dataset "final_dataset_semi.csv"
dataset = read.csv("smaller_dataset.csv")
dataset = dataset[,c(1,22)] # keep financial ratios plus the response variable "status" which takes value 0 if
# the company has not defaulted and 1 if it has.
dataset = dataset[complete.cases(dataset),]

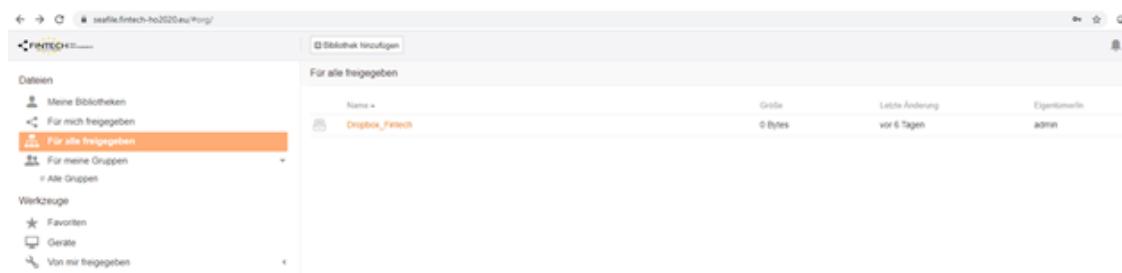
# Define a metric called "dist" that calculates the euclidean distance between
# 2 companies based on the standardized Euclidean distance between each pair (x1,x2).
# of observations per row vectors.
dist = as.matrix(scale(dataset[,c(1:21)]))

# A matrix from which we will calculate the mean and standard deviation for each column
# (variable).
```

Platform landing page with a side menu and file browsing functionality. Most file types can be previewed, and all files can be downloaded. Whenever there is a prepared R use case, another button appears that opens a new tab with IDE and the preloaded use case as in the screenshot below.



This is the git-based coding infrastructure where several developers can collaborate. A code versioning system supports joint development work. It is hosted on the FIN-TECH server.



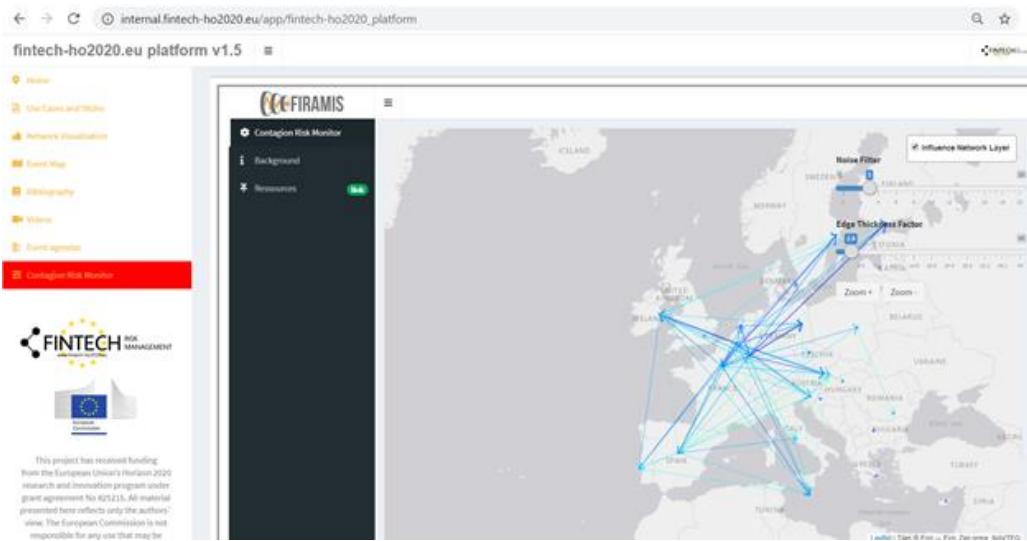
The seafile file exchange system is similar to Dropbox but is hosted on the FIN-TECH servers. For each user it can be defined which files can be seen, changed and shared. It also includes a versioning system.

The screenshot shows a web-based LDAP management interface. The main title is "Modify group cn=partners". Below it, a message says "There are 38 members in group cn=partners:". A dropdown menu titled "Group members" lists many users from the "cn=partners" group. At the bottom of the dropdown, there are buttons for "Add selected", "Add all", and "Save changes".

This LDAP dashboard supports the login management of the platform, the git-structure and the file exchange system. Inside each tool, there can be different groups with different access rights to data, files and applications. External evaluators receive access to the use cases and material of the platform and in return, they deliver the use case evaluations and feedback.

The screenshot shows an email inbox with several messages. One message is highlighted, showing the subject: "Platform access data for the EU Horizon 2020 FIn-TECH project for [Name] ([Surname])". The message body contains a welcome message, a registration confirmation, and a link to log in to the platform. It also includes a section about data protection and GDPR compliance, mentioning Prof. Dr. Guido Spierenburg as the responsible person.

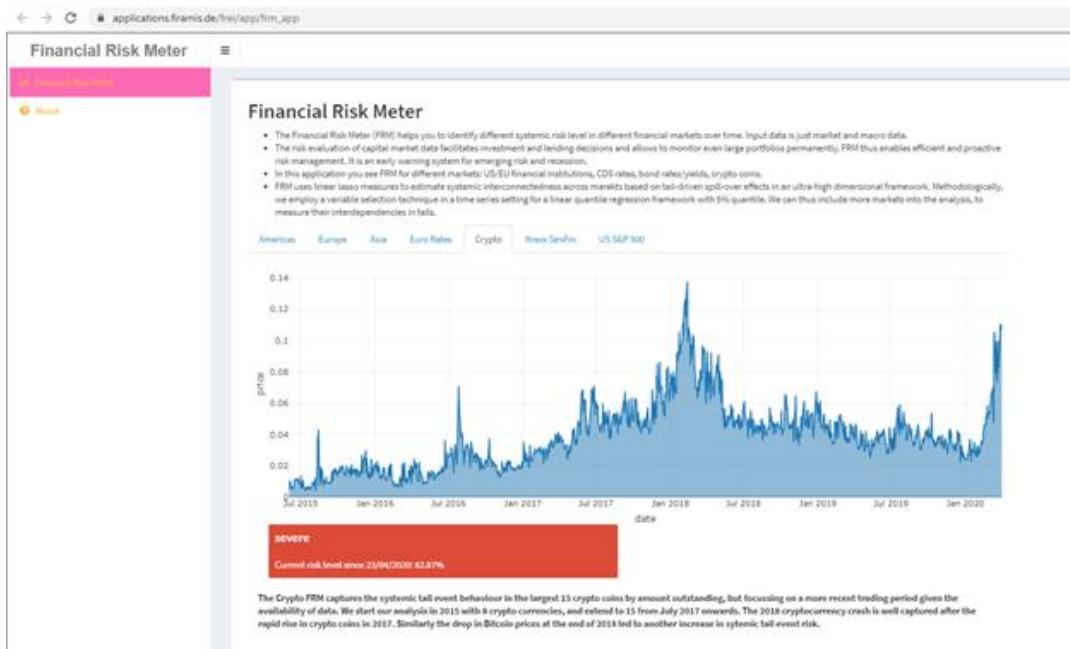
An automatic E-Mailing-System sends information to the platform users.



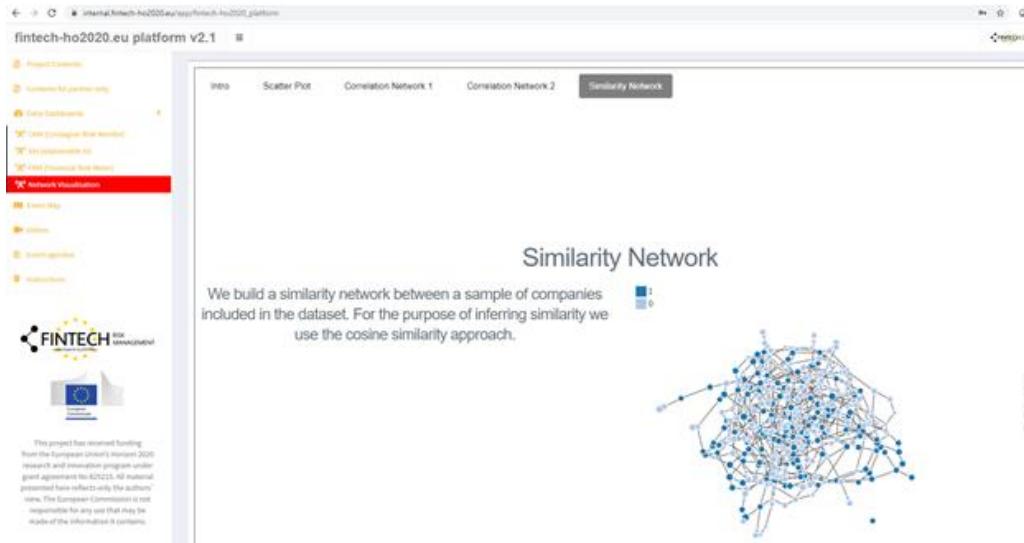
Some of the use cases are supported by interactive visualisations and dashboards produced by Rshiny. This helps to explain the use cases and get intuitive access to the methodology. This example shows the use case related to the Contagion Risk Monitor (CRM) by ZHAW.



These examples some visualisations produced by FIRAMIS so explain their XAI use case. More information can be found on <https://firamis.de/ai-fintech-riskmanagement-regulation>.



These examples show the use case related to the Financial Risk Meter by UBER.



These examples show some network filtering and visualisations produced by ZHAW.

a) RegTech Workshops

1) RegTech workshop I-Big Data Camp; Analytics: Developing algorithms for Fintech risk management, 29/03/2019

Location: Milan-Fintech District, Organizer: Modefinance

During this one-day event in Milano, an exhaustive overview of the most used technologies in credit scoring evaluation has been presented, with a deep comparative analysis with the most modern Artificial Intelligence methods. More than 50 people attended, from financial institutions, fintechs and regulators.

Introduction speakers were prof. Paolo Giudici, coordinator of the FIN-TECH EU project, who introduced the FinTech HO2020 to all the audience; prof. Giorgio Gasparri, from Legal Studies Office CONSOB, Antonio La Mura from Fintech District, Marta Ghiglioni from ItaliaFintech.

After this short introduction, Alessandra Tanda from the University of Pavia briefly presented the Fintech sandbox questionnaire.

The workshop started with a presentation of the objectives and the introduction of modefinance, the first FinTech Rating Agency in Europe, by prof. Valentino Pediroda, co-founder and CEO-who also remarked the workshop core, on risk management-history, common problems, market trends, and innovative solutions.

Then we welcomed Branka Hadji Misheva, from Zhaw Zurich University, with a speech on the FinTech project use case 1: Network Based Credit Scoring Models.

The morning ended with session 1 on Algorithms: Credit Scoring model development, the importance of dataset and dataset analysis, by Andrea Sorrentino, head of FinTech in modefinance.

Session 2, the hands-on coding part, was held by Sabrina Stella, Senior FinTech analyst in modefinance: regression, logistic regression, tree and random forest Credit Scoring models in R language.

Finally, we had a results-and-conclusion phase, closing the first workshop and socially networking.

Participation was open to up to 60 people, free of charge. Together with the FinTech HO2020, we decided not to select participants based on backgrounds, the only criteria was the interest in finance and a base of R coding language. Thanks to the support of ItaliaFintech (the largest Italian association and community of FinTech companies) and Fintech District-which hosted us-engagement and expectations were high: we saw a large interest coming from different private corporates, institutions and universities, with diverse expertise and skills.

The feedback we collected after the event was extremely positive, due to the choice of both introducing the argument, during the morning session, and applying theories in the practical hands-on session in the afternoon.

The workshop has been a very interesting opportunity for everyone to work closely with financial and public institutions, banks, FinTech companies and universities-and it led to several partnership occasions, and different chances for students to be hired in the next few months-resulting from the direct modefinance experience.

2) RegTech Workshop II, BDA, 28th June, Frankfurt.

Location: FinTech Quartier Frankfurt, Organizer: Firamis

Agenda:

- Opening Dr. Jochen Papenbrock-The FIN-TECH project Branka Hadji Misheva, ZHAW Zurich University

- The perspective of a European regulator/supervisor on modern Big Data and AI approaches Gilles Bouvier, ECB
- Credit risk in banking Dr. Jan-Alexander Posth, ZHAW Zurich University
- Coding Session: · Use case II-Clustered scoring models · Use case III-Spatial regression scoring models Branka Hadji Misheva, ZHAW Zurich University Thomas Leach, University of Pavia, Italy
- Network / Clustering models + Explainable AI Dr. Jochen Papenbrock, FIRAMIS Dr. Dimitri Marinelli, FIRAMIS
- Panel Gilles Bouvier, ECB Julian Arevalo, EIOPA Dr. Michael Jünemann, Bird & Bird Carsten Zecher, KPMG Thorsten Seeger, P2P industry expert

- Parties participating, their roles and their responsibilities:

Allianz, Peer-to-Peer Finance Association, Frankfurt Finance Association, ECB, FinTechs, Banking Software companies, Deutsche Bundesbank, KPMG, Deutsche Börse, Mastercard, Landesbank Hessen Thüringen, Deutsche Leasing, partner and local Universities, BaFin, p2p lending platforms, Volksbank Mittelhessen, Deutsche Bank, Quoniam Asset Management, City of Frankfurt, Mastercard Advisors, Microsoft AI Academy Digital@Investment, Department of Banking, Finance, Insurance, AI & Big Data, Data Science, Int. Finance, Fintech Team, Business Development, Insurance Science, Faculty of Business and Management, Supervisory Oversight and NCA Relations, Research and Development, Faculty of Economics and Business, Digital, Statistics and Econometrics, Department of Statistics and Econometrics, Digital Innovation Unit, Computer science, Management, Product and Sales Management, Business Strategy and Development, Credit Risk Management, Equities Research, Market Analysis and Portfolios, Risk, Computer Science, Sales and Product Management, Economics and Regional Development, Risk Advisory, Treasury, Advisory and Lending Platform, Executive Operations, Compliance, Business Consulting, Research Institute for Computational Methods, Hauptman u. Stadtmarketing, School of Engineering, Department of Software Engineering and Artificial Intelligence (ISIA), Computer Science, JGU, Senior Lecturer, Managing Partner, BDD, Director, Data Scientist, Student, Professor Supervisor, Managing partner, Post-doc researcher, Principal Supervisor ,Researcher, Teaching and research assistant, Pre-Sales, Associate Professor, Vice-Dean of BBS, Advisor ,Consulting, Consultant, Head of Capital Markets Academy, CEO, Director, Data Science Student, Developer / Founder, Data Scientist-Schulungen & Innovation Manager, Machine learning intern, Senior Advisor, Data Scientist, Project manager International Development and HR Director, Head Business Analyst, Principal Banker, Associate Partner, Capital Market Analyst / Data Scientist, Baltic Risk Manager, Ph.D. Researcher, Manager for corporate customers, Lecturer ,Junior Staff, Leadership Voyager, Product Manager, Managing Director, Manager, Junior Consultant, Senior Officer, Consultant, Associate Professor of Finance, BDO, Abteilungsleitung Presse, Researcher, PhD Student.

- How will they stay involved?

Since many participants came from the FIRAMIS network and the Techquartier Fintech Hub Ecosystem there is an ongoing dialogue and debate with them, many of the participants we connected on LinkedIn and Twitter to keep them posted, we granted access to the platform, we explained to them the ongoing plan and schedule of FIN-TECH and invited them to participate in future events, we emailed some of them

afterwards to keep them involved and asked for feedback, we connected them to the fintech hub, we visited some of the participants later (ECB, EBA, EIOPA, banks, fintechs)

- What is their feedback on the use cases presented?

Our impression was that the event was a success. We had many participants from a diversified background and good feedback. The discussion was lively. The project and the content were nicely introduced and highlighted by supervisors, practitioners and academics. Overall contents of the workshop were very highly rated. People liked use case I best. The use cases 'explainability, accuracy and utility were above average.

Here are some direct feedback from the participants:

'liked the first ECB presentation and the final discussion panel. '

'Use case II-Clustered scoring models was very interactive with the ability to access the case data online during the presentation. This adds much value.'

'Very pleasant speakers and topics indeed! '

'This workshop was very insightful and gave me the opportunity not just to learn about current issues regarding Credit Risk, FinTech and P2P lending but also to get to know various scholars and practitioners. This is a great platform to gain a lot of valuable insights. I am thankful for having the opportunity to attend.'

'great 73organization '

'ECB FinTech regulation was especially interesting '

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

It seemed so. We received also some feedback on improvement on the use cases regarding more data to increase accuracy:

'In the context of SMEs, qualitative aspects and business cycle are significant for prediction of default. E.g. experience of management, management quality, sector competitiveness, capacity to adapt to disruptions in the sector, dependence on limited number of customers/suppliers, groups of connected borrowers, etc. The database supplied lacks this type of information. The use cases probably would have stronger predictive accuracy with these variables.'

We also received feedback on the eXplainable AI part that was presented from our side for the first time before it later became an AI use case:

'The perceived \black box\ nature of the neural networks methodology also decreases its perceived utility especially when improvements in accuracy are not significant vs more traditional \white boxes\ methodologies. The explainable AI might solve the \black box\ constrain but only if it can be translated into layperson language to explain to front-office, borrowers and non-experts why a certain borrower is considered more or less risky.'

3) RegTech Workshop III, AI in Finance, 4th September 2019, Winterthur.

The third RegTech event was organized by ZHAW in Winterthur. The workshop is a coding session set up to explore the opportunities offered by AI/ML-based solutions applied to finance. Specifically, the coding session demonstrated how to implement open source scripts on: robo-advice, asset allocation, forecasting of market states and systemic risk estimations. The event was attended by 60-70 academic and fintech participants from all over Europe. A total of four use cases from the AI in finance research work package were presented together with the open source scripts. The use cases presented are listed below:

- Use Case I: Market structure discovery with clique forests. Prof. Dr. Tomaso Aste-UCL
- Use Case II: Convergence and Divergence in European Bond Correlations. Prof. Dr. Peter Schwendner, ZHAW School of Management and Law
- Use Case III: Solvency Risk Zones in Europe During and After the Debt Crisis. Dr. Veni Arakelian, Panteion University
- Use Case IV: Network models to improve robot advisory portfolio management. Paolo Pagnottoni, University of Pavia, Italy

Feedback

Location: ZHAW, Winterthur

Topics covered: Artificial Intelligence in Finance-A Journey of some Real Business Applications and why it is beneficiary, On the Effectiveness of Portfolio Composition Techniques to Build Stable and Sound Robo Advisory Portfolios, Phenotypic convergence of cryptocurrencies, Presentation of use cases under the AI research WP

- Participants and their roles:

The event was attended by 60-70 academic and fintech participants from all over Europe. A total of four use cases from the AI in finance research work package were presented together with the open source scripts. How participants remain involved?

ZHAW is in regulator contact with the participants and speakers, sharing updates, new use cases, project materials, etc.

ZHAW has informed and invited participants from the event to all open events organized under the Fintech-ho2020 Network

- What is their feedback on the use cases presented?

Overall, the participants provided positive feedback for the event. They suggested that there was a good mix of high level and technical content concerning the application of AI solutions in finance. Few participants suggested that some of the use cases were too technical.

- Are the selected use cases the ones that meet the expectations and requirements at most?

Four AI use cases were presented during the event and they received positive feedback. Participants suggested that a variety of ML-based approaches can be applied to improve predictions however a key advantage of conventional approaches lies in their simplicity which in turn makes them understandable and easy to explain. In line with this, a main conclusion of the discussion was that future research should

focus on developing interpretable and inclusive ML models that can be deployed with confidence. Few participants also suggested that some of the presented use cases were too technical and lacked an example of a practical application.

4) RegTech Workshop IV, AI in Finance, 26TH February, Vienna. 4th Workshop organized by WUWienna.

A detailed description of this event is a chapter 'RegTech Workshops-WP6' reported by WU Vienna. A day before was the review workshop that Firamis prepared with UNIPV and partners. One of the main tasks was to organize and upload the file structure with all documents and deliverables in the right format. This needed several days of preparation, collection and communication by the team.

5) (Scheduled) RegTech Workshop V, BlockChain in Finance, 23 October 2020, Madrid. 5th Workshop organized by Universidad Complutense de Madrid.

The tentative date for the workshop is October 23rd, the following use-cases will be presented through a hands-on /coding session:

- Use case I: Initial Coin Offerings: risk or opportunity? (Toma A., Cerchiello P. University of Pavia).
- Use Case II: A Statistical Classification of Cryptocurrencies. (Traian D., Wesselhoff N., Härdlec W., Kolossiatis M., Yatracos Y. Bucharest University of Economic Studies, Humboldt University of Berlin, Singapore Management University, Tsinghua University, University of Cyprus).
- Use Case III: Libra or Librae? Basket based stable coins to mitigate foreign exchange volatility spillovers. (Giudici P., Leach T. and Pagntoni P. University of Pavia).
- Hands-on Coding Session & Coding/Data Support
- Management Board meeting with all Consortium partners.

6) (Scheduled) RegTech Workshop VI, BlockChain in Finance, November 2020, Workshop organized by UP1

G. Dissemination-WP7

Objective: Communicate externally the advancement of the project, through dedicated website repositories and social networks activity; publications of papers and participation at conferences in financial technology (particularly to those organised by the European Supervisory Authorities, the European Central Bank and the Financial Stability Board); validation of the developed work with established banks, insurances and investment funds.

1. Firamis-Ase Bucuresti -WP7 leader

This section describes the activities of FIRAMIS as WP7 leader for the M1-M13 and Ase Bucuresti which took the activities as proposed WP7 leader since M16 with the following structure:

- Introduction
- Website, social media and further dissemination
- Feedback generation and evaluation

The section is further developed in the same structure by the representatives of ASE Bucuresti who has become proposed WP7 leader since 1st of April 2020, covering, therefore, activities related to months April-June. The representatives of ASE Bucuresti have spent during this period only 18 hours (+ 8 hours on March) since the official transfer was not implemented during this period and also due to the special national-level conditions. Also, during this period ASE Bucuresti representatives have received the support of the representatives of FIRAMIS for the exploitation of the platform.

Also during this period, the representatives of ASE Bucuresti have started constructing a strategy for increasing the dissemination of the project (external awareness) and also the internal awareness of activities done by each partner (for increasing the propensity of having a transfer of good practices among partners)

The deliverables of this WP can be found in the FIN-TECH platform at side menu ‘Project Contents’-> Folder ‘Deliverables’.

The use cases platform can be found in the FIN-TECH platform at side menu ‘Project Contents’-> Folder ‘Use cases and slides’

Part of the feedback of the use cases can be found in the FIN-TECH platform at side menu ‘Project Contents’-> Folder ‘Feedback’

More information and documentation about the activity in this work package can be found in the deliverables like the intermediate evaluation report as well as its resubmission with more details.

From January to June 2020 Firamis produced the updated intermediate evaluation report (that has already been uploaded officially to the EU servers and that was produced after M15 on about 68 pages). It gives evidence about the work done by Firamis in this period. The report has been written entirely new, now covers a period from M1 - M15 (including the BDA block and part of AI) and replaces the ‘old’ intermediate evaluation report. The new report includes more extensive feedback from several sources. It also includes evaluations and feedback collected in 2019 but also in 2020 (especially that of v29 Legal and exchange with EY and Banque de France). It also includes information about the exploitation activities with the main emphasis in 2020.

Here are further activities in 2020:

- Preparation and execution of workshops and meetings with ECB, EBA, ESMA, Deloitte (discussing XAI and network-analysis-related use cases)
- Setting up a Rshiny dashboard for the FRM potential use case which covers the AI and crypto block
- Further dissemination activities like representing the project and improving the performance and user interface of the platform and coding infrastructure (see also WP6)
- Social media activity (especially searching for discussion threads about (X)AI and Fintech pushing @fintech-ho2020.eu to disseminate the project)

- Invitation of Infitech/GFT and Deutsche Telekom to the London Research workshop (preparing and supporting their presentations)
- Updating all repos and handing over to ASE Bucuresti
- AI Roundtable at FIRM with presenters from BaFin, BCG, Commerzbank, NVIDIA and Firamis (promoting the EU project) treating topics like XAI, AI governance and risk management etc.
- Updates and new material on the blog: <https://firamis.de/ai-fintech-riskmanagement-regulation/>
- Preparation and presentation at the following events: SupTech Denmark AI (2-days),_London AI Research workshop, 2nd Bundesbank workshop and Vienna RegTech (and participation in online presentations)
- A special effort description is added here involving the RegTech coding infrastructure. It was decided that for several RegTech events an infrastructure should be in place allowing to host several dozen people in the same room to follow the coding examples. A swarm server infrastructure was set up and tested and a team was sent to measure the internet connectivity at the event location.
- Also, several measures were taken to increase the usability and UX as well as the speed of the platform. As use cases emerged and changed and as the status of use cases changed, the platform needed to be maintained to reflect these requirements.

Covid-19 related measures

For both WP6 and WP7, we report additional effort due to Covid-19 crisis. It was decided by the consortium to propose an extension of the project on the timeline until M6 2021. As a consequence, there was a shift of responsibilities to other partners that had to be managed and organised, including several technical and administrative activities to realise a smooth transition and platform migration. Here is an excerpt of the proposed activities, that are waiting for the official approval of the amendment:

- ASE Bucuresti took over WP7 so we organised several sessions to teach about the existing infrastructure. We also documented it for them in several reports and transferred large amounts of data and file structures. They also received all passwords and logins. In web conference calls we explained the data and infrastructure and helped them to run the platform and extend it. We also cleaned up programming code and increased the level of documentation. We improved the handling of the programs, apps and applications and introduced several improvements regarding further automation and simplified the platform
- Final workshop: we first tried to manage a postponement for the same reserved location from November 2020 to March 2021. Later it was agreed that we transferred the final workshop to another partner UBER. So, we managed the full cancellation and informed some potential workshop attendees. The new partner decided also to move the location from Frankfurt to Berlin. We handed over the prepared plans and the draft agenda and potential guest lists to the new partner.
- The project prolongation influences the server infrastructure for both WP6 and WP7. We had to re-plan it and look for alternatives. Having found them we had to technically migrate the servers to another host and close down the old infrastructure. All links and file structures had to be set up and the full functionality had to be tested.

- The exploitation activity was more shifted from physical real-world contacts to online and digital. The activity had to be increased as the real-world marketing and sales-like exploitation activities got limited.

a) Introduction

Firamis as WP leader set up a website for the FIN-TECH project, which contains all the content of the project, the names of the partners, the mission and vision of FIN-TECH ([here](#)) Furthermore, there are some image videos and a contact form.

All future and past workshops can be seen in the event map, which we included in the feed of the homepage. In the menu, one can find the links to our social media channels, which we set up for the project and a link to an e-mail-address, created for the FIN-TECH project, which is the same as in the “contact”-icon and form. Also, on the menu, one can find a button, which leads to all the workshop agendas. Every single agenda can be opened, downloaded and printed. There is also a folder, with all the feedback files of the project evaluators. We are not only responsible for making the agendas available on the website, but also for uploading the agendas to the website and keep it up to date, in the correct layout, etc. On the top right side of the menu, one can find a login-icon. This icon leads to the login-side of the FIN-TECH platform.

Firamis created an account for the FIN-TECH project in two social media channels. These two channels are LinkedIn and Twitter. As mentioned before, these channels are connected to the FIN-TECH website via social icons.

Another important part of WP7 was the tracking of the participation of the workshops and the corresponding evaluations. Therefore, Firamis implemented a registration form for all events via R (There are exceptions where an individual registration form had to be developed). These registration forms are basically the same for all the events, but Firamis always has to change the title of the workshop, the venue, the corresponding partner and so we had to create and upload a new registration form for every event and send the corresponding link to the partner so that the partner can send it to the participants of the workshop.

Firamis is also responsible for the evaluations of the workshop and the project. Therefore, Firamis implemented a registration form for all events via R. In principle, there are four different kinds of evaluation forms (as well as for the registration forms, there are exceptions where an individual evaluation form had to be developed). These evaluation forms are basically the same for all the SupTech workshops, but Firamis always has to change the title of the workshop, the venue and the corresponding partner and so we had to create and upload a new evaluation form for every single SupTech workshop and send the corresponding link to the partner, so that the partner can send it to the participants of the workshop. We also had to change the form when we switched from the BDA workshops to the AI workshops, because of the different use cases of the workshops.

The second evaluation form was created for the partners who organised the corresponding SupTech workshop. They should tell us, what the workshop was about, which Regulators/Supervisors participated, the number of participants overall, the main topics, the main results, new insights and main take away of the workshop.

The third evaluation form was created for the Regulators and Supervisors who participated in the workshops. They should tell us about the main topics and their comprehensibility, the main results and their significance for the corresponding institution, as well as new insights and main takeaways.

The fourth and last evaluation form was created for the RegTech workshops. For every workshop, we created individual forms, which included questions concerning the corresponding speakers and covered topics.

In every evaluation form, we gave the possibility to write some further remarks concerning the workshops.

In June, we had to create the first report, which presents all the participants of the workshops and all the workshop evaluations, so that all partners could see if enough participants evaluated their workshop or not.

In December we created the intermediate evaluation report which included the results of all the four different kinds of evaluation forms and the corresponding results. We not only provided the results but also interpreted them and send this information to the PO-Team.

Besides these official tasks, we always answered ad hoc questions of all the partners concerning questions like, how many people registered for the workshop and how many evaluations they have.

As WP7 leader, we also have to organise the final workshop of the project. Therefore, we already booked a hotel in November 2020 and paid a deposit.

UNIPV and FIRAMIS work at different levels for disseminating the objectives and outputs of the project, specifically addressing presentation to academia, to national regulators, to international regulators, supervisors and advisory board. Furthermore, the validation process is on stage and the first validation feedbacks have been received from different banks and the advisory board members. Additionally, on the validation process, UNIPV is setting different contacts and a practical convergence on specific areas with INFINITECH (Grant agreement ID: 856632), a European project composed by global leaders in ICT and finance to lower the barriers for BigData/IoT/AI driven innovation, boosting regulatory compliance and stimulating additional investments.

The representatives of ASE Bucuresti analyzed all existing agendas and feedback activity after taking over WP7 to present the situation to partners and to start addressing the identified issues. The presentation was realised for each partner and all the international events, both RegTech type and Research/SupTech type. For each of, he analysed events partners have received a short report and a proposition to address the issues that were identified so that in the end the entire amount of work realised in the project can be presented. The main presentation was done with the occasion of the management board meeting hosted the day before the virtual Validation Workshop in London (on the 18th of May). Also, in order to support further the organisation of events and obtaining a richer feedback, a methodology was proposed to partners accompanied by the required templates. Also, during this period, the representatives of ASE Bucuresti were working to improve the communication strategy for the project that will rely on the involvement of each partner so that a spider web network of information can be created around the project.

b) Website, social media and further dissemination

The following screenshots represent some of the activity regarding internal and external communication and dissemination. Some of them are deliverables further described in the deliverable reports already submitted. Besides the social media channels of the FIN-TECH project we also used those of FIRAMIS to open the network to the FIN-TECH project:

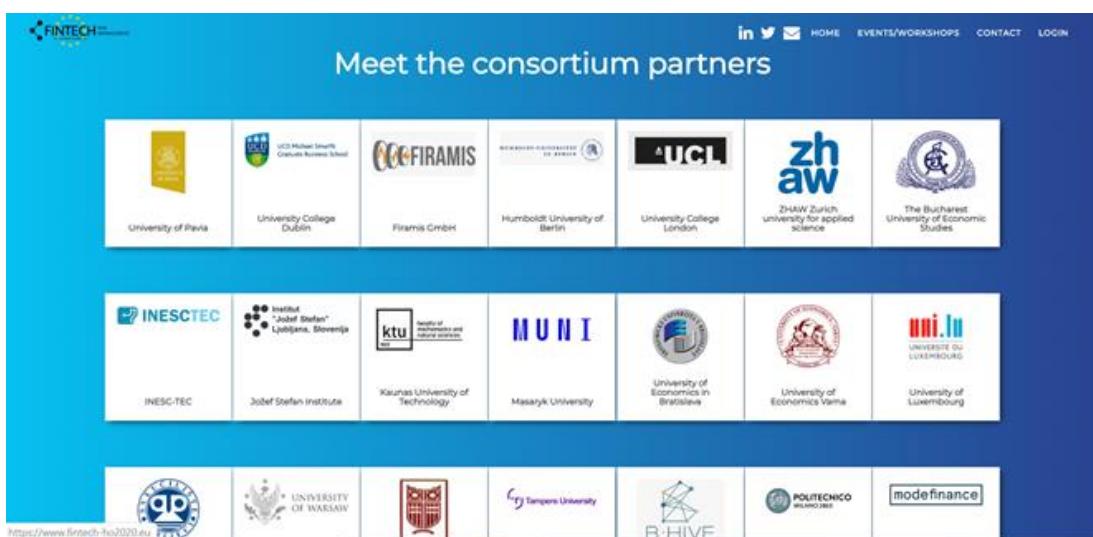
<https://www.linkedin.com/in/jochenpapenbrock/>

<https://twitter.com/firamiscompany?lang=de>

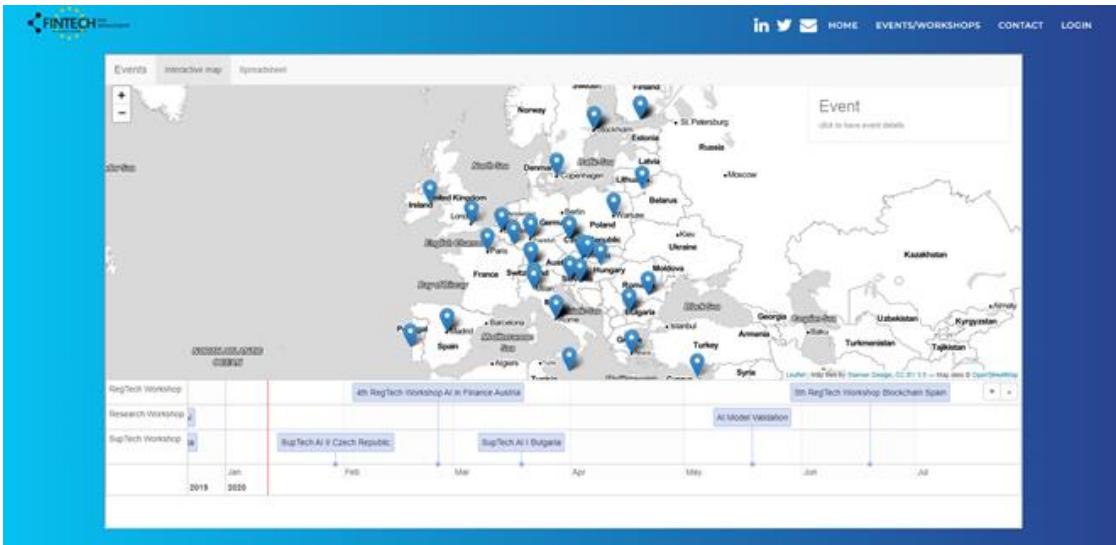
We also built a platform for communication and dissemination. The technology and architecture of that platform are described in detail in the chapter on WP6 in this document.



The main website



A presentation of all partners



The agenda repository

The platform for dissemination and communication. Technology and architecture are described in detail in WP6 chapter.

internal fintech-ho2020.eu/app/fintech-ho2020_platform

fintech-ho2020.eu platform v1.5

[Home](#)

[Use Cases and Slides](#)

[Network visualization](#)

[Event Map](#)

[Bibliography](#)

[Videos](#)

[Event agendas](#)

[Contagion Risk Monitor](#)





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Select field

Select field 2

Load file

Choose type of output

- Most relevant sources
- Word Cloud
- Table

[View output](#)

		DOI	AU	TI	SO	JL	AB
		10.1016/J.JBANKFIN.2003.07.002	MUNK C.;SORENSEN C	OPTIMAL CONSUMPTION AND INVESTMENT STRATEGIES WITH STOCHASTIC INTEREST RATES	JOURNAL OF BANKING AND FINANCE	J. BANK. FINANC.	WE CHARACTERIZE THE SOLUTION TO THE CONSUMPTION AND INVESTMENT PROBLEM OF A POWER UTILITY INVESTOR IN A CONTINUOUS-TIME DYNAMICALLY COMPLETE MARKET WI
		10.1016/J.JBANKFIN.2012.05.003	BELOUSOVA J.;DORFLEITNER G	ON THE DIVERSIFICATION BENEFITS OF COMMODITIES FROM THE PERSPECTIVE OF EURO INVESTORS	JOURNAL OF BANKING AND FINANCE	J. BANK. FINANC.	THIS PAPER INVESTIGATES THE DIVERSIFICATION CONTRIBUTION OF SEVERAL COMMODITIES TO A PORTFOLIO OF TRADITIONAL ASSETS FROM THE PERSPECTIVE OF A EURO IN
		10.1016/J.EJOR.2013.07.024	UTZ S.;WIMMER M.;HIRSCHBERGER M.;STEUER RE	TRI-CRITERION INVERSE PORTFOLIO OPTIMIZATION WITH APPLICATION TO SOCIALLY RESPONSIBLE MUTUAL FUNDS	EUROPEAN JOURNAL OF OPERATIONAL RESEARCH	EUR J. OPER. RES.	WE PRESENT A FRAMEWORK FOR INVERSE OPTIMIZATION IN A MARKOWITZ PORTFOLIO MODEL THAT IS EXTENDED TO INCLUDE A THIRD CRITERION, THE THIRD CRITERION CAUS

A bibliographic tool to browse and analyse the research paper repositories

The beginning

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 825215. All material presented here reflects only the authors' view. The European Commission is not responsible for any that may arise.

A special video server that manages all the videos in the project

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Complete actions to unlock new features along the way. On average, completed pages get 30% more traffic. [Learn more](#)

1 remaining to complete

Location
Let members know where you're based by sharing a location

Add

FINTECH RISK MANAGEMENT
www.fintech-ho2020.eu

A FINancial supervision and TECHnology knowledge exchange platform developing fintech risk management models

+ Follow Visit website

The LinkedIn page

twitter.com/fintech_ho2020

The Twitter page

The Slack Channel

The structure proposed and implemented by FIRAMIS was kept operational and even though the situation required the extension of the project due to the pandemic the activities of the project were not cancelled. The partners were encouraged to organise also virtual events and to further contribute to the dissemination and to increase engagement both with stakeholders inside the project and with stakeholders outside the project.

During the analysis realised after taking over the WP7 ASE Bucuresti representatives have also proposed a methodology for increasing the collaboration inside the project and also the recruitment of external stakeholders that might get acquainted with the project and might become interested in the activities of the project. The objective is to leverage the impressive network the project has created and to contribute to the creation of new links that have the potential to survive the end of the project. Also, in order to increase the collaboration among partners and Supervisors, ASE Bucuresti representatives have proposed leveraging on the expansion of online meetings for organising some regional level Workshops. These will also facilitate the presentation of the project to external stakeholders interested in the project. Also, during this period ASE Bucuresti representatives have worked with some partners that have developed innovative approaches for promoting the project and for increasing engagement and strengthening the network: Zhaw (Switzerland) and UCM (Spain).

In what the communication strategy of the project is regarded, the representatives of ASE Bucuresti are working in developing a framework that will enable the partner to also produce communication/marketing content. However, in the same time, the framework that will be created and the implementation strategy will remain simple and lean so that partners will not find it too burdensome (and therefore the strategy will fail to attain the desired objective). The strategy focuses on increasing the LinkedIn footprint of the project with the support of each partner through their networks. A second layer of the framework includes increasing the external awareness of the project through blog posts which will be presented on projects infrastructure (still under work) and, on external infrastructure (blogs, websites, media platforms) as much as possible.

c) Feedback generation and evaluation

- **Forms engine:**

The forms engine enables a digital process for building repositories (workshop participants and participant feedback), collecting feedback and generating flexible reports for feedbacks and summary statistics.

Based on Rshiny, we can set up new forms in minutes and add them to the automatic reporting. The engines collect feedback from supervisors, banks, fintechs, and other participants.

The forms engine has supported more than 200 forms in dozens of events/workshops (repositories, reports, statistics, documentation) since the beginning of 2019. Here is an overview of the forms generated:



A typical registration form can be seen [here](#).

The screenshot shows a registration form for the SUPTECH WORKSHOP III, which took place on December 10th, 2019, in Stockholm, organized by SWE-FSA. The form is titled 'Registration Form' and includes fields for participant details, affiliation, department, position, role, and contact information. At the bottom, there is a note about data protection and a 'Submit' button.

A FINANCIAL supervision and TECHNOLOGY compliance training programme

SUPTECH WORKSHOP III, AI, Market Risk and financial Robo-Advisory, Stockholm, December 10th 2019, SWE-FSA
Registration Form

Name and Surname of Participant*

Affiliation*

Department*

Position*

Role*

Fintech Consortium Partner

E-mail of Contact Person*

Submit

In order to submit, please fill out at mandatory fields marked as *

Data protection is of a particularly high priority for the management of the Fintech project. All regulations of the GDPR are observed.

A typical SupTech evaluation form can be seen [here](#).

The screenshot shows a web-based evaluation form for a workshop. At the top, it displays the FINTECH logo and the title 'SUPTECH WORKSHOP II AL Market Risk and Financial Robo-Advisory, Stockholm, December 30th 2019, SWE-FSA'. The form consists of several sections with questions and dropdown menus for user responses.

Section 1: Please evaluate the example of the user input you've provided in your own work suggestions for future events.

Section 2: Please evaluate the user input data you've had in these scenarios that had:

- 1. Improved user experience in the application development process
- 2. Improved user experience in the application development process
- 3. Improved user experience in the application development process
- 4. Improved user experience in the application development process
- 5. Improved user experience in the application development process
- 6. Improved user experience in the application development process

Section 3: Please evaluate the user input readability on a scale from 0 to 100%.

Section 4: Please evaluate the user input understandability on a scale from 0 to 100%.

Section 5: Please evaluate the user input relevance on a scale from 0 to 100%.

Section 6: Please evaluate the user input usefulness on a scale from 0 to 100%.

Section 7: Please evaluate the user input originality on a scale from 0 to 100%.

Section 8: Please evaluate the user input creativity on a scale from 0 to 100%.

Besides the usual SupTech and RegTech evaluation and registration forms there are special forms for collecting partner feedback for each event/workshop (more than 80 workshops supported so far):
https://www.fintech-ho2020.eu/free/app/form_summary)

The screenshot shows a web-based form titled 'Event summary and report of partners'. It contains various input fields for summarizing a workshop, including text areas for the title, venue, date, hosting university, speakers, participants, main topics, main results, and insights. There is also a section for further remarks and a 'Submit' button at the bottom.

Event summary and report of partners

Title of the workshop

Venue

Date

Hosting university

Registers/supervises

The speakers

The number of participants

The main topics

The main results

New insights and main take away

Further remarks

Submit

And for collecting feedback from supervisors (the workshop coordinators) (<https://www.fintech-ho2020.eu/free/app/event-summary-supervisors-regulators>)

Event summary and report of supervisors and regulators

Title of the workshop

Regulator/Supervisor

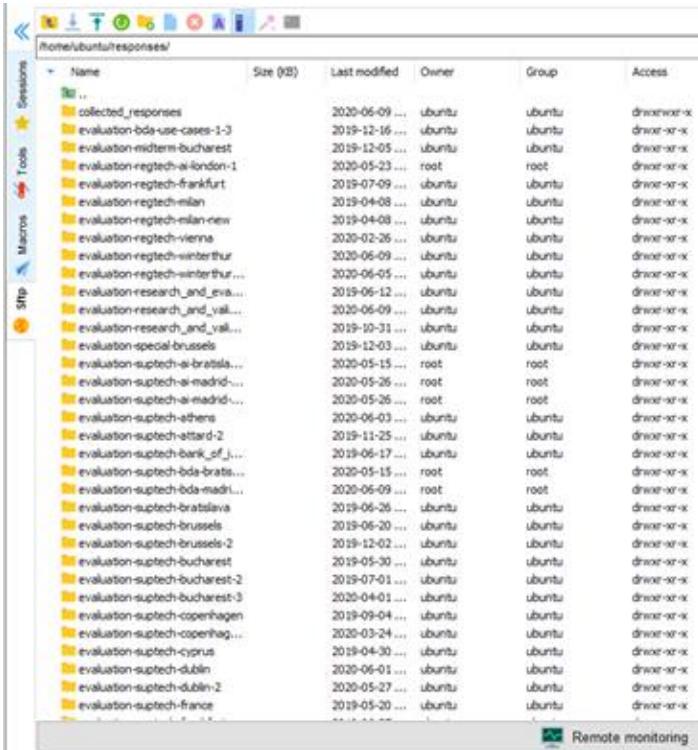
The main topics and their comprehensibility
 1)
 2)
 3)
 4)
 5)

The main results and their significance for your institution
 1)
 2)
 3)
 4)
 5)

New insights and main take aways

Further remarks

The forms are aggregated automatically on the server every minute by a script based on a folder structure of CSV files:



The screenshot shows a file manager window with a sidebar containing icons for Sessions, Tools, Macros, and Site. The main area displays a list of files in the directory 'home/ubuntu/responses/'. The files are listed in chronological order by modification date, all being CSV files (indicated by the .csv extension). The columns in the table are Name, Size (kB), Last modified, Owner, Group, and Access.

Name	Size (kB)	Last modified	Owner	Group	Access
..					
collected_responses		2020-06-09 ...	ubuntu	ubuntu	drwxrwxr-x
evaluation-bda-use-cases-1-3		2019-12-16 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-midterm-bucharest		2019-12-05 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-london-1		2020-05-23 ...	root	root	drwxr-xr-x
evaluation-regtech-frankfurt		2019-07-09 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-milan		2019-04-08 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-milan-new		2019-04-08 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-vienna		2020-02-26 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-winterthur		2020-06-09 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-regtech-winterthur...		2020-06-05 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-research_and_eva...		2019-06-12 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-research_and_vali...		2020-06-09 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-research_and_vali...		2019-10-31 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-special-brussels		2019-12-03 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-el-bratisl...		2020-05-15 ...	root	root	drwxr-xr-x
evaluation-suptech-el-madrid...		2020-05-26 ...	root	root	drwxr-xr-x
evaluation-suptech-ai-madrid...		2020-05-26 ...	root	root	drwxr-xr-x
evaluation-suptech-athens		2020-06-03 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-attard-2		2019-11-25 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-bank_of_...		2019-06-17 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-bda-bratis...		2020-05-15 ...	root	root	drwxr-xr-x
evaluation-suptech-bda-madri...		2020-06-09 ...	root	root	drwxr-xr-x
evaluation-suptech-bratislava		2019-06-26 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-brussels		2019-06-20 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-brussels-2		2019-12-02 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-bucharest		2019-05-30 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-bucharest-2		2019-07-01 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-bucharest-3		2020-04-01 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-copenhagen		2019-09-04 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-copenhagen		2020-03-24 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-cyprus		2019-04-30 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-dublin		2020-06-01 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-dublin-2		2020-05-27 ...	ubuntu	ubuntu	drwxr-xr-x
evaluation-suptech-france		2019-05-20 ...	ubuntu	ubuntu	drwxr-xr-x

Remote monitoring

These raw files are then processed by tools for statistical analysis and interactive HTML reports of arbitrary granularity. The following screenshot shows several reports uploaded to the dissemination platform where they can be viewed and downloaded by specific users. The report shows some basic statistics:

1 Suptech AI II Luxembourg

Role

Role	Count
Consortium partner	3
Virtual bank	2
National supervisor	5

The same report is displayed here in the platform's preview window and in this example, the list of specific feedback entries can be visualized. The partners can view and extract the feedback which was given in their workshops by each workshop participant:

Evaluation Results

Role	evaluate_use_case_explainability	evaluate_use_case_usability
1 National supervisor	4	4
2 National supervisor	5	2
3 Consortium partner	5	4
4 Consortium partner	5	4
5 Consortium partner	5	4
6 National supervisor	4	4
7 National supervisor	2	no use case covered
8 National supervisor	4	4
9 FinTechbank	4	4
10 FinTechbank	5	5

Registrations

affiliation	
1 Banque Centrale du Luxembourg	Human
2 Banque centrale du Luxembourg	internal
3 BCL	Finance
4 D4	Economy
5 D4	Finance
6 Banque centrale du Luxembourg (BCL, Central Bank of Luxembourg)	internal
7 Banque Centrale Luxembourg	Finance
8 Banque centrale du Luxembourg	Market
9 Banque Centrale du Luxembourg	internal

SPECIAL WORKSHOP FOR BANKERS & INSURERS on BDA AND AI

November 26th, 2019. With the friendly support of the Representation of the State of Hessen to the EU.
In collaboration with EBF



Agenda:

Opening

- Jochen Papenbrock & Prof. Paolo Giudici-The FINTECH project
- Felix Holefleisch, Head of Unit-Hessian Ministry of Economics, Energy, Transport and Housing, Representation of the State of Hessen to the EU
- The perspective of a European regulator/supervisor on modern Big Data and AI approaches| Gilles Bouvier, ECB
- EBA's report on Big Data and Advanced Analytics| Andreas Papaetis, EBA
- Big Data Analytics and Artificial Intelligence-risks and opportunities| Sébastien de Brouwer, EBF

The concept of Explainable AI

- Jochen Papenbrock, FIRAMIS
- Dimitri Marinelli, FIRAMIS

Panel Moderator:

- Sebastian Fritz-Morgenthal, Bain & Company
- Gilles Bouvier, ECB
- Andreas Papaetis, EBA
- Barak Chizi, KBC
- Davide Corda, Intesa Sanpaolo
- Peter Neu, DZ Bank

- **Parties participating, their roles and their responsibilities:**

European Central Bank	NVIDIA GmbH Germany	European Association of Co-operative Banks
AREA42-Credendo	European Commission	ICLA In-house Competition Lawyers' Association
CredaRate Solutions GmbH	European Banking Federation	AML
ESBG	Deutsche Börse AG	BBVA
Professional Risk Managers International Association / FIS GLOBAL	Deutsche Bank AG Landesbank Hessen-Thüringen	European Banking Authority
European Central Bank	DZ BANK Allianz SE	Intesa Sanpaolo
Austrian Savings Banks Association	ESBG NORD/LB	Tetralog systems AG
European Banking Federation	Oliver Wyman GmbH	Banca MPS
National Bank of Belgium	Austrian Savings Banks Association	Bain & Company
	Cicero Group	Ernst & Young GmbH
		ESBG-WSBI
		Intesa Sanpaolo
		KBC

- **Departments:**

Banking Supervision	Policy	Capital Markets Academy
Innovation	Banking supervision	Regulatory Affairs
Internal Rating Models	Sales	Risk controlling
Digital, Retail and Markets Regulation	WWFO	Strategy & Corporate Development
Risk Management	DG Connect	Group Regulatory and Public Affairs
DG-MSIII	Policy	Regulatory Affairs
European Affairs	Department of Economics and Management	Department

Risk Control	CEO Office	Intys FSA
Commission	Banking Markets, Innovation and Products Unit	FSO Advisory- Quantitative and Analytics Services
Financial Services		
Brussels Office	Group Data Office	Regulatory Affairs
EU Public Affairs	Partner	European Regulatory and Public Affairs
Retail Banking, Payments and Financial Markets	Organization Area	BDA and AI
Competition	Economics	fintech partnerships
Risk and compliance	Global Risk	KBC
European Public Affairs	Machine Learning	Bacon
	Management	Algo Trading

o **Positions:**

Analyst	Regulatory Policy & Advocacy-Digital	Senior Advisor, Retail Banking and Consumer Policy
Manager	Head of portfolio methods	ICLA Italia Chairman
CEO	Division Head, Managing Director	Software architect
Digital & Retail policy adviser	Head of European Affairs Office	Head of EU Digital Public Affairs
Managing Director	Legal Advisor	CEO
Supervisor	Senior Financial Services	Policy expert
Head	Correspondent	Head of Data Transformation
Chief Policy Officer	Head of RiskLab	Research Consultant
Financial & Risk Analyst	Policy officer	Head of Process Innovation
Account Manager	Partner	Professor
Sr. Solution Architect FSI-EMEA	EU Adviser	Head of Global Risk
Policy Officer	Associate (focused on Fintech)	Data scientist and quantitative analyst
Policy Adviser		
Assistant Professor		
Team Head		CLO

Manager	General manager big data, data analytics and AI	Producer
Partner	partner	Asst Vice President
Adviser		
Policy Adviser	GM AI and Big Data	

- How will they stay involved?

The event was intended, among other reasons, to connect each other and to strengthen the project network and ecosystem Workshop participants had the opportunity to connect in interactive sessions like the panel discussion.

Also, we invited people to follow the project in the future and to acquire them as evaluators of the project use cases, granting access to the platform.

Back in Frankfurt, we connected several of the participants by local physical meetings or by email/phone. They receive updates regarding the future activities of the project and how to engage.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

The event was a success. Many participants from a very heterogeneous background were involved. Several banks could be acquired to deliver feedback on the XAI use case and the network analysis use cases. Some banks invited us to deliver follow-up presentations on these topics. To some of them, it was to learn about the potential to open black box models and to explain them.

The event preparation had begun several months before the event and was directed to activate a large group of relevant people to follow the activity. We could not only reach banks and fintech but also groups representing the financial service industry on the European level. We use the FIRAMIS and UNIPV network as well as social media like LinkedIn as well as our meetings with ECB, EBA, EIOPA and other authorities

Here some direct feedback by the participants:

‘great event’

‘Excellent workshop-very insightful even for a non-technical person. Found extremely interesting the part presented by FIRAMIS on how to overcome the trade-off between accuracy and description in models.’

‘Discussions were very good, mix between Roles was good.’

‘Good overview of current project status and activities for new (fintech)participants’

Further dissemination activities

A large number of channels, multiplicators and events was used to inform the public and the consortium partners about the project activities and related developments. It was used to spread the objective of the project, to create a network and ecosystem around it, to acquire new supporters and experts giving feedback, and find further partners e.g. for the exploitation phase. The following shows a list of activities (excerpt):

- Journal

Another dissemination channel is the Section Frontiers Journal on AI in Financial Services. It is an open-access journal where Professor Giudici and Dr. Jochen Papenbrock are co-editors. A larger number of papers from this project have been published here: <https://www.frontiersin.org/journals/artificial-intelligence/sections/artificial-intelligence-in-finance>

The BDA network-based use cases re in this journal as well as the XAI use case and this editorial:

R. Hochreiter, P. Giudici, J. Osterrieder, J. Papenbrock, P Schwendner. Editorial: AI and Financial Technology. *Frontiers in Artificial Intelligence* 2, 25. 2019.

(<https://www.frontiersin.org/articles/10.3389/frai.2019.00025/full>)

- **Events, external workshops, conferences, seminars etc.**

6th of December 2019, XAI-presentation at EIOPA Insurtech task force in Frankfurt (XAI and FIN-TECH presentation)

11th of December 2019, representing fin-tech and XAI project at EU fintech lab in Brussels (most other fintech start-ups had XAI on the agenda as well)

ESMA morning 3rd Feb (presentation of use cases)

EBA afternoon 3rd Feb (presentation of use cases)

Banque de France (Autorité de contrôle prudentiel et de resolution) discussion on XAI

ECB January 30th (presentation of use cases)

EBC Fintech Dialogue (2 days)

Two trips to Brussels meeting the EC

Acquisition of Evaluators (Banks, Fintechs, Associations, Fintech Hubs, etc.): by email, phone, by personal visit and by extra events like the one in Brussels

Dashboard visualisations for the form (prof. Härdle from uber) and CRM (prof. Schwendner from Zhaw). Below the links:

Press release: <https://www.openaccessgovernment.org/artificial-intelligence-apps/72323/>

Blog: <https://firamis.de/ai-fintech-riskmanagement-regulation/> (see attachments on the blog in intermediate evaluation report)

- Partnering/Exploitation discussion by FIRAMIS
 - Deutsche Telekom (Cloud): <https://open-telekom-cloud.com/de>) <https://techquartier.com/>
 - Microsoft (Cloud/ML, XAI) <https://www.frankfurt-school.de/home/research/centres/blockchain>
 - EBF <https://appliedai.de/>
 - INFINITECH <https://www.infinitech-h2020.eu/>
 - BIG DATA STACK <https://bigdatastack.eu/>
 - BIG DATA VALUE <https://www.big-data-value.eu/>
 - Dell
 - Fujitsu
 - Tagetik
 - FIRM: <https://www.firm.fm/en.html> (presenting the project at 2 AI Roundtables in front of risk management executives in the financial services industry)
 - AlinFS (<https://www.aiinfs.com/>) Meetup activity
 - BDC and State of Hessen Ministry of Economics
 - Blockchain Sandner and EU Observatory
 - AI4EU
 - www.v29.tech
 - <https://frankfurt-digital-finance.de/>

- Promoting the project through FIRAMIS social media channels (some of them > 10.000 views):

https://www.linkedin.com/posts/jochenpapenbrock_horizon2020-p2plending-crowdfunding-activity-6663010417968717824-tkck

https://www.linkedin.com/posts/jochenpapenbrock_three-quant-lessons-from-covid-19-activity-6649223042629152768-ivNu/

mentioning @fintech-ho2020.eu; #xai

- FRANKFURT DIGITAL FINANCE

<https://frankfurt-digital-finance.de/speakers/jochen-papenbrock/>



Euro Finance Week: <https://www.dfv-eurofinance.com/archiv/22-euro-finance-week-2019/die-euro-finance-week-im-uberblick/mittwoch-20-november-2019-innovation/industry-4-0-meets-finance/sprecher/dr-jochen-papenbrock>



In what the feedback is regarded, the structure and instruments proposed by FIRAMIS were further used by the representatives of ASE Bucuresti. With the support of FIRAMIS ASE Bucuresti representatives have provided support to all events that have been scheduled during this period, April-June 2020 and also to those scheduled for September 2020. Thus, the engine forms for registration and obtaining feedback were used for the events organised by the following partners localised in the following project member states Slovakia (2 events), Spain (3 events), United Kingdom (1 event), Greece (1 event), Bulgaria (1 event – scheduled for September).

Also, during this period, starting from the general analysis made after the transfer of WP7, ASE BUCURESTI representatives together with FIRAMIS representatives have supported all willing partners (where issues were identified) to correct and further develop the feedback they have obtained.

To increase the richness of the feedback obtained by partners ASE Bucuresti representatives have proposed, based on the conducted analysis, a methodology for obtaining qualitative unstructured feedback. The disadvantage is that it is going to be much more difficult to collect and analyse but at the same time the advantage of identifying common ground and creating a narrative is supporting this approach. ASE BUCURESTI representatives have created some qualitative feedback templates that will be further shared and personalised with the partners so that they can maintain a certain unity but also satisfy in the same time the particularities of each partner and supervisor, encouraging in this way the diversity as a source of innovation.

III. Partners activities M1-M18

For the following partners, the activities have been described in the first section as they hold the role of Work-package leaders: Humboldt University, University of Pavia, ZHAW University, University College London, Firamis.

It follows the description of work for the remaining Consortium partners with the role of beneficiary but not WP leaders.

A. Bucharest University of Economic Studies

1. Management-WP1

During the first year of the project, the representatives of ASE BUCURESTI spent 20 hours for WP1. The number of hours was achieved by attending all management meetings (Pavia, Zurich, Bucharest) and being constantly in contact with the Consortium management representatives (Pavia). We also organised and managed the Mid-Term Workshop, which was held on the 15th of November in Bucharest. The representatives of ASE Bucuresti managed to create a link between representatives of the two financial supervisors in Romania (ASF-in the project and BNR-not part of the project). Probably during the second SupTech , dedicated to AI, representatives of both supervisors will attend.

During the first six months of the second year, 8 more hours were spent by representatives of ASE Bucuresti for WP1. As mentioned before, the representatives of the second supervisor (BNR) have also attended the second SupTech on AI. ASE Bucuresti representatives have also attended the Vienna event (February) and have also attended the virtual London event.

2. Big Data Analytics Research-WP2

During the first year of the project, the representatives of ASE BUCURESTI have spent 77 hours on WP2 attending (at least one representative) all European level activities related to the BDA pillar of the project (Pavia, Milano, Frankfurt, Zurich, Bucharest). One representative of ASE BUCURESTI has also attended the Regional Workshop organised by the colleagues from Varna University in October 2019. Furthermore, the research team of ASE Bucuresti has started working on a research paper (draft title) entitled “Comparison of classification methods for online platforms of P2P lending. A scenario based-approach” (a first draft of the work was presented during the Data Science International Summer School held during August 2019). A first presentation of the material (for the partners of the project) was done during the Zurich Workshop. The work on the paper also continues during the second year of the project (there are not many hours that can be allocated) and during this year the paper will be submitted to a peer-review journal for evaluation. Focusing on developing the local relationship with the financial supervisor, an NDA was signed between the university and the supervisor and data were provided to the research team of the university to evaluate the applicability of the models and instruments discussed during our meetings and in the use cases for the respective data.

No supplementary hours were consumed for this WP since the focus was shifted to the next WP. However, the work on the started research paper continues and will probably be finalised during the remaining period.

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- December 2017-Presentation of the Draft Fintech Project to the Romanian Financial Supervision Authority
- 31st of January 2018-Obtaining the Support Letter from the Romanian Financial Supervision Authority
- 19th of February 2019-Presentation of the Fintech H2020 Project to the Romanian Financial Supervision Authority (planned activities after the KOM)
- 01 of July 2019-Presentation of the Fintech H2020 Project to Instant Factoring-one of the most active Romanian Fintechs
- 26th of August 2019-Default classification in P2P Lending Platforms-Raluca Caplescu, 2nd Data Science Summer School, Predeal Romania organised by the Bucharest University of Economic Studies.
- 5th-6th September 2019-Phenotypic convergence of cryptocurrencies-Daniel Traian Pele, 4th European Conference in AI in Finance and Industry
- 5th-6th September 2019-Comparison of classification methods for online platforms of P2P lending. A scenario based-approach-Raluca Caplescu, Daniel Traian Pele, Vasile Alecsandru Strat, 4th European Conference in AI in Finance and Industry
- 20th of November 2019-The impact of the Blockchain Technologies on the Economy-Fintech H2020 Project-The National Forum of the Romanian Economists organised by the Association of Economics Faculties in Romanian, by the Romanian Statistical Society and by the Bucharest University of Economic Studies.

- 20th of November 2019-Brief Presentation of the Fintech H2020 Project-Excellency Gala of the Bucharest University of Economic Studies.
- 10th of December 2019-Presentation of the Fintech H2020 Project to the Romanian National Bank

3. Artificial Intelligence Research-WP3

During the first year of the project, the representatives of ASE Bucuresti have spent 35 hours on WP3. The time was divided between attending (at least one representative) all European level activities related to the AI pillar of the project (Pavia, Zurich, Bucharest), research, networking and activities with our SupTech partners. The research paper entitled “Probability of Default Estimation using Machine Learning Algorithms” also continues during the second year of the project and this year it will be submitted to a peer-review journal for evaluation. Moreover, focusing on developing the local relationship with the supervisor and based on the feedback obtained for the BDA SupTech , the representatives of ASE BUCURESTI have started to develop a material tailored to the supervisor’s needs and technical level to explain the main concepts of Artificial Intelligence and machine learning. The material will be used to support the presentation of use cases since the knowledge of the participants is not so strong in what the algorithms and instruments used in AI and machine learning are regarded.

During the first six months of the second year of the project, the representatives of ASE Bucuresti have spent 22 more hours on WP3. The work has continued on previously mentioned paper and the paper was finalised and will be submitted under a new title to a peer-review open access journal. The papers will also be uploaded on SSRN papers under the same title “Will they repay their debt? Identification of borrowers likely to be charged off”.

The representatives of ASE Bucuresti have also continued to work on the material that will be used for the SupTech on AI. The representatives of ASE Bucuresti have also attended the London Research AI Workshop: Caplescu, Raluca and Panaite, Ana-Maria and Pele, Daniel Traian and Strat, Vasile Alecsandru, *Will they repay their debt? Identification of borrowers likely to be charged off* (July 22, 2020). Available at SSRN: <https://ssrn.com/abstract=>

4. Blockchain Research-WP4

During the first year of the project, the representatives of ASE Bucuresti have spent 20 hours on WP4. Members of the research team in Bucharest have worked during this period on the paper “A Statistical Classification of Cryptocurrencies”, which will be submitted for evaluation to an open-access peer-review journal. Based on the paper, the representatives of ASE Bucuresti have also started working on one use case for the Blockchain research platform. Next year, the representatives of ASE BUCURESTI will continue the research in this WP and will also create a similar material as the one started for AI, to support the understanding of the Blockchain related concepts by the participants of the SupTech activities.

During the first six months of the second year of the project, the representatives of ASE Bucuresti have spent 14 more hours. The work on the research paper mentioned above was finalised and the paper was submitted to the peer-review (open access) Journal of Empirical Finance. In the same time, the use case was finalised and sent to the WP leader (ZHAW) for approval and technical implementation into the knowledge exchange platform of the project. The research for creating a material for the SupTech on

Blockchain has also continued and different aspects were discussed with the representatives of the supervisors concerning this topic.

Publications

- Pele, Daniel Traian and Wesselhofft, Niels and Härdle, Wolfgang K. and Kolossiatis, Michalis and Yatracos, Yannis G., A Statistical Classification of Cryptocurrencies (March 4, 2020). Available at SSRN: <https://ssrn.com/abstract=3548462> or <http://dx.doi.org/10.2139/ssrn.3548462>(open access)

5. SupTech Workshops-WP5

During the first year of the project, the representatives of ASE Bucuresti have spent 81 hours on WP5, organising the SupTech on BDA and starting the preparations for the SupTech on AI. The SupTech on BDA was organised for 3 days and was hosted by the university so that the participants could have access to the IT infrastructure necessary for using the platform for the 3 use cases. For the BDA SupTech a material for introduction to R and the main statistical instruments was created, to facilitate the understanding of the use cases.

The SupTech I was attended by 18 participants and 7 individual feedbacks were obtained. The supervisor has also provided overall feedback regarding the SupTech proposing some future development directions. To summarize the activity, the partner (us) has also provided overall feedback for the SupTech identifying future directions for the coming SupTech .

During the first six months of the second year of the project, the representatives of ASE BUCURESTI have spent 58 more hours on this WP. The second SupTech was organised and representatives of both supervisors have attended. The event was also organised on the premises of the university so that the required infrastructure was available. The event was attended by 16 persons and 6 individual feedbacks were obtained. Also, the representatives of ASF have completed the feedback from the Supervisor.

The general overview of the events is presented in the program and feedback bellow.

1) SupTech I Big Data Analytics

- a) Use case I-Network based scoring models
- b) Use case II-Clustered scoring models
- c) Use case III-Spatial regression scoring models

Feedback

The workshops dedicated to Big Data Analytics SupTech included the following important milestones: a brief history of Data Science, concepts related to P2P lending, introduction to R (a special material and practical applications were created for the participants) and the 3 use cases (mentioned above). The workshops were a mix between presentations, practical examples and debates. Brainstorming was also

an important part of the workshops since linking the concepts and the use cases to the day to day activity of the participants was a very important aspect for all participants.

The concepts related to network models and contagion models were considered very important by most participants. However, the limitation in what the link with their day to day activity that was identified was the fact that in Romania, the supervisor works with an environment where only a few tens of companies are active. Also sourcing from this issue, the participants mentioned that working with Big Data is mostly not the case since they have a very low number of units (active companies) in the supervised environment.

The practical activity based on running the code proved to be challenging since not many of the participants are familiar with programming languages and statistics. However, the participants considered the introduction in R very useful since acquiring quantitative skills and introducing some data analysis software is of interest for the supervisor. The uses cases proved to be very useful for the participants as tools for making them understand some of the research directions and they were excellent starts for brainstorming regarding their impact in practice and the impact they would have in the activity of the supervisor.

Engaging with the representatives of the other supervisor in Romania, the National Bank of Romania was considered by the participants as an interesting development direction for the future. Also, developing the communication with the fintech environment in Romania and using the project as a channel was another mentioned idea, during the brainstorming sessions.

- 2) SupTech II Artificial Intelligence-ASE BUCURESTI ASF (to be done in February 2020)
 - a) Use case I-Convergence and Divergence in European Bond Correlations
 - b) Use case II-Sovereign risk zones in Europe during and after the debt crisis
 - c) Use case III-Network models to improve robot advisory portfolio management

During the first six months of the second year of the project, the representatives of Ase Bucuresti have spent 58 more hours on this WP. The second SupTech was organised and representatives of both supervisors have attended. The event was also organised on the premises of the university so that the required infrastructure was available. The event was attended by 16 persons and 6 individual feedbacks were obtained. Also, the representatives of ASF have completed the feedback from the Supervisor. The general overview of the event is presented in the feedback below.

Feedback

The workshops dedicated to Artificial Intelligence included the following important milestones: a brief history and concepts related to machine learning and Artificial Intelligence, main algorithms used in artificial intelligence (a special material and practical applications were created for the participants) and the 3 selected use cases.

Starting from one of the ideas appeared during the BDA Workshops, during this workshop we also had participants from the second supervisor, namely the National Bank of Romania. The representatives of

the National Bank of Romania attended the Workshop and also expressed their interest in attending the Blockchain events.

Another aspect that emerged is that more international mix in the events would be of interest. Since the participants are not top management of their entities the project might be an important opportunity for bringing professionals from supervision authorities and academia across Europe together.

The extensive presentation created for the artificial intelligence concepts and main algorithms was very appreciated and was given to all participants to be shared with their colleagues in the institution.

The uses cases were again a very good starter for debates and brainstorming regarding developments in the field of artificial intelligence. The uses case based on network models using centrality measures was appreciated. Another topic that was considered of increased importance and used a good brainstorming starting point was the explainable AI.

During this time the presentations were a little bit adapted and the participants preferred not to run the code but just to discuss it and focus on the results and their practical implications.

ASE Bucuresti organized the Midterm research workshop on 15th November, where all partners participated and special speakers took the stage.

Agenda:

- a) Panel session 1-Credit and market risk in peer to peer lending
 - i) BDA use cases, Branka Hadji-Misheva and Rui Ren
 - ii) Macroeconomic news and risk in online lending, Xin Zhang, Riksbank
 - iii) P2P Loan acceptance and default prediction with Artificial Intelligence, Jeremy Turiel, UC London
 - iv) Prediction of success in early-stage start-ups using machine learning, Javier Arroyo Gallardo, Universidad Complutense Madrid
 - v) eXplainable AI (XAI) in regulated financial services, Jochen Papenbrock, Firamis
- b) Panel session 2-Market risk in financial robot advisory
 - i) AI use cases, Tomaso Aste and Veni Arakelian
 - ii) FRM Financial Risk Meter, Wolfgang Karl Härdle, Humboldt-Universität zu Berlin
 - iii) Robo-advice from insurance perspective, Andres Lehtmets, European Insurance and Occupational Pensions Authority
 - iv) Supervisory perspective on risks related to banks providing Robo-advisory services, Thomas Barkias, European Central Bank
 - v) Central Bank Digital Currencies associated risks, John Kiff, International Monetary Fund

- c) Panel session 3-Operational risk in blockchain and innovative payments; selected topics on market risk
 - i) Blockchain use cases, Peter Schwendner and Daniel Traian Pele
 - ii) The economic drivers of cyber risk, Paolo Giudici, University of Pavia
 - iii) Inter-Country Spillovers, Measurement with Hybrid Networks-Shatha Qamhieh Hashem, Faculty of Economics and Social Sciences, An-Najah National University, Palestine
 - iv) Word Embeddings in Finance Sector, Francis Liu, Humboldt-Universität zu Berlin
 - v) Forecasting high-frequency stock market returns using embedded limit order book data, Niels Wesselhöft, Humboldt-Universität Zu Berlin

The event was attended by over 65 participants and 58 among them registered online using the provided form and after the event 43 participants provided feedback. The quality of the talks, the structure of the event and the organization were among the most appreciated aspects.

6. Dissemination-WP7

During the first six months of the second year of the project, 26 hours were spent by the representatives of ASE Bucuresti of the WP7. Starting from the beginning of the fourth month of the second year ASE Bucuresti has become the WP leader even though the official approval was not obtained yet.

We have analyzed the dissemination and feedback activities of each partner and have presented a situation to all partners. Afterwards, we have started to work with partners for improving reporting where it was possible. We have also proposed some solutions for obtaining richer feedback and for creating more engagement in the network and around the project. We have also supported all partners that have organised events during this period.

B. Modefinance

Modefinance collaborates with UNIPV for the Uses Case mainly in Credit Scoring Evaluation. The aim is to introduce new methodologies developed by UNIPV using the financial data owned by modefinance.

Two different sets of data have been used, one of the active corporates (Italy based) and one for the defaulted companies. In both sets, an exhaustive set of financial information has been added (starting from industries, arriving at financial ratios) to perform Artificial Intelligence methods for credit scoring.

1. Management-WP1

Modefinance is involved in the Project Organization mainly with the relation with the University of Pavia. We have a weekly discussion with the University of Pavia manager to keep a sound organization of the project, mainly regarding the relation with corporates involved in Artificial Intelligence and Big data for Credit Risk Evaluation and management.

2. Big Data Analytics Research-WP2

Modefinance is specialized in Credit Rating Evaluation and today is the only official Credit Rating Agency registered by ESMA to provide more than 300 million of ratings worldwide. Thanks to the extensive database, the data (financials/ratings) have been used in many different research activities of the projects, to develop new methods and compare them with the results available in the literature.

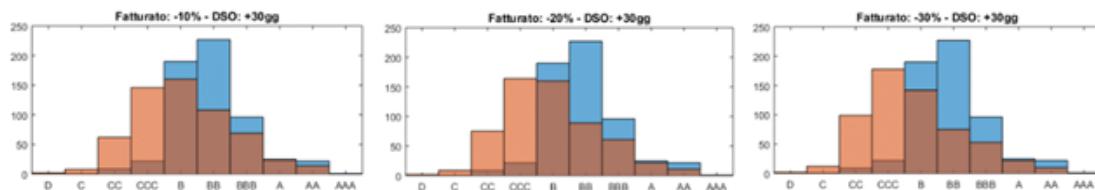
3. Artificial Intelligence Research-WP3

Modefinance uses Artificial Intelligence models to develop Credit Risk Evaluation methods. During the project Modefinance intensively worked on the new method base on the integration between Artificial Intelligence and Big Data method for the financial shock evaluation. This method keeps a lot of interest during the COVID crisis because has been intensively used for understating the impact of the COVID on the risk assessment of portfolios in different fields: corporates banks loans, asset management investment and corporates credits.

One example follows:

It is possible to simulate the impact of COVID on the entire portfolio performing different scenarios (blue - original, red - simulation)

1. Turnover - 10% e DSO + 30 days;
2. Turnover - 20% e DSO + 30 days;
3. Turnover - 30% e DSO + 30 days.



4. Blockchain Research-WP4

Modefinance is not specialist in blockchain technologies and its role in the project is limited, but modefinance collaborated in the project with ad hoc financial data exports of its own database for helping the blockchain specialists in their researches.

5. RegTech Workshops-WP6

Modefinance actively collaborated and developed coding for credit risk analysis. Together with the University of Pavia many different scoring methods has been implemented starting from simple and historical one (for example Z-Score) arriving at most complex based on Artificial Intelligence as Random Forest and MORE, the method used by Modefinance as Credit Rating Agency. All model has been implemented in the project platform and explained to the different meeting participant, to close the gap between developers and regulator, allowing using the new and most advanced technologies in real cases.

6. Dissemination-WP7

WP7: Modefinance was in charge of organizing the 1st RegTech session in Milan, Italy. For full details refer to section 7)a).

During this one-day event in Milano, an exhaustive overview of the most used technologies in credit scoring evaluation has been presented, with a deep comparative analysis with the most modern Artificial Intelligence methods. More than 50 people were attended, from financial institutions, fintechs and regulators.

Agenda

- Introduction: Risk evaluation: common problems, history, scope, market trends, innovative solutions, Valentino Pediroda, modefinance co-founder.
- Fin-Tech project use case I: network-based Credit Scoring models, Branka Hadji Misheva, Zhaw
- Session 2 – Coding Hands-on: coding the algorithms in R language
- Results and conclusion: FIN-TECH closing & networking

C. Panteion University

1. Management-WP1

Over the last year, the overarching goal has been to disseminate the project and everything we do for it, both domestically and internationally. Thus, a series of individual meetings were organized whereas many telephone conversations preceded. Specifically, there was constant communication with the Hellenic Capital Market Commission and Cyprus, both to organize the seminars and to explain any questions that arose during the course. A meeting was also held with the new head of the Hellenic Securities and Exchange Commission, Dr. Vassiliki Lazarakou, as her predecessor was replaced after the national elections. Besides, special emphasis was given on spreading what we do to private banks, universities and start-ups. Meetings with the Eurobank, Piraeus Bank, and National Bank of Greece were systematically

launched to discuss the strategic planning they follow on the FinTech track and the difficulties they face. At the same time, there were meetings with the Bank of Greece Governor, Mr. Yiannis Stournaras and the bank's Head of FinTech Ms. Stavroula Kambouridou, to discuss issues such as the bank's supervision, potential risks and licensing issues to start-ups that offer financial services similar to those of banks.

Extensive discussion about the FinTech developments was made with companies like deVere Group (financial), Nayms (Insurance), and Hellas Direct (Insurance).

During this year, various meetings and presentations were held at the Universities, among the others at the University of Piraeus. In that presentation, some members of the Hellenic Capital Market Commission were present, as they wanted to attend again the training session of Big Data, Machine Learning and Systemic risk (risk management). Some talks and presentations were held at the Board of CFA Society Greece.

On September 19, 2019, at the CEPR European Conference on Household Finance, a pre-conference meeting took place organized by the Think Forward Initiative, where I talked to the organizers about our project. Among them, it was the Chief Economist & Head of Global Research of the ING Group, Mark Cliffe, the Head of International Consumer Economics, Sustainability and Innovation, ING, Stefan van Woelderen, and one of their invited speakers, Devie Mohan, Co-founder and CEO of Burnmark.

It was commonly accepted the need for a broad meeting with all the involved participants present. This need drove the idea of organizing a conference on April 21-23, 2020, bringing together academics, supervisory authorities, banks, practitioners and FinTech companies. The CFA Society Greece endorses the conference by awarding CEs to the CFA charterholders.

Until now, the confirmed speakers cover all the aforementioned "parts" of FinTech and a lot of papers from worldwide known universities are submitted.

2. Big Data Research-WP2

- Greece and Cyprus

During the discussions with the Hellenic Capital Market Commission and the Cyprus Exchange and Security Market commission about the agenda of the Big Data-Machine Learning Activity, I was asked to work and focus on the Trade Repository under the Regulation EU No 648/2012 (EMIR). The concerns with the EMIR, the derivative market, and in general with all the OTC markets are the detection of reporting mistakes, either by accident or on purpose (fraud) and detection of the linkages among the market participants. To this end, I used the existing and unified training material under the prism of the EMIR (my modified slides are available to whom is interested). Additionally, machine learning techniques were used to show the possible classification of the bond market using various criteria, and since some of the members were only Microsoft Excel users, methods like k-means were shown how it could be implemented using Excel. Regarding the transactions reporting and the clearing, an extensive discussion took place focusing on the missing information. Although according to the regulation, the counterparties should use the LEI for the reporting, this is not always the case, driving to mismatches. Therefore, the quality issues of the data reported were raised.

To implement the training sessions, it was prepared extra material, entitled

- Discussion of ESMA's Trade Repository Data Reporting tool. Transactional and Correlation networks
- Complex systems, graph representation, measures. Networks and financial systems, Basel III and interconnectedness. Application to ESMA's Trade Repository Data Reporting tool. available at <https://www.researchgate.net/project/Fin-Tech-A-FINancial-supervision-and-TECHnology-compliance-training-programme-H2020>

Beyond the agenda of the topics covered by our Project, I was asked to provide models on discriminating the mutual funds between active and passive, verifying the style reported by the asset manager. The goal is to protect the investors from high fees in the case of a wrongly assumed active fund. Also, we discussed the EU Emissions Trading System, the regulation and the commonalities with the traditional asset classes.

Two SupTech events on Big Data were organized in Greece on April 17-18, 2019 and on November 29, 2019. The SupTech event for Cyprus took place on April 12, 2019.

One publication in the field: Arakelian, V., & Qamhieh Hashem, S. (2020). The Leaders, the Laggards, and the "Vulnerables". *Risks*, 8(1), 26. (open access)

3. Artificial Intelligence Research-WP3

The focus was on the Preparation of two use cases, one related to the detection of contagion and the systemic risk and the second on the implications of the web attention of the Greek banks. For the first use case, we based on my joint paper with Petros Dellaportas (UCL), Roberto Savona (University of Brescia) and Marika Vezzoli (University of Brescia), "Sovereign risk zones in Europe during and after the debt crisis". The use case required the code to re-written using open source programming, therefore the new implementation required to move from MATLAB to Python. The package named RJMCMC (reversible jump Markov chain monte Carlo) copula is available at the GitHub and a paper explaining in details all the steps is available at the SSRN and the ResearchGate.

<https://github.com/veniarakelian/copula>

The second use case is based on the joint paper with Nikos Delis (Panteion University), Greek systemic banks: A web-attention analysis.

The SupTech activities for WP3 are scheduled to take place in Athens on April 21-23, organizing the 1st International Conference on Economics and FinTech A three days conference

https://icef2020.wixsite.com/site?fbclid=IwAR0biygQfwXCrnJRBaUiQxIZ3c8R24z9ba_8SxI55JpSu-N9VTupobOXEnM

The guest editor for the EFM Special Issues is Dr. Veni Arakelian (Panteion University) and for Digital Finance are Prof. Christos Douligeris and Dr. Thomas Dasakis, from the Department of Informatics, University of Piraeus.

4. Blockchain Research-WP4

Preparation of use case on Blockchain applied to bond book building. Relevant information and a tutorial video are available at the GitHub. Additionally, there are two working papers, one focused on using blockchain at the bond clearing (joint with Dr. Dasaklis, University of Piraeus) and another on the prevention of collusion (joint with Prof. Dimitris Vliotis, University of Piraeus). Furthermore, and independent of the platform we have for the authorities, we have set “colab” available for anyone interested in our work. “Colab” is the short for Colaboratory, is a product from Google Research allowing anyone to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education. As a lot of people do not own high end software on their own, through Colab, which is a hosted Jupyter notebook service that requires no setup to use, is provided free access to computing resources including GPUs.

5. RegTech Workshops-WP5

For the WP5, two half-day workshops will be provided to the National Regulators, the banks, the FinTech and anyone who is interested during the 1st International Conference on Economics and FinTech in September 2020.

6. SupTech Workshops-WP6

Through discussions with the National Regulator of Greece and Cyprus, several SupTech activities shall be done, covering both the FinTech project’s mentioned topics but also tailor-made case studies on FinTech.

- 1) SupTech workshop, BDA, April 12, 2019, Cyprus
 - a) Big Data Analytics I: Introduction to Big Data. Discussion of ESMA’s Trade Repository Data Reporting tool. Transactional and Correlation networks | Veni Arakelian
 - b) Big Data Analytics II: Complex systems, graph representation, measures. Networks and financial systems, Basel III and interconnectedness. Application to ESMA’s Trade Repository Data Reporting tool. | Veni Arakelian
 - c) Machine Learning: Supervised Learning (Logistic regression, Tree models and random forests). Unsupervised Learning (Clustering, Principal Component Analysis (PCA)). Case study | Veni Arakelian
 - d) Q&A. Practitioner’s perspective. Future steps| joint with Nikolaos Markakis, Head of Bond Desk at National Bank of Greece Asset Management.
- 2) SupTech workshop, BDA, April 17-18, 2019, Athens
 - a) Use cases in peer to peer lending credit risk management | Paolo Giudici

- b) Big Data Analytics I :Transactional and Correlation networks | Complex systems, graph representation, measures. Networks and financial systems, Basel III and interconnectedness | Veni Arakelian
 - c) Big Data Analytics II: Big data analytics. Application to ESMA's Trade Repository Data Reporting tool (TRs). Main risk concerns | Veni Arakelian
 - d) Machine Learning I: Supervised Learning (Logistic regression, Tree models and random forests), Case study | Veni Arakelian
 - e) Machine Learning II: Unsupervised Learning (Clustering, Principal Component Analysis (PCA)) generalized linear models. Case study | Veni Arakelian
 - f) Generalized Linear Models: Case study| Veni Arakelian
- 3) SupTech workshop, November 19, 2019, Athens
- a) Big data analytics. Textual analysis| Veni Arakelian
 - b) Greek systemic banks: A web-attention analysis| Nikos Delis
 - c) Machine learning| Veni Arakelian
 - d) Means of payments: the introduction of cryptocurrencies| Spyros Kouvelos
- 4) SupTech Workshops on Artificial Intelligence April 21-23, 2020

To bring together academics, regulators, bankers, and FinTech companies, a three-day international conference was organized and supported by the European Financial Management Association, the CFA Society Greece, and the Corporate Finance Lab of the University of Piraeus.

The keynote and the invited speakers were across the globe covering the academic, the regulatory, and the market aspect of the FinTech. At the 1st International Conference on Economics and FinTech (conference site <https://icef2020.wixsite.com/site>), the following keynote and invited speakers would give a thorough talk. Details below

Keynote Speakers:

- Christian Brownlees, Universitat Pompeu Fabra
- Dirk Niepelt, University of Bern
- Mike Tsionas, Lancaster University
- Markos Zachariadis, Alliance Manchester Business School

Supervisory authorities:

- Stavroula Kampouridou, Bank of Greece, Head of FinTech Hub
- Dr. Vassiliki Lazarakou, Hellenic Capital Market Commission, Chair

Hellenic Republic Government Representative

- Grigoris Zarifopoulos, Deputy Minister of Digital Governance

Invited Speakers

- Thomas Barkias, ECB
- Arshad Khan, Co-Founder, and CEO of Arabian Bourse
- Andres Lehtmes, European Insurance & Occupational Pensions Authority (EIOPA)
- Devie Mohan, Co-Founder, and CEO of Burnmark
- Stefanos Mytilineos, General Manager, Digital Business at Piraeus Bank
- Michalis Tsarbopoulos, Group Chief Digital Officer and Head of Global Transaction Banking at Eurobank
- Dimitrios P. Tsomocos, Saïd Business School and St. Edmund Hall, University of Oxford

Additionally, Dr. Rapolas Lakavicius (FIN-TECH HO2020 Project Officer) would give a talk related to the objectives and the goals of the EC on FinTech.

A call for papers and industry speakers was announced at SSRN interested in high-quality research papers concerning all topics related to FinTech, RegTech, or InsurTech. Also, practitioners were invited to present use cases and speakers from FinTech companies to present client solutions.

In collaboration with the editor of the European Financial Management Journal, Prof. John Doukas (<https://www.efmaefm.org/specialissue2020.php>), and the editor of the Digital Finance journal, Prof. Wolfgang Hardle, we offered two publication opportunities.

1. All papers accepted for the symposium are eligible to be considered for publication in the EUROPEAN FINANCIAL MANAGEMENT in a special issue devoted to the conference. If you wish your paper to be considered for publication in the EFM, please indicate so in your cover letter. Papers will be reviewed for the EFM upon receipt using its normal criteria. Note that the acceptance of a paper to the conference is not a guarantee of publication by the EFM. All papers will go through the journal's standard blind review process.
2. All papers accepted for the conference are eligible to be considered for publication in the DIGITAL FINANCE, a Springer journal, in a special issue devoted to the conference (For details, please visit the site of the conference). The guest editors are Prof. Christos Douligeris and Dr. Thomas K. Dasakis of the University of Piraeus. If you wish your paper to be considered for publication in the DF, please indicate so in your cover letter. Papers will be reviewed for the DF upon receipt using its normal criteria. Note that the acceptance of a paper to the conference is not a guarantee of publication by the DF. All papers will go through the journal's standard blind review process.

The full agenda of the conference is shown below:

Conference sessions are reported here:

- Digital currencies and central banks I
- Digital currencies and central banks II

- Greek Banks Challenges in the Era of FinTech
- Competition in the Industry
- Textual Analysis
- InsurTech
- FinTech Economics
- Industry: Client Solution Presentations
- Fraud detection
- Big Data- Machine Learning

Use cases presented:

- Use cases on Systemic Risk, Cryptocurrencies and Robo-advisory (presented by V. Arakelian)
- Network Market structure discovery with clique forests
- Convergence and divergence in European bond correlations
- Sovereign risk zones in Europe during and after the debt crisis
- Are cryptocurrencies connected to forex? A quantile cross-spectral approach
- Network models to improve robot advisory portfolio management

Unfortunately, the conference was postponed due to COVID-19. To cover a part of this conference and to fulfil a part of the SupTech activities, on June 25th, a pre-conference took place. Besides the use cases which were presented only to the supervisory authorities of Greece and Cyprus, the rest was open to the public, recorded, and available for everyone who missed

it (https://www.youtube.com/watch?v=WuKE7boF_NY&t=94s). The pre-conference gained a lot of attention as it was presented by the Bank of Greece the new directive on Customer Digital Onboarding, and now a new event is organized to discuss a similar regulation that will be announced by the Hellenic Capital Market Commission.

The agenda of the meeting is given below

- Presentation of use cases on artificial intelligence (only for the national supervisors) | Dr. Veni Arakelian
- Convergence and divergence in European bond correlations
- Network models to improve robot advisory portfolio management
- Joint event with 1st International Conference on Economics and FinTech: The pre-conference
- Digital Finance Special Issue Session on Fraud Detection. Guest Editors, Prof. Christos Douligeris, Dr. Thomas Dasaklis, University of Piraeus.
- Sotiris Bersimis, University of Piraeus, Statistical tools for Health Insurance Fraud Detection
- Elissavet Nika, AUEB, Techniques for monitoring health care expenditure
- Vasilis Georgakopoulos, Deloitte, Technology fighting fraud
- Fran Casino, University of Piraeus, A blockchain-based forensic model for financial crime investigation: The embezzlement scenario. Discussion by Lamprini Zarpala

- Ilias Plaskovitis, Bank of Greece, "The banking system in Greece: Past, present and future"
- Angelos Tzermiadis, Bank of Greece, "Digital customer onboarding"
- Stavroula Kampouridou, Bank of Greece, "Hub & Sandbox"
- Tammaro Terracciano & Luciano Somoza, Swiss Finance Institute, "CBDC Designs and their Economic Consequences"
- Dr. Vassilis Nikolopoulos, Protergia, "Transactive energy P2P systems: Future energy FinTech in action, using cryptos and stable coins"
- Panel discussion: Markos Zachariadis, University of Manchester, and Devie Mohan, Burnmark
- Dr. Hariton Korizis, ResonanceX, "A New Target Operating Model for Financial Services"
- Georgios A. Panos, University of Glasgow, "On the educational curriculum in finance and technology"
- Ioanna Sapfo Pepelasis, AUEB, "Innovation and entrepreneurship in Greece"
- Ronald Kleverlaan, Utrecht University, AltfinatorHub - European network of national Hubs for Alternative Finance eco-system development
- Costas Lambrinoudakis, University of Leeds, "Blockchains and earnings management"
- Dr. Laurence E. Day, Arboreum, "Trust-Based Lending On Trustless Networks"

7. Dissemination-WP7

The dissemination activity consists of seminars and hands-on workshops. The participants cover the widest aspect of the topics, that is, they are academics, national regulators, bankers and fintech companies. Successful dissemination of the project is guaranteed by the interactions and consultations of a very strong network which is dynamically evolving. The last is resulted by the successful proposal on COST Action for the use of AI to improve the transparency of the financial service sector, which was recently approved for funding.

Publications and presentations in external events

- CFA Society Greece, Loukas Dedes, 2/3/2019 (during the CFA Research challenge)
- Moody's, Tsvetana Kaicheva, Associate Director, Sales Representative, Research, Data & Analytics, 4/4/2019
- Frankfurt-Meeting with ECB affiliated people. Meeting with Professor Haliassos, Goethe University Frankfurt and CEPR, 26/6/2019
- CRETE 2019: The 18th Conference on Research on Economic Theory and Econometrics, Paper Presentation, 12-16/7/2019
- Statistics5@AEGINA, 5-9/9/2019, one paper presentation and one poster presentation
- Research Workshop, RegTech Winterthur, Zhaw University of Applied Science, 3-4 September, Zurich
- CEPR-Think Forward Initiative 19-21/9/2019, presentation of the FinTech Project
- deVere Group, Dimitris Litsikakis, Global Head of FinTech, 9/10/2019

- Hellenic Telecommunications Organization, Dimitris Kontogiannis, Digital Channels Senior Manager, 25/10/2019
- KPMG, Meeting with Myron Flouris, FinTech Expert, 13/11/2019
- Bank of Greece, Yiannis Stournars, Governor, 19/11/2019
- University of Piraeus, Seminar, 29/11/2019
- Bank of Greece, Stavroula Kampouridou (καμπουρίδου), Head of FinTech, 5/12/2019
- EY, Meeting with Elias Vyzas, 6/12/2019 at 14:00
- Meeting with Michalis Tsarbopoulos, Group Chief Digital Officer and Head of Global Transaction Banking at Eurobank, 19/12/2019
- Ministry of Digital Transformation, Meeting with Kyriakos Pierrakakis, Minister, 21/11/2019
- Attica Bank, Meeting with the CEO, Theodoros Pantalakis, 21/11/2019

D. INESC-TEC

1. Management-WP1

Participation in the official FinTech meetings:

- Kick-off meeting, Pavia, Italy, 1st February 2019
- Workshop Winterthur, Switzerland, 3rd-4th September 2019
- Mid-term Research Workshop, Bucharest, Romania, 15th November 2019
- Online Management Board meeting, 18 May 2020, 15.00 – 18:00 (London time)
- First Fintech Workshop on AI, Financial Automation and Market Risk, 19 May 2020, 9:20 – 18.00 (London time)

Regular meetings, plus frequent e-mail exchange, with the team in Porto, to coordinate activities, information about the project development, organize sessions with national regulator.

In particular, formal meetings have been organized on:

- 1 October 2018, 15:30
- 21 January 2019, 16:00
- March 2019, 18:30
- 21 October 2019, 16:30
- 28 November 2019, 18:00

Skype meetings with the project coordination team, on January 22nd and June 17th, 2019. Meeting with other project partners in Berlin, March 28th-29th, 2019.

Participation in the event at the Portuguese Coordinator, CMVM; on July 9th, 2019

2. Big Data Research-WP2

Presentations in external events

Presentations in FinTech events - FinTech Workshop on AI, Financial Automation and Market Risk.

Bernardo, M. & Alves, C. Using clustering ensemble to identify banking business models.

Publications

- Marques, Bernardo P. and Alves, Carlos Francisco Ferreira, Using Clustering Ensemble to Identify Banking Business Models (March 5, 2020). Intelligent Systems in Accounting, Finance and Management, Forthcoming, DOI: 10.1002/isaf.1471.

Presentations in external events

- Brito, P., Silva, M.E., Dainovich, M. (2020) Analysis of Symbolic Temporal Data: Clustering
- Multivariate Time Series. Workshop on Advances in Data Science for Big and Complex
- Data, University Paris-Dauphine, PSL, Paris, France, 23-24 January 2020.
- Alves, H., Brito, P. & Campos, P. (2019). Community Detection in interval-weighted networks, The 8th International Conference on Complex Networks and Their Applications, 10-12 Dec., Lisbon, Portugal.
- Brito, P., Maharaj, A., Teles, P. (2019). Clustering and Classification of Interval Time Series. XVI Conference of the International Federation of Classification Societies, IFCS 2019, Thessaloniki, Greece, August 2019.
- Marques, B. & Alves, C. Using clustering ensemble to identify banking business models. 2nd PhD Student Workshop in Economics and Business Administration, Univ. Minho, Portugal, June 7th, 2019.
- Marques, B. & Alves, C. Using clustering ensemble to identify banking business models. 6th Young Finance Scholars Conference, Unive. Sussex, June 13-14, 2019.

THESIS by INESC TEC:

Ongoing:

- H. Alves. PhD thesis (ongoing, presented in 2020), in Applied Mathematics, at UP, on "Interval-Weighted Networks: Community Detection and Centrality Measures", co-supervised by Paula Brito & Pedro Campos.
- B. Marques. PhD Thesis (ongoing), in Management, at UP, on "One Size Does Not Fit All: Linking Diversity of Business Models to Performance and Resilience in the Banking Sector", supervised by C. Alves.

- Nikhil Koppala Suresh - Master Thesis (ongoing) in Data Analytics, at FEP-UP, on “Clusterwise Linear Regression for Interval Data An Extension of Interval Distributional Model”, co-supervised by Paula Brito & Sónia Dias (INESC TEC)
- Inês Ferreira Master Thesis (ongoing) in Data Analytics, at FEP-UP, on “Fraud Detection and Prevention Using Network Mining”, co-supervised by Pedro Campos (FEP-UP & INESC TEC) and Fábio Pinto.
- José Pedro Silva, Master Thesis (ongoing) in Data Analytics, at FEP-UP, on “Use of Real-Time Data in Quick Estimation of Macroeconomic Indicators”, co-supervised by Pedro Campos and Cecília Azevedo.
- Tiago Gonçalves Pereira, Master Thesis (ongoing) at FEP-UP, on “Measures of Bipartite Graphs in Listed Companies - The Case of the Interconnection between Boards of Directors in Portugal and their Relationship with the Performance of Companies”, co-supervised by Pedro Campos and Carlos Alves.

Completed 2019:

- A. Vieira (2019). “Community Detection in Attributed Networks: An Application to Socioeconomic Data from European Union”. Master Thesis, in Data Analytics, at FEP-UP, co-supervised by Pedro Campos & Paula Brito.
- M. Dainovich (2019). “Clustering Multivariate Time Series”. Master Thesis in Data Analytics, at FEP-UP, co-supervised by M.E. Silva & Paula Brito.
- D. Alves (2019). “Hyperband for Clustering”. Master Thesis in Data Analytics, at FEP-UP, co-supervised by Paula Brito & C. Soares.
- N. Machado (2019). “How Bitcoin Returns Behave: Like a Currency or like a Financial Asset?” Master Thesis in Finance, FEP, UP, supervised by Carlos Alves.

3. Blockchain-Research-WP4

Working papers and presentation in external events.

- Paper submitted, now on 2nd round of revision: TEM-19-0522.R1: "Fostering consumer bargaining and e-procurement through a decentralized marketplace on the blockchain", submitted to Transaction and Energy Management.

Presentations:

- "Fostering consumer bargaining and e-procurement through a decentralised marketplace on the blockchain" at Carnegie Mellon University, Pittsburgh, EUA-24 Jan. 2020 AND Faculty of Engineering of the University of Porto, Porto, Portugal-21 Feb. 2020

4. SupTech Workshops-WP5

- 1) SupTech I, Lisbon, Portugal, CMVM, 6, 7, 18, 19 June 2019. Topics covered: Statistical models, Approaches for high-dimensional problems, Principles of Machine Learning, three Use Cases presented:
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Factorial network models to improve P2P credit risk management
 - c) Use Case IV: Loan screening and default prediction with Machine Learning and Deep Neural Networks

Feedback

- The role of the participants:

Director, Coordinator, Supervision officer, Economist, Data Analyst, Project manager, Systems and applications administrator, Advisor, Jurist, Legal advisor, IT Project Manager, Technician.

In general: Rather heterogeneous audience, as concerns formation, functions, age.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars.

- What is their feedback on the use cases presented?

They considered the presenters were “Highly experienced teachers”. There was a general interest in the methods/approaches presented.

Network analysis raised much interest, with interventions from the audience, proposing examples, etc.

The use of a use case motivates and helps to understand the models presented. The focus was also on the use of econometric tools, where it was considered that it would be useful to plan additional sessions where the participants could run the empirical applications in their laptop.

We witnessed a high level of curiosity regarding Machine Learning topics, which is perceived as is important for their activities. From the Q&A as well as talks after the session, there is interest in testing such topics in the context of the regulation/supervision entities that attended, albeit with not a clear idea as to what context/application/use case. Attendees related to legal issues were highly interested in the subject in the perspective of privacy and ethics in ML/AI.

In general, participants understand the need to use new methods and consider that the course would benefit from more hands-on and software practice.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Use cases perceived utility ranged from 2 to 5, with a mean of 3.5 (stand. dev. = 0.81). For the use case explainability we get a mean of 3.7 (0.78) and for use case predictive accuracy a mean of 3.9 (0.83).

- 1) SupTech II planned to take place in Lisbon, Portugal, CMVM, 19,20,25,27h March 2020. Use Cases planned to be presented:
 - a) Use Case VIII: Convergence and Divergence in European Bond Correlations

- b) Use Case V: Network Models to Improve Robot Advisory-Portfolio Management
- c) Use Case VI: Are Cryptocurrencies Connected to Forex? A Quantile Cross-Spectral Approach
- d) Use Case IX: Market Structure Discovery with Clique Forests Platforms

The SupTech had to be postponed due to COVID-19, it is now planned for October 2020. Topics to be covered: Determinants of Sovereign Risk, Portfolio Construction, Network Models, Heteroscedastic ARCH and GARCH Models, How do Bitcoin Returns Behave, Structure Learning for Bayesian Networks, Learning Clique Forests.

E. University of Paris 1

1. Management-WP1

UP1 set a communication procedure around the project through meetings every month on Monday or Friday afternoon in Paris, at the House of Economics of the University Paris 1.

Participation in the board meetings of the Consortium, in Pavia (1st of February 2019), in Winterthur (3rd of November 2019) and in Bucharest (15th of November 2019).

Setting up of telephone or physical meetings for coordination with French regulators and preparation of joint events.

2. Big Data Research-WP2

Presentations

- 19 March 2019, Workshop Paris: “Big Data and Artificial Intelligence: Risks, Challenges and Applications”.

3. Artificial Intelligence Research-WP3

List of Publications

- Alexis Bogroff, Dominique Guégan (2019) Artificial Intelligence, Data, Ethics: An Holistic Approach for Risks and Regulation, WP P1.
- “In Algorithms We trust: interpretability, robustness and bias in machine learning”, Louis Abraham -Ecole Polytechnique, ETH Zurich, Qwant Care
- « Bias, Discrimination and Fairness », David Bounie - Telecom ParisTech.
- “Credit Risk Analysis using machine and deep learning models”, Peter Addo – AFD

- "Main risks identified for the use of AI and machine learning in the financial sector", David Hagen - CSSF (Commission de Surveillance du Secteur Financier) (Luxembourg)

Presentations

- 19 March 2019, Workshop Paris “Big Data and Artificial Intelligence: Risks, Challenges and Applications.
- Alexis Bogroff, Dominique Guégan (2019) “Artificial Intelligence, Data, Ethics: An Holistic Approach for Risks and Regulation”.

4. Blockchain Research-WP4

Presentations

- Karima Lachgar (CMS Francis Lefebvre Avocats): Les projets de réglementation liés à la technologie blockchain.
- Stéphane Blemus (Université Paris 1, Kalexius, ChainTech) et Dominique Guégan (Université Paris 1, LabEx ReFi): Initial Crypto-asset Offerings (ICOs), tokenisation et corporate gouvernance.
- Fabrice Heuvrard (Expert-Comptable): Les enjeux comptables des ICO.
- Jérôme de Tyche (Consensys, Asseth): PoS against PoW for scalability?
- Saman Adhami Mirhossaini (University of Vienna, Autriche) et Giancarlo Guidicci (University of Milan, Italie): Tokens it easy? Analyzing the success of Initial Coin Offerings.
- Paola Cerchiello and Anca Toma (University of Pavia, Italie): Statistical Model for Fraud Detection in ICO.
- Jean-Marc Stenger (Société Générale, Lyxor Asset Management): Blockchain use cases in banking industry: a practitioner's perspective.
- 9 November 2018, Blockchain Seminar: New issues, ESCP Paris (France)
- 22 January 2019, Blockchain Seminar: Risk & Blockchain, CNAM Paris (France)
- 19-21 June 2019, 26th International Conference on Forecasting Financial Markets, Venice (Italy)

5. SupTech Workshops-WP5

- 1) SupTech I, ACPR-Banque de France (Prudential Control and resolution authority), 19 March 2019.
Topic: Big Data and Artificial Intelligence-Risks, Challenges and Applications.
 - a) Session Big Data Analytics:
 - i) “Regulatory framework for Big Data”

- ii) "From Statistics to Big Data, the Transformation of the Techniques of Government"
- iii) "Big Data and Judicial Decision Making"
- iv) "Disentangling and quantifying market participant volatility contributions"
- b) Research topics around AI:
 - i) "In Algorithms We trust: interpretability, robustness and bias in machine learning"
 - ii) "Bias, Discrimination and Fairness".
 - iii) "Credit Risk Analysis using machine and deep learning models",
 - iv) "Main risks identified for the use of AI and machine learning in the financial sector"
- c) Discussion between Researchers, Fintechs (QuantCube, Scaled Risk, Dreamquark), Banks (Banque de France, OrangeBank, BNP Paribas) and Regulators (AMF, ACPR, CSSF).

6. RegTech-WP6:

UP1 will organize the last RegTech session under the FinTech-ho2020 project. Specifically, the main objective of the workshop will be to explore the opportunities offered by blockchain technology in finance and present state-of-art use cases on fintech risk management tools coming from the FinTech-ho2020 network. The presentations will cover both a theoretical overview of the methodologies developed as well as a practical session with a live demonstration of the code and data used to develop the use case. The final RegTech workshop will also serve as a forum for interdisciplinary discussion and exchange of ideas on the adoption of innovative technologies in finance. Specifically, the use cases will cover research on platform fraud detection, text analysis and classification of ICO reports, money laundering and illegal activity risk management etc.

F. Politecnico of Milan

1. Management-WP1

Politecnico di Milano creates and manages the connection with Consob, the Italian supervising authority.

2. Big Data Research-WP2

Publications and presentations in external events

The research of the Politecnico di Milano group is mainly devoted to Big Data in Insurance and Insurtech, mainly investigating the determinants of an early lapse in insurance contracts.

- E. Barucci, T. Colozza, D. Marazzina and E. Rroji, Lapse risk in life insurance contracts. Available at:
<https://re.public.polimi.it/retrieve/handle/11311/1134359/511654/PrePrint.pdf> (open access). Accepted for publication in "European Actuarial Journal".
- EIOPA Seminar on Quantitative Techniques in Financial Stability-September 5-6, 2019, Frankfurt.
- OICA Conference, April 29th, 2020.

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

BDA seminar (Consob, Rome-in video conference with Consob, Milan)

- March 3, 2019
- April 9, 2019
- May 6, 2019
- May 23, 2019

3. Artificial Intelligence-WP3

Publications and presentations in external event

The research of the Politecnico di Milano group is mainly devoted to Machine Learning technique in forecasting early lapse in insurance contracts and power consumption in the energy market.

- EIOPA Seminar on Quantitative Techniques in Financial Stability-September 5-6, 2019, Frankfurt
- AI, Financial Automation and Market Risk Workshop, May 18-20, 2020

Another research topic is connected to the use of ML to energy finance

Publications

- M. Azzone, R. Baviera, Neural Network Middle-Term Probabilistic Forecasting of Daily Power Consumption (<https://arxiv.org/abs/2006.16388>) (open access)

Presentations of the project objectives and outputs in external workshops, conferences, seminars etc.

- AI (Consob, Rome-in videoconference with Consob, Milan)
- October 31, 2019
- November 7, 2019
- November 21, 2019
- December 12, 2019

4. Blockchain research-WP4

The research is at an early stage, working on stable coins (from a quantitative perspective) and the design and creation of token in a DeFi framework, with a focus on the Covid-19 crisis.

5. SupTech Workshops-WP5

Organization of SupTech events

- 1) SupTech I, Consob, Rome (video conference with Milan), 25 March, 9 April, and 6 and 23 May 2019.
Topic Covered: Big Data Analysis: sentiment analysis and networks. Three Use-Cases presented:
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) UseCase III: Spatial Regression Scoring Model

Feedback

- Parties participating, their roles and their responsibilities:

Politecnico di Milano, Consob Officers, Politecnico di Milano (speakers)

The role of the participants:

Consob Deputy Head of Training, Consob Experts and Researchers

- How were they involved?

Participants were involved through communications, seminars, and coding sessions given by Politecnico di Milano.

- What is their feedback on the use cases presented?

The highly valuable perspective of a dialogue between supervisors and academia.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, particular interest on Big Data and privacy challenges.

- 2) SupTech II, Consob, Rome (video conference with Milan), 31 October, 7 and 21 November, 12 December 2019. Topic Covered: Machine learning, AI, Market Risk and Robo Advisory. Three Use-Cases presented:

- a) Sovereign risk zones in Europe during and after the debt crisis
- b) Learning Clique Forests
- c) Network models to improve robot advisory-portfolio management

Feedback

- Parties participating, their roles and their responsibilities

Politecnico di Milano, Consob Officers, Politecnico di Milano (speakers)

- The role of the participants:

Consob Deputy Head of Training, Consob Experts and Researchers

- How were they involved?

Participants were involved through communications, seminars, and coding sessions given by Politecnico di Milano.

- What is their feedback on the use cases presented?

The highly valuable perspective of a dialogue between supervisors and academia. The necessity of a deeper training in the technical part

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, particular interest on Machine Learning applications and Interpretability challenges.

6. Dissemination-WP7

Participation in conferences (see WP2, WP3) and organization and participation to SupTech events (WP5). Participation in the event AI-ROME-BANK OF ITALY-JUNE 12, organized by University of Pavia.

G. University College Dublin

1. Management-WP1

The management role of the coordinator of the UCD team was to arrange meetings, average once per semester with the Central Bank of Ireland to coordinate our research activities and plan the training events. In this regard, it should be pointed out that the Central Bank of Ireland was under an extraordinary set of circumstances, due to an exceptional workload resulting from the United Kingdom leaving the European Union (so-called Brexit). Hence, we had to carefully plan and manage our interaction and collaboration with them.

We took part and contributed also to the following management meetings at the network level:

- 1 February 2019 Kick-Off Meeting, Pavia
- 3-4 September 2019, 1st Validation and Research Workshop (Winterthur)
- 26 September 2019, Validation meeting with FSMA & NBB (Brussels)
- 14-15 November 2019, Intermediate Research Workshop, Bucharest
- 18 May 2020. Management Board meeting, UCL (online)

2. Big Data Research-WP2

Presentations from UCD:

- 14 June 2019: UCD Michael Smurfit Graduate School of Business Fintech Workshop
- June 2019: Presentation of the paper titled "Nonparametric Tests for Superior Predictive Ability" (Post, T., Potì, V., Arvanitis, S. and S. Karabati,) at the annual meeting of the International Association for Applied Econometrics (Cyprus 2019)
- 27 July 2019: UCD-Irish Central Bank First FinTech Workshop
- August 2019: Presentation of the paper titled "Nonparametric Tests for Superior Predictive Ability" (Post, T., Potì, V., Arvanitis, S. and S. Karabati,) at the annual meeting of the Econometric Society (Manchester 2019)

3. Artificial Intelligence Research-WP3

Presentations from UCD:

- Irish Economic Association, Cork, November 2019, Financial Bubbles Monitoring and Systemic Risk Events Early Warning Using Textual Analysis.

4. Blockchain Research-WP

We are working in collaboration with the RADAR (Risk Analysis Data Analytics and Reporting) division of the Central Bank to identify themes and topics for a concrete collaboration. They have a very specific research agenda and research priorities in this regard, so all efforts have been made to find ways to interface the activities within the node within the Work Package with the Central Bank objectives. This is requiring substantial planning, which is necessary so engagement with the Work Package to make sense for the Central Bank. The training workshops will be organized when this planning activity is completed. They will be however more events for the exchange of research ideas and experiences than training workshops.

Publications:

- Cojocanu, T. F., Clark, G. L., Hoepner, A. G., Pažitka, V., & Wójcik, D. (2020). Fin vs. tech: are trust and knowledge creation key ingredients in fintech start-up emergence and financing? Smalla, Business Economics 1-17. <https://link.springer.com/article/10.1007/s11187-020-00367-3> (Open Access)

5. SupTech Workshops-WP5

- 1) SupTech I, UCD M. Smurfit School of Business, 14 June. Topic covered: Big Data Analysis; two Use-Cases presented
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) Fintech Risk Management and the EU – Prof. Andreas Hoepner
 - d) Fintech around the OECD – Theodor Cojocanu
 - e) Fintech Risk Management and Peer-to-peer lending – Prof. Valerio Poti
- 2) SupTech II Workshop: this was held on the 17th and 18th of February. It was held later than initially scheduled because of the heavy workload at the Irish Central Bank due to Brexit. The preparation activities, however, took place during the reporting year. The workshop included:
 - a) Several papers by UCD, Irish Central Bank and external researchers were presented on AI, Market Risk and Robo Advisory:
 - b) Use cases I, III and IV were presented and discussed, together with snippets of the code available on the platform
 - c) Regulating and Risk Managing with & of AIs – Prof. Andreas Hoepner, Chair in Operational Risk, Banking and Finance, UCD & Member of the EU Technical Expert Group on Sustainable Finance
 - d) FinTech and the Sustainable Development Goals (SDGs): will the EU Action Plan for Financing Sustainable Growth disrupt markets? - Prof. Andreas Hoepner, Chair in Operational Risk, Banking and Finance, UCD & Member of the EU Technical Expert Group on Sustainable Finance
 - e) Alert models for financial institutions – Prof. Cal Muckley, Chair in Operational Risk, Banking & Finance, UCD
 - f) An Introduction to Machine Learning with Python and Scikit Learn - Dr. Conall O'Sullivan, Assistant Professor of Finance, UCD
 - g) The LIBOR Scandal: What Now for Benchmark Markets? - Dr. Conall O'Sullivan, Assistant Professor of Finance, UCD

- h) Option Implied Risk Measurement – Dr. Richard McGee, Assistant Professor of Finance, UCD
- i) Fin vs. Tech: Determinants of Fintech Start-Up Emergence and Innovation in the Financial Services Incumbent Sector – Dr. Theodor Cojocanu, Postdoctoral Research Fellow, UCD
- j) Corporate Social Responsibility and Financial Services Misconduct Risk – Dr. Thomas Conlon, Associate Professor of Banking and Finance, UCD
- k) Basel II and Operational Risk Capital – Dr. Thomas Conlon, Associate Professor of Banking and Finance, UCD
- l) Use cases I, III and IV were presented and discussed, together with snippets of the code available on the platform

Feedback:

Most of the feedback was received in the form of verbal comments and suggestions at the end of the meetings. Additionally, an online form was filled by some of the participants. Overall, the feedback was largely that the events were in line with the attendees' expectations. The reason is that we held events for different audiences/participants. Because of discussions and engagement ahead of the events, we were able to target them to the interests and background of the audience. The June event was less technical, more geared towards managerial considerations and conceptualization. The July and February events instead were geared towards personnel in the data science department of the central bank and therefore could focus on quantitative modelling. The feedback from them was that they found the platform and use cases interesting but well within the span of the modelling capabilities currently in place at the central bank. Hence, we are discussing ways to drive our research agenda in a direction that they can find ambitious enough to represent an expansion of their modelling capabilities. Going forward, we have agreed that senior personnel at the central bank will provide input in the selection of topics and content for future events, to increase their appeal for the bank and its personnel.

6. Dissemination-WP7

The dissemination activity consisted of seminars, liaison with industry and liaison with regulators. The main seminars were the events in which the presentations listed above were held. The liaison with industry and regulators included consultations to identify common areas of interests and to share ideas on uses of AI in Finance. These interactions and consultations resulted in a very strong network which has been working on several common projects. One of these was a proposal for a COST Action for the use of AI to improve the transparency of the financial service sector, which was recently approved for funding.

H. University of Luxembourg

1. Management-WP1

The management role of the coordinator of the Luxembourg team in the first year was mainly focused on regular contacting the National Regulator to ensure fluent communication and planning of the training agenda and timing.

Presentations of the Project objectives and outputs in external workshops, conferences, seminars etc.

- 1 February 2019 Kick Off Meeting, Pavia
- 14 February Meeting with CSSF (Luxembourg)
- 22 March Conf call with B-hive (Dave Remue) (Brussels)
- 18 April Meeting with B-hive (Dave Remue) (Brussels)
- 16 May Conf call with FSMA & NBB
- 27 May SupTech Workshop BDA I (Luxembourg)
- 4 June Partnership Day SNT (Luxembourg)
- 6 June SupTech Workshop BDA I (Brussels)
- 10 June SupTech Workshop BDA II (Luxembourg)
- 20 June SupTech Workshop BDA II (Brussels)
- 3-4 September 1st Validation and Research Workshop (Winterthur)
- 26 September Validation meeting with FSMA & NBB (Brussels)
- 29 October Cybersecurity and blockchain workshop-EU Blockchain Observatory and Forum, Brussels
- 12 November, Blockchain Conference, Exhibition Stand, Malaga
- 14 15 November Intermediate Research Workshop, Bucharest
- 28 29 November Workshop AI (Brussels)

2. Big Data Research-WP2

Preparation of the use cases:

- The use cases were always reviewed and executed beforehand so that an overview could be presented to the regulators in several meetings before each SupTech workshop.
- While the regulators pointed out the initially proposed use cases lied outside their area of focus and expertise, they did display interest in the topics and proposed amendments to the agenda.
- A series of additional use cases, usually based on research from the University of Luxembourg and other members of the consortium, were also presented. This allowed regulators to have a broader choice and showcased the avenues of research tackled by the group as a whole.

Dissemination:

We focused on three groups of people to promote the project:

- The national regulators, which include the Financial Sector Supervisory Commission (CSSF) and the Banque Centrale du Luxembourg (BCL) in Luxembourg. In Belgium, we talked with the Belgium Financial Services and Markets Authority (FSMA) and with the National Bank of Belgium (NBB).
- Local industry and financial entities, including the Luxembourg House of Financial Technology (LhoFT) and the Luxembourg Bankers' Association (ABBL).
- Academia, which included colleagues from the University of Luxembourg and the Interdisciplinary Centre for Security, Reliability and Trust (SnT).

Feedback and improvement of the paper/ code/ analysis

- Most of the results were received in the form of verbal feedback at posterior meetings.
- An additional online form was filled by the participants
- On several occasions, it was mentioned that the level of detail of some of the sections in the workshop were too technical. As a result, we adapted our next workshop to have incremental complexity.

3. Artificial Intelligence Research-WP3

Dissemination

We focused on three groups of people to promote the project:

- The national regulators, which include the Financial Sector Supervisory Commission (CSSF) and the Banque Centrale du Luxembourg (BCL) in Luxembourg. In Belgium, we talked with the Belgium Financial Services and Markets Authority (FSMA) and with the National Bank of Belgium (NBB).
- Local industry and financial entities, including the Luxembourg House of Financial Technology (LhoFT) and The Luxembourg Bankers' Association (ABBL).
- Academia, which included colleagues from the University of Luxembourg and the Interdisciplinary Centre for Security, Reliability and Trust (SnT).

Preparation of the use cases

Feedback and improvement of the paper/ code/ analysis

- Preparation of the Use Cases:
- Over an hour of time was dedicated to discussing some of the implications of AI in current regulatory frameworks and how academia can help solve some of the most pressing issues. This

translated into a direct indication of research venues that might have a more direct impact in their day to day operations.

- An online form was filled by the participants
- The overall feedback with regards to the coding tutorial was that it was far more approachable than the BDA workshop for less technical people, however, it was once more recommended to divide the workshop into a high-level section targeted to non-technical people, and a programming section for advanced users.

4. Blockchain Research-WP4

Preparation of the Use Cases

- We have begun work on a research paper regarding fraudulent ICOs. Most of the gathering of data and test phase has been done already.

1) SupTech BDA Luxembourg:

- a) Use Case I: Use Case I: Network Analysis Credit risk management in P2P lending
- b) Use Case II: Factorial network models to improve P2P credit risk management
- c) Use Case III: Spatial regression models to improve P2P credit risk management
- d) Use Case IV: Loan screening and default prediction with machine learning and deep neural network.

Feedback

- Parties participating, their roles and their responsibilities:

The main target of our courses were the national supervisors and central bank: Financial Sector Supervisory Commission (CSSF) and Banque Centrale du Luxembourg (BCL), alongside researchers from the Interdisciplinary Centre for Security, Reliability and Trust, of the University of Luxembourg.

- Parties participating, their roles and their responsibilities:

The roles of the participants were of diverse backgrounds, including but not limited to lawyers, auditors, analysts, auditors and statisticians.

- How will they stay involved?

Participants were provided access to the material presented during the lectures, including the code for the workshop and the presentations with the references to more advanced methods. In addition, several participants asked for follow-up meetings with our research group in order to

discuss some specific problems they are facing in their respective areas, in particular in the field of fraud detection. Moreover, the bank showed interest in future collaborations with research institutions as a way of gaining access to expert knowledge in some of the latest technology developments.

- What is their feedback on the use cases presented?

The feedback was overall very positive: participants were particularly pleased in the manner that all the materials covered during the introduction and theory part linked directly with concrete use cases later in the workshop. This allowed them to have a hands-on approach to the material learnt and fostered group thinking in how these methods could apply to other similar problems they might be facing.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Due to the variety of the audience's background, some of the use cases were not directly relevant to their day to day work, and as such found it slightly more difficult to follow. Nevertheless, participants found the presented use cases interesting and representative for understanding how to apply the outlined techniques across different areas. Overall the presented choice of use cases met their expectations.

2) SupTech BDA Brussels:

- a) Use Case I: Use Case I: Network Analysis Credit risk management in P2P lending
- b) Use Case II: Factorial network models to improve P2P credit risk management
- c) Use Case III: Spatial regression models to improve P2P credit risk management
- d) Use Case IV: Loan screening and default prediction with machine learning and deep neural network.

3) SupTech AI Brussels:

- a) Use Case I: "Are cryptocurrencies connected to forex? A quantile cross spectral approach"
- b) Use Case II: Network models to improve robot advisory portfolio management
- c) Use Case III: Interpretable AI and Federated Learning.

Feedback

- Parties participating, their roles and their responsibilities

The two main participants at the events, and present during discussions of use cases and workshop structure were the Financial Services and Markets Authority (FSMA) and the National Bank of Belgium (NBB). B-Hive also invited fintech startups and other interested parties to the workshops.

- Parties participating, their roles and their responsibilities:

The most prominent roles of the participants were of analysts, statisticians, economists, policy advisors and innovation officers. A detailed list with the name and position of all participants can be found annexed.

- How will they stay involved?

Participants were provided access during the workshop to not only the course slides, but also to interactive Jupyter notebooks where they could execute the code alongside the lecturer to give a true hand on experience with some of the material covered during the workshop. Contact details of each of the instructors was shared for further discussions.

- What is their feedback on the use cases presented?

Unfortunately, the feedback with regards to the use cases was a mixed bag. During the first SupTech (BDA), the topics were deemed to be not in line with their interests. Indeed, given that the main topic of the workshop was P2P lending, which is forbidden in Belgium. However, we were able to highlight how some of the graph-related techniques can be applied to other problems they might encounter. The feedback with regards to the AI workshop however was more positive. While once more they were of the opinion that the use cases given was not entirely in line with their core interests, we were able to adapt the material to suit their needs, alongside the programming use case for more technical users towards the end of the workshop.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

As previously mentioned, the overall feeling was that the use cases provided did not provide enough customization to satisfy the needs of the participants. However, the feedback provided was promptly adopted into our course delivery process and expectations were met. Belgium SupTech participants

The main contribution towards the management of the FINTECH project was in regular communication with the coordinator to ensure that the activities within the project were running as planned and in accordance with the execution of work taking place at other locations with the rest of the partners. This communication was done through the use of emails and teleconferences on regular intervals. JSI also contributed to the preparation of the Intermediate technical report for M1-M18.

I. Jozef Stefan Institute

1. Management-WP1

The main contribution towards the management of the FINTECH project was in regular communication with the coordinator to ensure that the activities within the project were running as planned and in accordance with the execution of work taking place at other locations with the rest of the partners. This communication was done through the use of emails and teleconferences at regular intervals. JSI also contributed to the preparation of the Intermediate technical report for M1-M18.

2. Big Data Analytics Research-WP2

Within WP 2-Big Data, JSI focused on the study and internal preparation of the presentations of Use-Cases prepared by other partners to ensure successful and in-depth execution of their presentation to its regulator. The team at JSI is also heavily involved in the Big Data research and used its extensive expertise in this field when preparing various activities for the Slovenian regulators-Banka Slovenije. Numerous meetings between the two institutions took place between M1-M18 of the project:

Meetings with the regulator in preparation of Big Data SupTech activities:

- January 9, 2019, 10:00-11:00
- Bilateral JSI-Banka Slovenije meeting at BS premises, Slovenska cesta 35, Ljubljana
- March 18, 2019, 11:00-12:00
- Bilateral JSI-Banka Slovenije meeting at BS premises, Industrijska cesta 1, Ljubljana
- May 10, 2019, 9:00-10:00
- Bilateral JSI-Banka Slovenije meeting at BS premises, Industrijski cesti 1, Ljubljana
- June 21, 2019, 13:00-14:00
- Presentation of FINTECH project at the Board meeting of Banka Slovenije, Slovenska cesta 35, Ljubljana
- October 22, 2019,
- Bilateral JSI-Banka Slovenije meeting at BS premises, Industrijska cesta 1
- In 2020 until M18, the majority of meetings between JSI and the Bank of Slovenia took place online or via telephone conversations in order to keep all involved persons up-to-date and fully informed regarding the status of the project.

3. Artificial Intelligence Research-WP3

Artificial Intelligence is the main research topic of the JSI team. During the period M1-M12, the JSI team published numerous scientific papers in this area. An effort was also placed in the study and internal preparation of the presentations of Use-Cases prepared by other partners in order to ensure successful and in-depth execution of their presentation to its regulator.

Between M12 and M18 of the project, an Artificial Intelligence Research SupTech was scheduled and fully prepared to take place. However, due to the COVID-19 epidemic and the consequent restrictions that were put in place as a result of the epidemic, the SupTech has been rescheduled for the autumn of 2020.

4. Blockchain Research-WP4

The Slovenian regulator-Banka Slovenije expressed the greatest interest with the topic of Blockchains. Upon their request, the first SupTech activity organized by JSI was an overview of Blockchain technology. External experts on this topic from the University of Primorska were invited as speakers to the full day workshop. The event was also organized as a promotion of the FINTECH project to the Slovenian regulator in order to ensure successful collaboration during the full duration of the project.

Meetings with Blockchain technology experts in preparation of the Blockchain SupTech activity:

- Lj March 19, 2019, 11:00-12:00 Bilateral JSI-University of Primorska meeting at JSI premises, Jamova 39, Lj Preparation of Blockchain SupTech

5. SupTech Workshops-WP5

Within the project period between M1-M18, JSI organized four SupTech activities on the topics of Blockchains, Big Data Analytics and Artificial Intelligence. The latter two were given by researchers within JSI, while the topic of Blockchains was covered by external Slovenian experts since the JSI team does not currently perform research in this topic. All SupTech workshops were recorded by the JSI award winning Videolectures.com, an academic online video repository, and at the disposal of the Slovenian regulator-Banka Slovenije.

SupTech activities:

- 1) May 27, 2019-SUPTECH WORKSHOP I-BLOCKCHAINS, Jožef Stefan Institute, Jamova 39, Ljubljana
- 2) June 20, 2019-SUPTECH WORKSHOP II-BIG DATA ANALYTICS, Jožef Stefan Institute, Jamova 39, Ljubljana
- 3) October 17, 2019-SUPTECH WORKSHOP III-ARTIFICIAL INTELLIGENCE and BIG DATA ANALYTICS, Jožef Stefan Institute, Jamova 39, Ljubljana
- 4) November 12, 2019-SUPTECH WORKSHOP IV-BIG DATA ANALYTICS-Use Cases-Banka Slovenija, Industrijska cesta 1, Ljubljana

Feedback SupTech Event

Following each event, JSI encouraged all participants to give feedback in order to improve future events and ensure that the topics and workshops are in-line with the needs of the regulator. Most of the feedback from participants was received in the form of verbal comments and suggestions at the end of the meetings. The representative of the regulator, Banka Slovenije, responsible for the FINTECH project also requested internal feedback from the participants and verbally reported them back to JSI. The communication between the Bank of Slovenije and JSI was continual during the entire period between M1-M18 of the project to ensure that the execution of the project ran smoothly and fulfilled the needs of the regulator as well as the requirements of the project. Additionally, an online form was filled by some

of the participants. Overall, the feedback was positive, with suggestions regarding which topics were of interest to the financial community of the regulator as well as the depth of technical detail needed for a deeper understanding of the topic while still being of interest to non-technical participants. As a result of the SupTech activities of the FINTECH project, the collaboration between the Banka Slovenije and the Jozef Stefan Institute has strengthened considerably, building on trust and common knowledge of the interdisciplinary topic of financial technology, while exploring various possibilities for further cooperation and collaboration.

J. University of Warsaw

1. Management-WP1

The management role of the coordinator of the Polish team was mainly focused on regular contacting the Polish Regulator to ensure fluent communication and planning of the training agenda and timing. It included meeting with the director of HR department on April 15th, meeting with the director of the Fintech department on May 28th and numerous telephone calls and emails exchanged. Regular communication was crucial to ensure that we clearly understand the specific needs of the Polish Regulator and can adjust the contents of the training to these needs. Also, the Polish regulator insisted on signing the additional agreement with the University of Warsaw, which also several iterations to achieve the consensus. The coordinator of the Polish team was the only person involved in the project in the first year. Since March 2020 two other participants were actively participating in the project. The role of the coordinator was therefore also to supervise their activities, including help in preparations of the blockchain SupTech materials.

2. Big Data Research-WP2

Research conducted within the BDA topic in WARSAW was strictly related to the needs and expectations expressed by the Polish regulator. We performed a literature review related to historical and methodological aspects of Big Data Analytics, the development of peer-to-peer lending and regulatory challenges, which results were used in the preparation of the first SupTech workshop materials.

3. Artificial Intelligence Research-WP3

Research conducted within the AI topic in WARSAW is related to the needs and expectations expressed by the Polish regulator. We performed a literature review related to explainable artificial intelligence in preparation to the second SupTech workshop. In addition we prepared a Shiny application to be presented on the SupTech workshop. which was initially presented on the WhyR 2019 conference in Warsaw.

- Wójcik Piotr, Koc Tomasz, presentation "Shiny application for algorithmic trading", Why R? 2019, Warsaw, 26-29.09.2019.

4. Blockchain Research-WP4

Blockchain research has started in April 2020. Based on the research article published in Physica A we prepared and presented a Shiny application on the Blockchain kick-off meeting hosted by ZHAW on June 20th 2020. The presentation was entitled: "Momentum and contrarian effects on the cryptocurrency market - an interactive shiny application". This application has been designed and implemented to extend the results presented in Kość, Sakowski, Ślepaczuk (2019) "Momentum and contrarian effects on the cryptocurrency market", Physica A 523 (2019) 691-701.

The application is available online at the address: <http://coin.wne.uw.edu.pl/sakowski/fintech2020-app.html>

Its very initial version was presented on the WhyR 2019 conference:

- Sakowski Paweł, Ryś Przemysław, presentation "A Shiny Real-time Application for Backtesting Investment Strategies on Regulated and Crypto Markets", Why R? 2019, Warsaw, 26-29.09.2019.

Three articles in progress:

- Sakowski Paweł, Turovtseva Anna, "Verification of investment opportunities on the cryptocurrency market within Markowitz framework"
- Sakowski Paweł, Turovtseva Daria, "Does Bitcoin improve investment portfolio efficiency?"
- Kryńska Katarzyna, Ślepaczuk Robert, "The volatility forecasting on the cryptocurrency market"

5. SupTech Workshops-WP5

- 1) SupTech I, The Polish Financial Supervision Authority (UKNF), Warsaw, 19-20.08.2019. Topic covered: Big Data Analysis and machine learning with applications to p2p lending; three Use-Cases presented

The employees of the FinTech department in the Polish Financial Supervision Authority (UKNF) are lawyers, who had no prior knowledge of machine learning methods and did not know much also about statistics. Therefore, knowing that in advance, the SupTech workshop materials prepared for UKNF were extended by the general description of reasons why (big) data should be analysed, the overview how data is used in statistical models to give the participants some general background and better understanding of more advanced topics. The use cases presented did not seem to be useful for everyday practice of the FinTech department. However, employees from other UKNF departments (including the risk department) also participated in the BDA SupTech workshop and found presented research very interesting. Polish national regulator did not agree to invite for the SupTech workshop participants from other institutions or fintech companies.

- 2) SupTech II workshop on AI applications in finance was initially scheduled for March 2020, but due to the COVID-19 outbreak was postponed for later. The Polish Financial Supervision Authority (UKNF) prefers

traditional form of the meeting, but all training activities in UKNF are stopped until the end of August 2020. We agreed to contact at the beginning of September 2020 to finally discuss the form and date of the SupTech workshop on AI.

K. University of Rijeka

1. Management-WP1

- 1 February 2019 Kick-Off Meeting, Pavia, Italy
- 22-26 January 2019 Haindorf Seminar 2019, Humboldt-Universität zu Berlin, Hejnice, Czech Republic
- 15 February 2019 Kick-Off and Coordination Meeting with HANFA (Croatia)
- 22 March 2019 organized visit and Workshop for University of Rijeka bachelor and master students to Croatian financial markets regulator (HANFA) and Croatian National Bank (CNB) which introduced the students to the FinTech project (Croatia)
- 22 March 2019 SupTech Workshop BDA I Credit risk in P2P Lending (HANFA, Croatia)
- 29 March 2019 SupTech Workshop BDA I Credit risk in P2P Lending (HANFA, Croatia)
- 29 March 2019 Reg-Tech FINTECH workshop 1 on credit risk modeling, "Big Data Analysis", Milano, Italy
- 05 April 2019 SupTech Workshop BDA I Credit risk in P2P Lending (HANFA, Croatia)
- 12 April 2019 SupTech Workshop BDA I Credit risk in P2P Lending (HANFA, Croatia)
- 02-04 June 2019 Economics of Digital Transformation (2018) DIGITOMICS Conference, Opatija, Croatia
- 26-27 June 2019 Workshop „BIG DATA ANALYTICS KNOWLEDGE EXCHANGE PLATFORM“, Deutsche Bundesbank, Frankfurt, Germany
- 28 June 2019 Reg-Tech FINTECH workshop 2, Big data, analytics, P2P lending platforms and credit risk, Frankfurt, Germany
- 03 September 2019 1st Research Workshop on Big Data and Risk Management, Reg-Tech FINTECH, Winterthur, Switzerland
- 04 September 2019 3rd RegTech session on AI in Finance, Reg-Tech FINTECH, Winterthur, Switzerland
- 05 September 2019 4th European Conference in AI in Finance and Industry, Reg-Tech FINTECH, Winterthur, Switzerland
- 27 September 2019 Working meeting with Croatian regulator (HANFA) and blockchain entrepreneurs (HANFA, Croatia)
- 27 September 2019 “Invest CRO”, Zagreb, Croatia

- 10 October 2019 “AI 2 Future” AlgebraLab, Zagreb, Croatia
- 14-15 November 2019 Intermediate Research Workshop, Big Data, AI and Blockchain, Bucharest, Romania
- 21 November 2019 Coordination meeting with HANFA, Croatia
- 22 November 2019 SupTech Workshop BDA II AI, Market Risk and RoboAdvisory (HANFA, Croatia)
- 05 December 2019 Panel discussion and brainstorming session with Croatian regulator (HANFA) and blockchain entrepreneurs (HANFA, Croatia)
- 06 December 2019 SupTech Workshop BDA II AI, Market Risk and RoboAdvisory (HANFA, Croatia)
- 6 December 2019, FinTech Workshop for the general public “What is Bitcoin-Digital money of 21st century”, Faculty of Economics and Business University of Rijeka, Rijeka, Croatia
- 13 December 2019 SupTech Workshop BDA II AI, Market Risk and RoboAdvisory (HANFA, Croatia)
- 19 May 2020 Fintech Workshop on AI, Financial Automation and Market Risk, University College London, London, UK
- 24-26 June 2020 Organizer and part of Program Committee for “International Scientific Conference (Economics of Digital Transformation - EDT) 2020 DIGITOMICS”, Opatija, Croatia – Horizon 2020 research and innovation program FIN-TECH was named as the official conference Partner
- 24-26 June 2020 Chairman of the “FINTECH” session at International Scientific Conference Economics of Digital Transformation (EDT) 2020 DIGITOMICS

2. Big Data Research-WP2

Research conducted within the BDA topic in Croatia was predominately related to the stated needs of the Croatian financial markets regulatory agency (HANFA). HANFA’s needs related mainly to literature overview of Big Data analytics, the historical development of peer-to-peer lending and regulatory challenges. The requested results and highlights were presented during the BDA SupTech workshops to HANFA.

Preparation of the use cases:

- The use cases were always reviewed and executed beforehand so that an overview could be presented to the regulators in meetings before each SupTech workshop.
- While the regulators pointed out the initially proposed use cases lied outside their area of focus and expertise, they did display interest in the topics and proposed amendments to the agenda.
- A series of additional use cases, written by University of Rijeka team members were also presented alongside the joint presentations. In this manner, the Croatian regulator had a broader choice of cases and access to a wider range of research topics.
 - Statistics of Financial Markets

- Duration, modified duration and convexity
- Models for Limited Dependent Variables
- Logit and Multiperiod Logit Models; application to forecasting business insolvencies
- Working out an example from Tomas Žiković, Ivana: Challenges in Predicting Financial Distress in Emerging Economies: The Case of Croatia, Eastern European Economics, 56 (2018), 1; 1-27.
- Value at Risk methodology for measuring Market Risk
- Value at Risk methodology for measuring Credit Risk
- Blockchain asset market: Sectoral analysis of a portfolio

Dissemination:

University of Rijeka team focused on three groups of people to promote the FinTech project:

- o The national regulator-Croatian Financial Services Supervisory Agency (HANFA).
- o Local industry and financial entities, including the Association for Blockchain and Cryptocurrencies (UBIK).
- o Academia, including colleagues from the University of Rijeka and the Centre for support to smart and sustainable cities. One of the main hubs for the exchange of ideas among academia, regulators and industry is the Economics of Digital Transformation DIGITOMICS conference. The conference is organized by the University of Rijeka and H2020 Fintech is one of the main partners.

Feedback and improvement of the paper/ code/ analysis

- o Most of the results were received in the form of verbal feedback at posterior meetings.
- o An additional online form was filled by the participants from HANFA
- o At the opening meeting with the regulator, it was brought to our attention that they consider some of the cases too complex and technical. Based on this input and further consultations with the regulator University of Rijeka team prepared additional cases and introduction to certain statistical and econometrical methods in order to comply with the regulator's request.

3. Artificial Intelligence Research-WP3

Dissemination:

University of Rijeka team focused on three groups of people to promote the FinTech project:

- o The national regulator-Croatian Financial Services Supervisory Agency (HANFA).
- o Local industry and financial entities, including the Association for Blockchain and Cryptocurrencies (UBIK).

- Academia, including colleagues from the University of Rijeka and the Centre for support to smart and sustainable cities. One of the main hubs for the exchange of ideas among academia, regulators and industry is the Economics of Digital Transformation DIGITOMICS conference. The conference is organized by the University of Rijeka and H2020 Fintech is one of the main partners.

Preparation of the use cases

- One whole meeting was dedicated to discussing the potential consequences and implications of wider adoption of AI technology to governing regulation and public perception.
- An online form was filled by the participants
- The feedback with regards to AI tutorial was better compared to Big Data analytics in the sense that it had a more realistic learning curve. They were generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two tracks could be constructed, one for the classical regulators and one only for quants.

4. Blockchain Research-WP4

Preparation of the Use Cases:

- We have begun work on a research paper regarding fraudulent cryptocurrency optimization taking into account the sectors they belong to as well as the sophistication of cryptocurrencies. The paper is finished and submitted to Open access Q1 financial journal “Journal of Financial Markets, Institutions and Money”.

Papers:

- Žiković Saša, Čuljak Maria, Tomić Bojan: Benefits of Sectoral Cryptocurrency Optimization. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3661600 (open access)

5. SupTech Workshops-WP5

- 1) SupTech I, Croatian Financial Services Supervisory Agency (HANFA), 22 March, 29 March, 05 April and 12 April 2019. Topic covered: Big Data Analysis; three Use-Cases presented:
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) UseCase III: Spatial Regression Scoring Model

Feedback

- I. Credit Risk in P2P Lending – ZAGREB – Croatian financial markets regulatory agency (HANFA) – MARCH 22 2019

- Parties participating, their roles and their responsibilities

University of Rijeka, HANFA, Croatian National Bank (CNB), HANFA Officers, CNB Officers, University of Rijeka,

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by the University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two tracks could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, but the regulator considers some of the cases too complex and technical. Based on this input and further consultations with the regulator University of Rijeka team prepared additional cases and introduction to certain statistical and econometric methods in order to comply with the regulator's request.

II. Credit Risk in P2P Lending – ZAGREB – Croatian financial markets regulatory agency (HANFA) – MARCH 29 2019

- Parties participating, their roles and their responsibilities

University of Rijeka, HANFA, Croatian National Bank (CNB), HANFA Officer, CNB Officers, University of Rijeka.

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International

Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by the University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two tracks could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, but the regulator considers some of the cases too complex and technical. Based on this input and further consultations with the regulator University of Rijeka team prepared additional cases and introduction to certain statistical and econometric methods in order to comply with the regulator's request.

III. Credit Risk in P2P Lending – ZAGREB – Croatian financial markets regulatory agency (HANFA) – APRIL 5 2019

- Parties participating, their roles and their responsibilities

University of Rijeka, HANFA, Croatian National Bank (CNB), HANFA Officer, CNB Officers, University of Rijeka

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two tracks could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, but the regulator considers some of the cases too complex and technical. Based on this input and further consultations with the regulator University of Rijeka team prepared additional cases and introduction to certain statistical and econometric methods in order to comply with the regulator's request.

IV. Credit Risk in P2P Lending – ZAGREB – Croatian financial markets regulatory agency (HANFA) – APRIL 12 2019

- Parties participating, their roles and their responsibilities :

University of Rijeka, HANFA, Croatian National Bank (CNB), Association for Blockchain and Cryptocurrencies (UBIK), HANFA Officers, CNB Officers, University of Rijeka, UBIK.

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by the University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two tracks could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, but the regulator considers some of the cases too complex and technical. Based on this input and further consultations with the regulator University of Rijeka team prepared additional cases and introduction to certain statistical and econometric methods in order to comply with the regulator's request.

- 2) SupTech II Workshop, Croatian Financial Services Supervisory Agency (HANFA), 22 November, 05 December, 06 December and 13 December 2019. Topic covered: AI, Market Risk and Robo Advisory; five use cases presented:
 - a) Use case I
 - b) Use case II
 - c) Use Case III
 - d) Use Case IV
 - e) Use Case V

Feedback

- I. AI, Market Risk, Roboadvisory – ZAGREB – Croatian financial markets regulatory agency (HANFA) – NOVEMBER 22 2019

- Parties participating, their roles and their responsibilities:

University of Rijeka, Libertas University, HANFA, Croatian National Bank (CNB), Association for Blockchain and Cryptocurrencies (UBIK), HANFA Officers, CNB Officers. University of Rijeka, Libertas University.

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by the University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, the selected Usecases and topics have been commonly chosen but had to be supplemented with materials University of Rijeka produced in order to provide an easier introduction to the topic.

II. AI, Market Risk, Roboadvisory – ZAGREB – Croatian financial markets regulatory agency (HANFA) – DECEMBER 6 2019

- Parties participating, their roles and their responsibilities

University of Rijeka, Libertas University, HANFA, Croatian National Bank (CNB), Association for Blockchain and Cryptocurrencies (UBIK), HANFA Officers, CNB Officers. University of Rijeka, Libertas University.

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two track could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, the selected Usecases and topics have been commonly chosen but had to be supplemented with materials University of Rijeka produced in order to provide easier understanding of the main topic.

III. AI, Market Risk, Roboadvisory – ZAGREB – Croatian financial markets regulatory agency (HANFA) – DECEMBER 13 2019

- Parties participating, their roles and their responsibilities:

University of Rijeka, Libertas University, HANFA, Croatian National Bank (CNB), Association for Blockchain and Cryptocurrencies (UBIK), HANFA Officers, CNB Officers. University of Rijeka, Libertas UniversityBIK

- The role of the participants

Head of Systemic Risk Department, Deputy Head of Funds and Investment Firms Supervision Division, Head of Insurance, Leasing and Factoring Supervision Division officer, Deputy Head of International Regulations and Cooperation Department, Head of Funds and Investment Firms Supervision Division, Deputy Head of Pension Funds Supervision Department, Insurance Supervision Department officer, Investment Funds and Investment Firms Supervision officer, Expert.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by HANFA or by University of Rijeka.

- What is their feedback on the use cases presented?

Generally satisfied but had some complaints regarding the very steep learning curve that is expected from them to be able to follow and implement the presented cases. Some participants suggested that maybe two-track could be constructed, one for the classical regulators and one only for quants.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, the selected Usecases and topics have been commonly chosen but had to be supplemented with materials University of Rijeka produced to provide an easier understanding of the main topic.

6. Dissemination-wp7

The University of Rijeka has presented the project and research outcomes in:

- Seminars held at the University of Rijeka premises (December 6th, 2019) that have been publicly announced in the University.
- We have presented one of the research outcomes at the June 26-27, 2019 Workshop „Big Data Analytics Knowledge Exchange Platform“, Deutsche Bundesbank, Frankfurt, Germany.

- Team members from University of Rijeka and Humboldt University teams presented their findings at the International scientific conference Economics of Digital Transformation DIGITOMICS (2019) organized by University of Rijeka in Opatija, Croatia.
- We organized a special session as part of Economics of Digital transformation (EDT) DIGITOMICS 2019 INTERNATIONAL CONFERENCE, Opatija, Croatia, 02-04/06/2019, where consortium partners presented their research made for the FinTech project was presented to General public, Regulators and FinTechs.
- Our team members presented the FinTech project and findings at „AI 2 Future“Algebra Lab, an event that brings together the FinTech community from the region (October 2019)
- We participated at 4th „Invest CRO“ a conference on attracting investments in new financial products and digital sector (September 2019)
- Organized a workshop for the general public at University of Rijeka „What is Bitcoin-Digital money of 21st century“, Faculty of Economics and Business University of Rijeka, Rijeka, Croatia (December 2019), [Link1](#), [Link2](#);
- Organized visit and workshop for University of Rijeka students to Croatian regulator (HANFA) and Croatian National Bank in order to introduce them to FinTech project, 22nd March 2019, (Hanfa headquarters, Croatia)
- We regularly post all our activities regarding FinTech project activities on the LinkedIn platform and have very high visibility (average is 1.700 views per post)
- University of Rijeka team leader gave an interview to the state national broadcaster about the FinTech project (17/03/2019):⁵
- Croatian regulator (HANFA) published several announcements and news (in Croatian and in the English language), for example [Weblink](#), [LinkedIn post](#).
- As one of the results of our FinTech project Croatian regulator HANFA launched the 1st FinTech innovation hub: [Fintech Innovation Hub – en](#), [Fintech Innovation Hub- hr](#)
- Together with Croatian regulator HANFA published a call for best BA and MA final papers on “Sustainable Finance” promoting Sustainable finance and FinTech as a disruptor to the classical financial industry.
- 24-26 June 2020 Organizer and part of Program Committee for “International Scientific Conference (Economics of Digital Transformation - EDT) 2020 DIGITOMICS”, Opatija, Croatia – Horizon 2020 research and innovation program FIN-TECH was named as the official conference Partner
- 24-26 June 2020 presented the paper “VALUE OF PICKING SECTORS IN CRYPTOCURRENCY OPTIMIZATION” as part of “FINTECH” session at International Scientific Conference Economics of Digital Transformation (EDT) 2020 DIGITOMICS

- 06-16 July 2020 Lecturer at the „International Environment and European Integration”, International Summer School, topic: “EU HORIZON 2020 PROJECTS, FINTECH AND SUSTAINABILITY OF FINANCIAL SERVICES”, University of Rijeka.

L. Universidad Complutense de Madrid

1. Management-WP1

Participation in the events, discussions, and board meetings of:

- Kick-off Workshop, 1st of February 2019, official project kick-off, Pavia (Italy)
- 1st Validation and Research Workshop on Big Data, 3rd of September 2019, Winterthur (Switzerland)
- FINTECH project management board meeting, 15th November 2019, Bucharest (Romania).
- FINTECH project management board meeting, 18th May 2020, University College London-UCL, online
- An approximately biweekly meeting of 1 hour in the Department of Computer Science at the UCM to establish the communication strategy and evaluate the response of the three national regulators involved against the participation of the events giving effect to the activities of WP2, WP3 and WP4.
- Preparation, translation and adaptation of case summaries so that they are attractive to regulators and supervisors face-to-face, telephone or email contact to each of the three national regulators to motivate the seminars associated with WP2, WP3, WP4 or to guide and guarantee the evaluation of the seminars held. One contact per month approximately.
- Reporting administrative and budgetary requested by the coordination of the project and UCM administrators.
- UCM-Spain has involved in the project four national organizations and regulators: Bank of Spain, National Commission for the Securities Market-CNMV, the Public Treasury, and the General Insurance and Pension Funds Directorate.
- Regarding industry, UCM has held regular contact with AEFI (Spanish Fintech and Insurtech Association) and Santander Bank.

2. Big Data Analytics Research-WP2

Research on interpretability and explainability of machine learning credit scoring in p2p lending. This research was triggered by the discussion held during the “Spanish SupTech I-Credit risk in p2p lending” in June 2019. Bank of Spain was interested in the topic and suggested UCM to investigate that field.

Publications

Ariza, M., Arroyo, J., Caparrini, A. and Segovia M. (2020). Explainability of a machine learning granting scoring model in p2p lending. IEEEAccess 8, 64873- 64890.
<https://ieeexplore.ieee.org/document/9050779/> (open access)

Presentations:

- 22nd May 2019. 22 May. Presentation of the project FIN-TECH Ho2020. Computer Science Faculty, Universidad Complutense de Madrid. Madrid
- 19th May 2020. Lecture in the Fintech Workshop on AI, Financial Automation and Market Risk. Prof. Javier Arroyo. “Explainability of a Machine Learning Granting Scoring Model in Peer-to-Peer Lending”. University College London-UCL, online.

Preparation of the Use Cases:

Our objective was presenting different data science methodologies as alternatives to manage credit risk in novel products such as p2p lending and to model and analyse contagion and financial stability.

The steps in the use case seminar process covered the following activities.

- Case-papers reading.
- Preparation of cases including the review of associated literature.
- Translation and preparation of case presentations and codes.
- Sending case summaries to the regulator
- Sending the papers of the cases to the regulator
- Gathering the feedback (questions and topics of interest) from the regulators about the use cases.
- Preparation of the answers of the regulator's questions to be discussed at the workshop event. This point included an extensive conceptual review of the case-related literature, and even a review of complementary literature not covered in the cases used about, for example, explainability.
- Preparation of a feedback report including comments within the workshops, the discussion session and documents prepared by regulators.
- Research about risk scoring and explainability in p2p lending (see the paper listed above).

Additionally, we participated in the Kick-Off Meeting in Pavia (1st February 2019), Bucharest Mid-Term Workshop (15 November 2019) and in the different board management meetings of the project.

3. Artificial Intelligence Research-WP3

Research on how machine learning can help to assess the risk in Venture Capital investments. However, the work cannot be proposed as a use case, because data is proprietary (from Crunchbase) and the intellectual property of the source code developed belong to a Venture Capital firm that commissioned the work.

Publications

- J. Arroyo, F. Corea, G. Jimenez-Diaz and J. A. Recio-Garcia. (2019). Assessment of Machine Learning Performance for Decision Support in Venture Capital Investments. IEEE Access, vol. 7, pp. 124233- 124243 DOI: 10.1109/ACCESS.2019.2938659 (open access)

Presentations:

- 11th November. Seminar: Prediction of success in early stage start-ups using machine learning. Computer Sciences Faculty UCM, Madrid.
- 15th November. Talk at the Mid-Term Research Bucharest Workshop “Prediction of success in early-stage start-ups using machine learning” at the Bucharest University of Economic Studies, Bucharest.

Preparation of the Use Cases

Our objective was presenting different data science methodologies as alternatives to measure and evaluate dynamics of contagion and to identify determinants (political, macroeconomic and contagion factors) of sovereign risk.

The steps in the use case seminar process covered the following activities.

- Case-papers reading
- Preparation of cases including associated literature
- Translation and preparation of case presentations and codes
- Sending case summaries to supervisors and regulators
- Preparation of feedback report including comments within the workshops, to the discussion session and documents prepared by regulators.

4. Blockchain Research-WP4

Research on characterizing the different behaviour of cryptocurrencies. We are currently writing a paper about the clustering of cryptocurrencies to be considered as a use case for the Blockchain part. We devoted time to data collection, literature review, study about the methodologies, and programming. We aim to finish the paper by September 2020 and submit it to an open access journal.

5. SupTech Workshops-WP5

- 1) SupTech I, Bank of Spain, Madrid, 10 June and 26 of June 2019. Topic covered: Big Data Analysis; five Use-Cases presented
 - a) Use case I: Network based scoring models to improve credit risk management in P2P lending
 - b) Use case II: Factorial network models to improve P2P credit risk management.
 - c) Use case III: Spatial regression models to improve P2P credit risk management
 - d) Use Case IV: Loan screening and default prediction with machine learning and deep neural networks
 - e) Use case V: Measuring bank contagion in Europe using binary spatial regression models.

Feedback

- Parties participating, their roles and their responsibilities:

First Session: Division of Financial Innovation, Financial Risks, Market Conduct and Complaints Department.

Second Session: Financial Stability and Macroprudential Policy Department, Division of Financial Innovation, Financial Risks, Market Conduct and Complaints Department.

- The role of the participants:

Directors, Head of Division, Transparency regulations head of unit, Experts, Technical staff, Head of the New Products and Services Unit, IT Risk Supervisor, Head of unit, IT auditor, Data Analyst and Analysts in general, at the first session. Head of Division, advisors and economists, and their background were focused on statistics and econometrics, at the second session.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, taking into account that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU

countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events. and two of them finally attended to the Fintech Workshop on AI, Financial Automation and Market Risk in May 2020.

They have contacted us to have meetings to discuss our progress on explainable artificial intelligence applied to credit risk modelling to exchange knowledge.

- What is their feedback on the use cases presented?

In general, the participants think that the activity was fruitful, there was good acceptance and detailed discussion of the cases, of the validation of the ML models and on the potential behind these models and their risks embedded. An aspect that they consider relevant for the models presented in the cases is sensitivity analysis, which allows simulating shocks on the included variables and identifying the most affected companies or banks, which allows them to foresee measures in that case of relevant consequences.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, and they show a special interest in the ML and AI interpretability topic. They consider it extremely important for the models to be explainable from a theoretical point and with parameter values reasonable. To illustrate this argument, they say that they test a wide battery of models, they discard all those in which the signs of the variables do not make sense. They also suggest studying the interconnections of banks with other financial actors.

- 2) SupTech II, CNMV Madrid, 2 December 2019. Topic covered: AI, Market Risk and Robo Advisory; two use cases presented
 - a) Use case I: Convergence and Divergence in European Bond Correlations.
 - b) Use case II: Sovereign risk zones in Europe during and after the debt crisis.

Feedback

- Parties participating, their roles and their responsibilities:

Studies and statistics department, Secondary market department. Remote investment services companies supervision (ESI), Department of authorization and entity records (DARE)

- The role of the participants:

Deputy Director of financial stability, Head of Division, Data analysts, Officer, Statisticians, Analysts, Technicians, Inspector.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, taking into account that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events.

- What is their feedback on the use cases presented?

In general, the participants think that the activity was fruitful. An aspect that they consider relevant for the models presented in the cases is sensitivity analysis, which allows simulating shocks on the included variables and identifying the most affected companies or banks, which allows them to foresee measures in that case of relevant consequences.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes. In general, they consider that the topics shown provide tools to participants to improve their analysis and understanding the dynamics of financial markets, with a special focus on financial stability issues.

3) SupTech I, Public Treasury. Ministry of Economy and Business, Madrid, January 20, 2020. Topic covered: BDA, Contagion and financial stability. The main topic discussed is the estimation of the risk of interbank contagion due to bankruptcy before and during the sovereign debt crisis; use-Case presented

- a) Use case V: Measuring bank contagion in Europe using binary spatial regression models.

Feedback

- Parties participating, their roles and their responsibilities:

General Secretariat of the Treasury and Financial Policy.

- The role of the participants:

Head of Division, advisors and economists.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, considering that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events.

- What is their feedback on the use cases presented?

In general, the participants think that the activity was valuable. They agree that the legal status of bankruptcy insolvency, dissolution and liquidation are appropriate, but find that by not including bank rescue or banks under stress that were publicly recapitalized or merged with another entity, the default event is underestimated and, therefore, the risk of contagion is underestimated as well. With the same purpose, they suggest that when updating the study in a longer window, also new policies and strategies associated with reducing the risk of bank failure should be considered. For example, ring-fencing, because its impact can be evaluated in combination with different conceptions of contagion and new measurement alternatives.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes. They consider very interesting the use of Machine Learning tools and the use of other types of information (Big Data) for estimating interbank contagion. Consider the use of spatial econometrics in the presentation and display of results to be appropriate, although not so novel.

- 4) SupTech II, Public Treasury. Ministry of Economy and Business, Madrid, February 18, 2020. Topic covered: AI, Market Risk and Robo Advisory; two use cases presented
 - a) Use case I: Convergence and Divergence in European Bond Correlations.
 - b) Use case II: Sovereign risk zones in Europe during and after the debt crisis.

Feedback

- Parties participating, their roles and their responsibilities:

General Sub-Directorate for Public Debt Management.

- The role of the participants:

Statistician, analyst.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, considering that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events.

- What is their feedback on the use cases presented?

The participants appreciate having instruments that allow them to understand the transmission of effects by different political phenomena, as well as making markets segments for varying periods. However, they suggest using models that include control variables around the differences associated with markets. These variables recognize to every specific market strengths and limitations to have a more robust estimation of contagion.

In the second case, they value the model very highly because you define risk routes and segments, including dynamic estimates of contagion. They also consider that it would be good to be able to determine the meaning of the divergence with quantitative measures and not only with the maps. They also suggest to perform the same sovereign risk analysis before the crisis. Likewise, they suggest a comparison not only of two moments, crisis and post-crisis but also to include pre-crisis moment. They considered that by not covering this period, the effects associated with the policies of governments and the European Union might be overestimated.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes. They consider that the topics shown provide tools to participants to improve their analysis and understanding the dynamics of financial markets.

- 5) SupTech I, Dir. Gral. of Insurance and Pension Funds. Ministry of Economic Affairs and Digital Transformation, Institute of Fiscal Studies-Online, Madrid, June 9, 2020. Topic covered: BDA, Contagion and financial stability; two use-Cases presented
 - a) Use case III: Spatial regression models to improve P2P credit risk management
 - b) Use case V: Measuring bank contagion in Europe using binary spatial regression models

Feedback

- Parties participating, their roles and their responsibilities:

Balance sheet and risk analysis area, Inspection equipment, Subdirectorate General for Solvency, Area of Studies.

- The role of the participants:

Directors, head of division, informatics and state insurance inspectors.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, considering that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events.

- What is their feedback on the use cases presented?

There were not many comments on the cases, only that the methodologies could be applied to predict default and support premium estimates in the area of insurance.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Although specifically, the cases are not directly applicable in their areas, they consider that they show some developments and ideas that allow them to glimpse the advance that data analysis has had in risk management, along with the possibilities that they could take advantage of with the amount of data and the varied information that they receive from the companies' reports.

- 6) SupTech II, Dir. Gral. of Insurance and Pension Funds. Ministry of Economic Affairs and Digital Transformation, Institute of Fiscal Studies-Online, Madrid, June 16, 2020, and June 23, 2020. Topic covered: AI, Robo Advisory and Market Risk Sovereign Risk and AI Explainability; four use-Cases presented
 - a) Use case I: Convergence and Divergence in European Bond Correlations.
 - b) Use case II: Sovereign risk zones in Europe during and after the debt crisis.
 - c) Use Case III_V: Network Models to Enhance Automated Cryptocurrency Portfolio Management
 - d) Use case IV_X: Explainable AI in Fintech Risk Management

Feedback

- Parties participating, their roles and their responsibilities:

Balance sheet and risk analysis area, Inspection equipment, Subdirectorate General for Solvency, Area of Studies.

- The role of the participants:

Directors, head of division, informatics and state insurance inspectors.

- How will they stay involved?

They have access to the platform to see the exposed cases, other use cases and all the tools and material provided by the project. They receive the papers with the use cases, the presentations and the codes as material derived from the seminars. They receive continuous sending of the summaries of other use cases, from the different WPs, to evaluate their interest and the possibility of new seminars, considering that they are different regulatory bodies and different departments. We are committed to providing participants with a report that collects comments and feedback from the same seminars in other EU countries. We share our publications so that they can see results of the feedback given, collect feedback on their applied approach, and carry out knowledge transfer. They have been invited to participate in different SupTech and RegTech events.

- What is their feedback on the use cases presented?

They value the knowledge of alternative tools that allow their use to be transferred to other problems such as the prevention of money laundering taking into account similar patterns, the correlation of variables, together with patterns of transmissibility that could exist due to these events or others such as the financing of terrorism. To transfer the methodologies presented at the level of countries and markets as observation units, to companies in national contexts with internal or transnational operations.

Once again, explainable Artificial Intelligence is considered a key issue, not only for regulators but for the whole sector. It is deemed an essential component, together with ethics, to guarantee transparency and trust derived from its use. Explicability is one of the major levers of IA use, gaining not only in precision but in the understanding of how and why the new tools make decisions.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Although specifically, the cases are not directly applicable in their areas, they again consider that they show some developments and ideas that allow them to glimpse the advance that data analysis has had in risk management, along with the possibilities that they could take advantage of with the amount of data and the varied information that they receive from the companies' reports.

In particular, the Directorate General of Insurance appreciates the seminars, appreciates the disinterested commitment, the well-prepared sessions and the usefulness generated by the cases presented, showing them the potential that artificial intelligence can have for the analysis and risk management of the insurance market.

6. RegTech Workshops-WP6

UCM will organize a RegTech workshop on Blockchain use cases in Madrid and attended to the RegTech workshops in Milano, Frankfurt and ZHAW for networking purposes and to take ideas for preparing the RegTech workshop among other things. The feedback for the workshop is being used for the preparation of the Madrid RegTech workshop.

It is also worth mentioning that the RegTech in Madrid scheduled for June 2020 was postponed to the end of 2020 due to the consequences of COVID-19, and if it is not possible to do it physically, it will be organized online. The tentative date for the workshop is October 23rd, the following use cases will be presented through a hands-on /coding session:

- Use case I: Initial Coin Offerings: risk or opportunity? (Toma A. M., Cerchiello P. University of Pavia).
- Use Case II: A Statistical Classification of Cryptocurrencies. (Traian D., Wesselhöfft N., Härdlec W., Kolossiatis M., Yatracos Y. Bucharest University of Economic Studies, Humboldt University of Berlin, Singapore Management University, Tsinghua University, University of Cyprus).
- Use Case III: Libra or Librae? Basket based stable coins to mitigate foreign exchange volatility spillovers. (Giudici P., Leach T. and Pagnuttoni P. University of Pavia).
- A section of the RegTech day will be hosting the Management Board Meeting at which every partner has to participate with at least one representative member.

7. Dissemination-WP7

UCM has presented the project and research outcomes in seminars held at the UCM premises (May 22, 2019, and November 11, 2019) that have been publicly announced in the University. Furthermore, have presented one of the research outcomes at the Mid-Term Research Bucharest Workshop held in November 2019 and at the London Workshop in May 2020.

RegTech seminars have been disseminated through AEFI (Fintech and Insurtech Spanish Association) and Santander bank and the four national organizations and regulators: Bank of Spain, National Commission for the Securities Market-CNMV, the Public Treasury, and the General Insurance and Pension Funds Directorate.

SupTech seminars have been disseminated through the four main national economic and financial organizations: central bank, market regulator, treasury and the general insurance and pension funds directorate.

Also, we have contributed to the digital Strategy for Europe through participation in the consultation designed to Better Regulation principles gather stakeholders' views on policies to support digital finance, "Consultation on a new digital finance strategy for Europe / FinTech action plan". This consultation is structured in three sections corresponding to the priorities areas: The first section of the consultation seeks views on how to ensure that the financial services regulatory framework is technology-neutral and innovation-friendly, the second section invites stakeholder views on ways to remove fragmentation of the Single Market for digital financial services, and, finally, the third section seeks views on how best to promote a well-regulated data-driven financial sector. We completed and submitted the final records for this consultation on June 23, 2020.

M. University of Economics in Bratislava

1. Management-WP1

Preparation of meetings with regulator on schedule and content of project cooperation:

- 21.1.2019-National Bank of Slovakia 11:00-13:30.
- 7.3.2019-National Bank of Slovakia 13:00-15:00
- April 2019: Coordination of team at the EUBA and brainstorming on SupTech 1 workshop
- 21.-22.5.2019-coordination and organization of SupTech workshop
- January 2020 - Preparation of BDA SupTech workshop on 24 March 2020 and AI SupTech workshop for 25-26 March - postponed for COVID pandemic
- May 2020 - Preparation of BDA SupTech workshop AI SupTech workshop in June
- 22- 24 June 2020 - coordination and organization of SupTech workshops

2. Big Data Research-WP2

- 21. January 2019 National Bank of Slovakia-Bank and Financial Market Supervision Meeting
- 29. March 2019 Annual Meeting of Centre for Financial Innovations
- 11.-13. September Slovak Economic Association Annual Meeting

3. SupTech Workshops-WP5

- 1) SupTech I, Slovak National Bank, 21-22. May 2019. Topic covered: Big Data Analysis; three Use-Cases presented
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) Use Case III: Spatial Regression Scoring Model

Feedback

SupTech 1 workshop BDA-May 21-22, 2019

- Parties participating, their roles and their responsibilities:

National Bank of Slovakia.

- The role of the participants:

Director of the Financial Technology and Innovations Department, analyst of the FTI department, risk analyst, Senior Developer of Supervisory IS, Junior Supervisor-Insurance Supervision Section, Supervisory Inspector-Securities Market, Insurance and Pension Savings Supervision Department,

expert-Banking and Payment Services Supervision Department, risk analyst-Macroprudential Supervision Department.

- How will they stay involved?

Participants will stay involved through follow up communications and seminars, hosted by the UEBA and / or Centre for Financial Innovations.

- What is their feedback on the use cases presented?

Much appreciated concept of theoretical introduction and application via cases. Good discussion led to a set of suggestions for authors of all cases regarding methodology.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, despite the different backgrounds of participants.

2) 2nd SupTech workshop on AI, 22-23.June 2020,3 case studies were presented:

- a) Case study I: Artificial Intelligence for Robo Advisory to compute optimal asset allocations
- b) Case study II: Learning Clique Forests
- c) Case study III: Are Cryptocurrencies Connected to Forex? A Quantile Cross-Spectral Approach

3) 1st SupTech BDA workshop repetition for new employees of the Slovak National Bank and interested public on 24th June 2020. Three case studies covering topics on big data analysis were presented:

- a) Use Case I Network Based Scoring Models
- b) Use Case II: Clustered Scoring Models
- c) Use Case III: Spatial Regression Scoring Model

4. Dissemination WP7

UEBA has presented the project and research outcomes in seminars held at the UEBA (research seminars and EDAMBA doctoral conference held on 23-24 October 2019) that were publicly announced. Project and project outcomes were disseminated through the Fintech Innovation hub by the National Bank of Slovakia as well as through the Centre for Financial Innovations.

Short info about the FinTech workshops is published on the website of the UEBA as well as an article on Fintech project Kick off meeting in Pavia from 5.2.2019 (www.euba.sk)
Information about FinTech project and SupTech workshops as a part of the official presentation of UEBA research used for official purposes to business as well as academic partners.

N. Kaunas University of Technology

1. Big Data Research-WP2

Development of paper to be proposed as use case

a. Objective

Predict the direction of asset price instead of its value. This idea is based on the literature analysis and implemented for commodity price prediction using not only trading indicators, but also features derived from historical time-series. This could be used as a robo advisory tool to invest in commodities, for example, buying a futures contract.

b. Feedback and improvement of the paper/ code/ analysis

The code is prepared and finished. It implements two-class and three-class prediction models with features including trading indicators and time-series based features.

2. Artificial Intelligence Research-WP3

Publications

- Audrius Kabasinskas, Kristina Sutiene, Eimutis Valakevicius, Milos Kopa (2019) Dominance-based decision rules for Pension Fund Selection under different distributional assumptions. Submitted to Frontiers in AI in finance, accepted and publish in Mathematics (open access)

Preparation of the Use Case:

- Dominance-based decision rules for Pension Fund Selection under different distributional assumptions:
 - Main objective of case study is to create decision support background for pension fund selection. R code and test data are submitted. (Objective, Literature review, methodology, coding, application and report of the results).

- Shared with partners, presented at conferences (EURO conference, Dublin and seminar organized by Charles university, Prague) (Dissemination-sharing with partners, conferences, workshops)
- Feedback and improvement of the paper/ code/ analysis

3. Blockchain Research-WP4

Development of paper to be proposed

1. retrieval, cleaning and analysis of data, literature review for paper "Cryptocurrency arbitrage analysis"
2. Analysis of Bitcoin transactions traceability, code modification and use case preparation "Traceability of origin funds of transactions in Bitcoin blockchain"
3. data analysis for paper "Review of Bitcoin Improvement Proposals (BIP) and their effect on possible BTC integration with classical financial markets and institutions"

4. SupTech Workshops-WP5

- 1) SupTech I, Vilnius Bank of Lithuania, 21-22 March 2019. Topic covered: Big Data Analysis; three Use-Cases presented
 - a) Use Case I Network Based Scoring Models
 - b) Use Case II: Clustered Scoring Models
 - c) Use Case III: Spatial Regression Scoring Model
 - d) Introduction to Big data analytics, peer to peer lending, statistical learning from data, data and benchmark analysis

Feedback

- Parties participating, their roles and their responsibilities.

Bank of Lithuania, Latvian Financial and Capital Market Commission, Estonian Finantsinspeksioon

- The role of the participants

Manager, Analyst, Student, Head of department. The background of participants comes mainly from econometrics, finance, statistics, management.

- How will they stay involved?

Participants will stay involved through the H2020 portal where they can access the material, as well as through follow up communications and seminars organised in Lithuania as well. They have been invited to future SupTech and RegTech events. A useful topic would cover the SupTech on RegTech, especially

real mechanisms and functions in practice, less technical models. Also, the ways of using solutions in order to improve supervisory solutions and lessen administrative burden for market participants.

- What is their feedback on the use cases presented?

The participants showed a particular interest on the application of network credit scoring models. However, the market regulators were expecting more regulation linked presentations than analytics, as well as use cases demonstrating their application purposes regarding the market regulation. The utility of information provided was relatively high, in particular information on the SupTech on Big Data Analytics. Information on P2P lending was of less value for us as supervisors because of its rather mathematical and technical focus. We expected more realistic examples that could be used in our supervisory practices, including even ready-made solutions. Information was presented very explicitly and clearly, at the same time it was rather exact and specific for representatives of certain areas, i.e. those who have previously dealt with mathematical models or modelling.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes, the use cases and topics have been commonly chosen. A particular interest is received on network credit scoring models. In practice, the proposed cases would be more appropriate for the business area, in particular P2P lending, while the SupTech on Big Data Analytics – for supervisory functions in individual episodes. Examples could be less technical but more functional.

- 2) SupTech II, Finantsinspeksiõon, Tallinn, Estonia, 30-31 January 2020. Topic covered: Artificial Intelligence; six Use-Cases presented
 - a) Market structure discovery with clique forests
 - b) Convergence and Divergence in European Bond Correlations
 - c) Sovereign risk zones in Europe during and after the debt crisis
 - d) Are cryptocurrencies connected to forex? A quantile cross-spectral approach
 - e) Network models to enhance automated cryptocurrency portfolio management
 - f) Stochastic Dominance for pension funds

Feedback

- Parties participating, their roles and their responsibilities.

Financial and Capital Market Commission, Financial Instruments Market Division, Pension and Investment Funds Division Supervision Department, Regulatory Requirements and Statistics department, Supervision Department, IT, Legal and Licensing Department, Banking supervision, Licensing Division Legal and Licensing Department, Statistics and analysis division, Regulations and Statistics Department, Regulations and Statistics, Payment Systems, Financial Services Supervision Department.

- The role of the participants.

Chief supervision expert, supervision expert, Senior supervisory expert, Head of IT, Senior legal consultant, IS auditor, Senior Legal Consultant, Senior financial market analyst, Member of the Board, Director, Head of Payment systems policy division

How will they stay involved? Continuation of workshops would be explicitly useful regarding the possibilities of Artificial Intelligence in practice and using in exercising supervisory functions or data analysis with supervisory function.

- What is their feedback on the use cases presented?

The information provided on SupTech on Artificial Intelligence and Robot Advisory was more functional and valuable. The subject was very interesting and useful for exercising supervisory functions. Explainability of cases presented was sufficient to enable experts of other areas to become aware of their appropriateness and functionality as well as expand horizon. As supervisors we are interested in applying them in practice and supervisory functionality. This was an interesting topic for professionals in this area, enhancing technical knowledge and possibly applied in practice.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Yes. The utility of the presented use cases and information in our opinion was more appropriate to the professionals of this area. However, other participants had the opportunity to have a vision of the technical capabilities of the next generation related to the use of artificial intelligence. In general, we can admit that the workshop expanded our horizon in above areas.

3) SupTech II, Financial and Capital Market Commission, Riga, Latvia, 06 – 07 February 2020. Topic covered: the same as in 2)

Feedback

- Parties participating, their roles and their responsibilities

Financial and Capital Market Commission, Financial Instruments Market Division, Pension and Investment Funds Division Supervision Department, Regulatory Requirements and Statistics department, Supervision Department, IT, Legal and Licensing Department, Banking supervision, Licensing Division Legal and Licensing Department, Statistics and analysis division, Regulations and Statistics Department, Regulations and Statistics, Payment Systems, Financial Services Supervision Department.

- The role of the participants

Chief supervision expert, supervision expert, Senior supervisory expert, Head of IT, Senior legal consultant, IS auditor, Senior Legal Consultant, Senior financial market analyst, Member of the Board, Director, Head of Payment systems policy division.

- How will they stay involved?

Continuation of workshops would be explicitly useful regarding the possibilities of Artificial Intelligence in practice and using in exercising supervisory functions or data analysis with supervisory function.

- What is their feedback on the use cases presented?

The information provided on SupTech on Artificial Intelligence and Robot Advisory was more functional and valuable. The subject was very interesting and useful for exercising supervisory functions. Explainability of cases presented was sufficient to enable experts of other areas to become aware of their appropriateness and functionality as well as expand horizon. As supervisors we are interested in applying them in practice and supervisory functionality. This was an interesting topic for professionals in this area, enhancing technical knowledge and possibly applied in practice.

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- 1) SupTech II, Bank of Lithuania, Vilnius, Lithuania, 20 – 21 February 2020. Topic covered: the same as in 2)

Feedback

Parties participating, their roles and their responsibilities:

Financial and Capital Market Commission, Financial Instruments Market Division, Pension and Investment Funds Division Supervision Department, Regulatory Requirements and Statistics department, Supervision Department, IT, Legal and Licensing Department, Banking supervision, Licensing Division Legal and Licensing Department, Statistics and analysis division, Regulations and Statistics Department, Regulations and Statistics, Payment Systems, Financial Services Supervision Department.

- The role of the participants

Chief supervision expert, supervision expert, Senior supervisory expert, Head of IT, Senior legal consultant, IS auditor, Senior Legal Consultant, Senior financial market analyst, Member of the Board, Director, Head of Payment systems policy division.

- How will they stay involved?

Continuation of workshops would be explicitly useful regarding the possibilities of Artificial Intelligence in practice and using in exercising supervisory functions or data analysis with supervisory function.

- What is their feedback on the use cases presented?

The information provided on SupTech on Artificial Intelligence and Robot Advisory was more functional and valuable. The subject was very interesting and useful for exercising supervisory functions. Explainability of cases presented was sufficient to enable experts of other areas to become aware of their appropriateness and functionality as well as expand horizon. As supervisors we are interested in applying them in practice and supervisory functionality. This was an interesting topic for professionals in this area, enhancing technical knowledge and possibly applied in practice.

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5. Dissemination-WP7

- oral dissemination during EURO 2020 conference, 23-27.06. 2019
- dissemination during the meeting in Winterthur and Bucharest, 3-5.09.2019 and 14-16.09.2019
- presentation of H2020 project to students at faculty seminar, 08.10.2019
- presentation at a seminar organized by Charles university in Prague, 20.10.2019
- Oral presentation during B2B meeting at FintechInn Vilnius 2019, October 27-28, Vilnius (not included to main list of presenters)
- Annual meeting of young Lithuanian mathematicians, 2019.12.27, Kaunas
- Publication (in Lithuanian) in science dissemination journal “Science Lithuania”, news portal and university web page
- [FinTech plėtros europoje skatinimui-analogų neturintis ktu ir partnerių projektas, Mokslo Lietuva, 12 June 2019.](#)
- Publication (in Lithuanian) in science dissemination journal “Science Lithuania”, news portal and university web page
- [Fintech Plėtros Europoje Skatinimui-Analogų Neturintis KTU ir Partnerių Projektas, Mokslo Lietuva, 12 June 2019. URL.](#)
- Presentations at conferences, seminars, working group meetings etc.:
- oral dissemination during EURO 2020 conference
- dissemination during meeting in Winterthur and Bucharest
- presentation of H2020 project to students at faculty seminar
- presentation to participants of FintechInn Vilnius 2019 (not included to main list of presenters)
- presentation at seminar organized by Charles University in Prague
- Dissemination about SupTech AI in Tallinn
- dissemination of event in Riga
- dissemination of event in Vilnius
- dissemination of event and moderation of panel session: Programmable Digital Euro
- reservation of domain

0. Masaryk University

1. Management-WP1

Given that the Czech National Bank (CNB) is the main stakeholder and recipient of project activities in Czechia, Masaryk University's actions and project events reflect the official position of the Czech National Bank on the development of FinTech industry. Czech National Bank does not provide any technical or legal support to any FinTech firm or financial organization since it contradicts the principle of market competition and the same fair conditions for regulated businesses. FinTech firms have to function within the existing legal framework, usually applying for payment institution license. Moreover, the implementation of blockchain technologies in financial services is deemed non-transparent and beyond current regulatory standards. Bitcoin and other cryptocurrencies are not considered electronic money, financial asset or payment facility; thus, the Czech National Bank does not regulate them in any capacity (does not fall under the jurisdiction of the central bank). As a result, unlike many other EU states, Czechia does not have or actively prepare any specific legislation or regulation of digital assets.

The management role of the coordinator of the MUNI team is to arrange meetings with the central bank and FinTech firms, plan training events and agendas and coordinate research activities. The Czech National bank is very active in discussing the contents of workshops, suggesting specific topics for training and discussing the relevance of the use cases to the activities of the bank. First official meeting with the managers of the Czech National Bank was held on January 25, 2019, in the Czech National Bank Headquarters in Prague. Most discussions beyond SupTech workshops happened via phone or e-mail.

Additional effort was put into providing Czech FinTech firms with the unofficial platform to present their analytical tools to the participants of workshops (all employees of the Czech National Bank). For this reason, we sought out the support of the Czech Fintech Association. The first meeting with the CEO Maria Staszkiewicz took place on March 13, 2019, in Prague. Closer cooperation was achieved with the following firms: payment service Twisto, online invoice financing platform Roger and Bulletproof AI, a FinTech security consulting firm.

We also took part and contributed to the management meetings at the network level: Kick-Off Meeting in Pavia (February 1, 2019), 1st Validation and Research Workshop in Winterthur (September 3-4, 2019), Intermediate Research Workshop in Bucharest (November 14-15, 2019) and First Fintech Workshop on AI, Financial Automation and Market Risk in London (May 18-19, 2020).

2. Big Data Research-WP2

The following publication is under review (submitted with the possibility of open access, available upon request):

- Lyocsa, S. and P. Vasanicova (2019). Default or Profit Scoring Credit Systems? Evidence from an Emerging High-Risk P2P Loan Market. 42 p.

We propose a profit-scoring decision support system, which is dynamically updated and is based on modelling an annualized adjusted internal rate of return of a loan. Using data on loans from an emerging European P2P market, we document that in an out-of-sample framework, our approach overwhelmingly dominates standard credit scoring models which aim to label loans as either defaulted or not. Even if we take data-snooping bias into account, we find that realized returns tend to be significantly, almost 2:5 times higher while using our profit scoring approach compared to the standard credit-scoring model. Finally, as our results are robust across different modelling choices, we conclude that the management of

credit risk can be significantly increased by designing systems that model profitability instead of loan's (non)failure.

Research results, including a literature review and overview of methodological approaches, were also used for the preparation of the SupTech Workshop BDA I.

3. Artificial Intelligence Research-WP3

Development of paper to be proposed as use case

Activities: objective formulation, literature review, selection, organization and pre-processing of the data, methodology, coding, experimentation application and report of the results. Feedback and improvement of the paper/ code/ analysis.

The following publication is under review (submitted with the possibility of open access, available upon request):

- Baumohl, E. and T. Vyrošt (2020). Stablecoins as a crypto safe haven? Not all of them! 11 p.

We test the safe-haven properties of the largest stablecoins (USDT, USDC, TUSD, PAX, DAI, GUSD) against the standard “nonstable” coins (BTC, ETH, XRP, BCH, LTC). Our dataset comprises high-frequency 1-minute data calculated as volume-weighted averages across 18 exchanges where these cryptocurrencies are traded, thus capturing the entire price movement around the world. Using a quantile coherency cross-spectral measure, we find that only TUSD, PAX, and GUSD can serve as safe havens. We also show that cryptocurrency returns are not closely related to each other, as is widely believed.

Research results, including a literature review and overview of methodological approaches, were also used for the preparation of the SupTech Workshop AI I.

4. SupTech Workshops-WP5

Masaryk University provides an official certificate for the completion of the lifelong education program “A FINancial supervision and TECHnology compliance training programme” to participants of SupTech workshops. To facilitate the hands-on experience in statistical modelling, we provide participants with online access to R Server.

- SupTech Workshop BDA I, Czech National Bank, March 14-15, 2019 (12 hours). Topics: Standard methods in quantifying P2P loan risk factors (with hands-on coding examples in R), Improving prediction models with Lasso, Ridge, Elastic net, Logistic regression in credit risk analysis in P2P lending, Applications of network analysis in financial risk management.
- SupTech Workshop BDA II, Czech National Bank, May 7, 2019 (4 hours). Three Use-Cases: Network-based scoring models in P2P lending, Clustered scoring models in P2P lending, Spatial regression scoring models in P2P lending
- SupTech Workshop BDA II, Czech National Bank, May 17, 2019 (3 hours). Workshop and roundtable with FinTech firms (Twisto, Roger, Bulletproof AI)

- SupTech Workshop AI I, Czech National Bank, November 21-22, 2019 (12 hours). Topics: Robo-advisors in investment and wealth management, Introduction to modern portfolio theory, Measures of statistical association for network analysis, Information filtering in networks, Neural networks in asset management and portfolio optimization (with hands-on coding examples in R). Four Use-Cases: Convergence and divergence in European bond correlations, are cryptocurrencies connected to forex? A quantile cross-spectral approach, Market structure discovery with clique forests, Network models to improve robot advisory portfolio management.
- SupTech Workshop AI II, Czech National Bank, January 30, 2020 (9 hours). Topics: Introduction to text mining with machine learning, Classification and clustering of text documents (with hands-on coding examples in R).

Participants attended our workshops representing a diverse group of central bank's employees: risk analysts in credit, market, operational and liquidity risk management, lawyers in bank supervision and consumer protection units, statisticians, inspectors in payment regulation and control, and IT specialists in administration, information system management and security. The role of the participants varied from the head of division or unit to early-career experts, technical staff, regulation inspectors or analysts. The educational background of participants spans from economics and finance to mathematics, IT, media studies, law, management and chemical and mechanical engineering.

The *first SupTech workshop* was devoted to the training of CNB employees in *big data analytics* necessary for the analysis of credit risk in peer-to-peer lending. Given the diverse background of participants, we have focused on the explanation of basic statistical concepts, gradually introducing more advanced machine learning methods. We have accompanied the explanation of theoretical concepts with hands-on examples in statistical programming in R. We have received great feedback from participants praising clear, straightforward, broad and inspiring training. Participants noted that they were able to follow the contents of the workshop even without previous experience in statistical modelling.

The *second SupTech workshop* presented carefully curated *use cases on advanced scoring models in peer-to-peer lending*. The case studies embodied the blend of standard big data analytics techniques and network analysis. Participants acknowledged that presented use cases might be implemented in their work.

The second day was comprised of *industry presentations* by three Czech fintech firms: Twisto, Roger and Bulletproof AI. Michal Kročil, Chief Risk Officer at Twisto, showed how his company achieves the balance between great user experience and accurate risk analysis in payment services. Adam Šoukal, co-founder and CEO of Roger a.s., talked about the company's products in online invoice trading and how electronic data interchange is achieved in financial technologies. Martin Řehák, founder and CEO of Bulletproof AI, showed how different standard techniques in big data analytics might result in biases and financial losses. Workshop participants discussed what exactly should be regulated in FinTech activities including the discrimination of clients due to unavailability of data, personal responsibility of model builders (similar to financial institutions), technical robustness of machine learning models to fraud and the overall accuracy of used models. Representatives of the participating firms also pointed out that the quality of data collection and preparation, the complexity of data and model features might be a particular way for FinTech regulation. The discussion resulted in an *interesting suggestion on creating specific protocols, that might be beneficial for firms and regulator to test models on specific data samples (created by the regulator with known and potential misspecifications and outliers) and generating stress testing scenarios based on sectoral development and different hypotheses (not only a macroeconomic stress scenario,*

provided by the regulator). Czech FinTech would appreciate a more proactive role of the local regulator and are ready to participate in the dialogue.

The *third SupTech* workshop was dedicated to *AI applications in market risk analysis for robo-advisory*. Given the diverse background of participants, we have focused on the explanation of the modern portfolio theory, especially profit maximization and risk minimization techniques in asset portfolios and measures of statistical association for asset allocation and portfolio optimization. We have accompanied the explanation of theoretical concepts with hands-on examples in statistical programming in R. Background session followed by the presentation of several use cases, providing examples on how statistical association techniques and information filtering in association-based networks improve performance of bond and ETF portfolios. We also covered the usage of neural networks in asset management and portfolio optimization. Participants of the workshop praised very accessible explanation of statistical methods even for non-statisticians, the depth of the explanation of theoretical concepts and followed practical examples. Participant also expressed their discontent in the availability of robo-advisory services in Czechia. Only a few firms provide robo-advisory investment solutions in Czechia. However, none of those solutions utilizes advanced statistical methods or even simple portfolio optimization and rebalancing techniques (firms are still on the level of investor profile identification and asset universe selection).

The *fourth SupTech workshop* was devoted to *text mining with machine learning*. The topic of the workshop was requested as an additional topic for training by the regulator, which is considering the implementation of own RegTech solution for simple regulatory requests (chatbot) and textual data analysis. Participants found the contents of the workshop inspirational and interesting. Several participants discussed with us specific possibilities of implementing text mining techniques in their work.

In general, the Czech National Bank sees the workshops significant for the institution in terms of building further understanding and expertise in machine learning and artificial intelligence solutions. Given the gaining popularity of AI solutions in financial decision-making, the understanding of such methods and their potential risks is vital for the central bank. Moreover, the training would eventually help the regulator to initiate the implementation of innovative internal projects.

5. Dissemination-WP7

Our dissemination activities included consultations with project partners, the Czech National Bank and industry partners to identify possible areas of cooperation and establish our expertise in machine learning and artificial intelligence solutions in financial decision-making. We believe that we have created a strong network working on several joint projects, such as COST Action for the use of AI to improve the transparency of the financial service sector. One industry partner has asked to help them build solutions for profit scoring, auctions mechanism and impact analysis (how access to FinTech services affected the financial performance of clients).

Short info about the SupTech workshops is published on the website of the Institute of Financial Complex Systems at Masaryk University (<https://fincos.econ.muni.cz/>). We have also participated in the Czech National Bank's First Roundtable on financial innovations (January 14, 2020), which started the official dialogue between FinTech firms and the central bank on possible regulatory problems and solutions. As

participants of the Roundtable, we offered our expertise in explainability and interpretability of machine learning and artificial intelligence solutions in FinTech applications.

1) SupTech Workshop BDA, Czech National Bank, March 14-15, May 7 and 17, 2019

- How will participants stay involved?

Participants were provided with training materials, including presentations, codes, data and use cases. Participant also expressed interest in getting materials and additional expertise on specific topics (such as fraud detection in financial advisory). Participants will stay involved with the follow-up workshops. Attendees were also invited to participate in RegTech events.

What is the feedback on the use cases presented?

Participants viewed use cases as good examples of interrelations of different topics (ML, AI, Big Data, FinTech, P2P) and methods (supervised, unsupervised learning, network analysis for financial risk management).

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? Yes. Use cases provide a basis for the understanding of interlinkages of different methods available for financial market supervision.

2) SupTech Workshop AI, Czech National Bank, November 21-22, 2019 and January 30, 2020

- How will participants stay involved?

Participants were provided with training materials, including presentations, codes, data and use cases. Participant also expressed interest in getting materials and additional expertise on specific topics (such as data integration with text mining tools or automation of responses to simple regulatory requests). Participants will stay involved with the follow-up workshops.

- What is the feedback on the use cases presented?

Participants viewed use cases as good examples of interpretable ML and AI solutions in investment analysis and optimization.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? Yes. Use cases provide a basis for the understanding of robo-advisory tools.

P. B-Hive

B-Hive -in its role as FINTECH innovation hub in Belgium- contributed in the first months of the project actively through the establishment of contacts & required networks. Examples being the network establishment with other international external fintech hubs (Switzerland, Spain etc), the first contacts and organisation of activities with Abi-lab within the evaluation lab task and the first contacts with the regulator of Denmark.

Next to that B-Hive organized and participated in the first meetings with European Commission project officer and the EU Unit in order to address the project's issues and possible developments. As one of the

work-package leaders at that time, B-Hive participated in several workshops to re-structure the project for success (Result April Amendment). For the benefit of the project, B-hive proposed to transfer some of its activities to better-placed organisations. An example of this is the transfer of the validation task (evaluation lab) of the project has been moved to Firamis, the leader of the dissemination work package. In this way, the generation of the feedback from each project's event (feedback repositories) and the analysis of the same feedback (evaluation reports) are joined under the same leadership.

B-hive focused on WP5, The connection of Belgium and Dutch regulators to the FinTech project and the organization of training workshops for Belgium and Dutch regulators. 2 workshops were organized by B-hive in 2019 for Belgian and Dutch regulators in Brussels to train/inform them on new developments in technologies (BDA and AI). This was done in partnership with the University of Luxembourg.

B-Hive requested End of Nov 2019 to withdraw from the Project, its activities were transferred to the University of Luxembourg.

Therefore, to make the project more efficient, the responsibility of the validation task (evaluation lab) of the project has been moved to Firamis, the leader of the dissemination work package. In this way, the generation of the feedback from each project's event (feedback repositories) and the analysis of the same feedback (evaluation reports) are joined under the same leadership. In line with this reorganisation, the final workshop, where the final evaluation reports will be presented, has been moved from B-HIVE to Firamis.

The residual activities such as Training in Belgium has been conducted through the partnership of the University of Luxembourg, therefore refer to the SupTech in Belgium under section H University of Luxembourg, 5) SupTech activities.

Q. University of Economics-Varna

1. Management-WP1

During the reporting period M1 – M18 and within the WP 1 Management, the following activities are implemented:

- Regular communication with coordinator and feedback, input or other types of partner' contribution is being provided upon request;
- Internal technical and financial reporting;
- Participation in management board meetings (horizontal workshops);
- Communication with national regulator with regards to scheduling, adaptation, handling and providing feedback following the sup-tech knowledge exchange sessions;
- The organisation of dissemination activities and events;
- Participation in the official horizontal workshops – management board meetings:
- Kick-off meeting, Pavia, Italy, 1st February 2019
- Workshop Winterthur, Switzerland, 3rd September 2019
- Mid-term research workshop, Bucharest, Romania, 15th November 2019
- Management board meeting, online event, held on May 18, 2020

The management structure of UE-Varna team:

The team involved in the organization, management and implementation of the activities under the FIN-TECH project on behalf of the University of Economics-Varna, comprises of 7 persons, all of them working as experts and two of them having additional tasks to manage and coordinate the implementation process within the team and with stakeholders, partners, university administration and etc., including the mandatory events to attend.

All 7 experts work on each work package except the WP 1. The WP \ (effort allocated as per GA) is shared between the project manager (PM) and the coordinator (PCo). All experts attend the project meeting, but reporting the effort is for the project manager (PM) and the coordinator only (PCo).

List of project meetings under WP1 January 2019 - June 2020

2019

- Jan. 2019, UE-Varna, hours reported: 2 h., topic: forthcoming kick-off meeting in Pavia;
- Jan. 2019, UE-Varna, hours reported: 1 h., topic: Meeting with Project management Dept of UE-Varna for solving misleading SME status in the Funding portal;
- 6 Febr. 2019, UE-Varna, hours reported: 2 h., topic: following the attendance of kick-off meeting by the coordinator;
- 18 April 2019, UE-Varna, hours reported: 2 h., topic: correspondence from the BG regulator and discussion on Agendas for SUPTECH I BDA
- May 2019, UE-Varna, hours reported: 1 h., topic: materials for SUPTECH I BDA reviewed before uploading on Seafile;
- 05 June 2019, UE-Varna, hours reported: 2 h., topic: Team meeting re SUPTECH I 6-7.06.2019 Sofia; 18 June 2019, UE-Varna, hours reported: 2 h., topic: Team meeting re SUPTECH I 20-21.06.2019 Sofia; 19 June 2019, UE-Varna, hours reported: 2 h., topic: Team meeting re SUPTECH I 20-21.06.2019 Sofia; July 2019:
- 01 July 2019, UE-Varna, hours reported: 4 h., topic: participation of forthcoming events;
- 08 July 2019, UE-Varna, hours reported: 2 h., topic: organization of local project event, defining stakeholders, event themes on of local project event, defining stakeholders, event themes etc.;
- 28 Aug. 2019, UE-Varna, hours reported: 2 h., topic: forthcoming trip to Switzerland;
- 27 Sept. 2019, UE-Varna, hours reported: 4 h., topic: Review of Management board meeting minutes;
- 09 Oct. 2019, UE-Varna, hours reported: 2 h., topic: Monitoring of readiness of the presentation intended for the round table coming on 11.10.2019;
- 4 Dec. 2019, UE-Varna, hours reported: 2 h., topic: closing the first half of the project, general discussion on the next SUPTECH , planned for March 2020;
- 4 Dec. 2019, UE-Varna, hours reported: 2 h., topic: closing the first half of the project, general discussion on the next SUPTECH , planned for March 2020;

- 14 February 2020, UE-Varna, hours reported: 2 h., topic: distribution of current tasks under the project;

2020

- 5 March 2020, UE-Varna, hours reported: 1 h., topic: forthcoming knowledge exchange session with the Bulgarian regulator;
- 2 April 2020, UE-Varna, hours reported: 3 h.; topic: team meeting for project progress overview;
- 4 May 2020, UE-Varna, hours reported: 2 h.; topic: team meeting for project progress overview;
- 10 June 2020, UE-Varna, hours reported: 2 h., topic: team meeting for project progress overview;

2. Big Data Research-WP2

Related to the main task of UE-Varna under the GA, namely, to arrange and implement SUPTECH sessions, each under specific topic, with the Bulgarian Regulator “Financial supervision commission”, the main activities implemented by the UE-Varna team under WP 2 are as follows:

- Studying and analysis of training hub case studies;
- Comparing models for peer-to-peer credit risk modelling;
- Analysis of the potential need and the scope of local personalization of BDA trainings;
- Communication with local regulator-specifying details about BDA training;
- Training hub case studies reproduction, Training hub case studies customization
- Preparation of additional information required by local regulator for the need of training sessions, Survey of local financial intermediaries and tech companies working in the field of BDA (for a potential invitation as training participants),
- Training hub materials integration;
- Training hub outline program development;

Development of paper to be proposed as use case

Additional use Case has been developed: Predicting success and failure of crowdfunding projects using machine learning algorithms. Data for this use case has been collected by a web crawler from Kickstarter website. Several machine learning algorithms have been implemented, such as decision trees, random forest, boosted decision trees, logistic regressions. The applied models showed satisfactory predictable power with accuracy varying from 0.759 (logistic regression) to 0.943 (boosted decision tree).

Additional presentation materials prepared: Compliance challenges of peer-to-peer lending in Bulgaria and EU.

3. Artificial Intelligence research –WP3

UE-Varna was highly engaged in preparation of presentations based on use cases received from partners and uploaded to the platform on the FIN-TECH website.

We worked on presentation slides about the following use cases:

- Use Case I. Convergence and Divergence in European Bond Correlations Market
- Use Case II. On the effectiveness of Portfolio Composition techniques to build stable and sound Robo Advisory Portfolios
- Use Case III. Network models to enhance automated cryptocurrency portfolio management
- Use Case IV: explainable AI in credit scoring and portfolio construction

Besides, our team worked on the following research topics of interest to the Bulgarian Financial Supervision Commission - Application of AI for Robo Advisory and Portfolio Management Strategies. We made the necessary customizations and additions according to the requirements of our partners from the commission.

Furthermore, we kept on doing our research. We researched many academic articles, papers, and books in the area of artificial intelligence.

We also participated in the Fintech Workshop on AI, Financial Automation and Market Risk, which was held online in May 2020.

4. Blockchain research-WP4

During the first year of the project implementation in the Blockchain area an introductory review was implemented of the potential need and scope of local personalization of the forthcoming BCH trainings related to the foreseen project activities and deliverables to provide. Also, the stage of local penetration and absorption of the Blockchain technologies was studied, together with publications review, trends and statistics.

Besides and paying attention to the local Blockchain market-the subject of research became opportunities, threats, as well as current regulations, applications, challenges and burdens, experience as well for the key players regulator, business/industry and academia.

Following the invitation of WP 4 lead partner for proposing papers for consideration in order to prepare the set of BCH use cases a local review and discussion of potential papers was initiated in line with specific topics pointed but not limited to a list provided by the WP 4 lead partner together with the mandatory pre-requirements to meet.

5. SupTech Workshops-WP5

- 1) SupTech I, Credit risk in peer to peer lending, Sofia, Financial Supervision Commission, June 6th-7th and June 20-21st, 2019. Topic covered: Big Data Analysis;

- a) Case 1: Network based scoring models;
- b) Case 2: Distance based scoring models
- c) Case 4: Loan screening and default prediction with machine learning and deep neural networks.

Feedback

The BDA SupTech in Bulgaria was scheduled in two two-days sessions, both held in June 2019.

The first two-day knowledge sharing session between academic staff representatives of University of Economics-Varna and experts from the Financial Supervision Commission (FSC) was held on June 6 and 7, 2019 in Sofia.

The forum was opened by Vladimir Savov-Member of the Financial Supervision Commission and by Prof. Stefan Vachkov, Project Manager on the part of the University of Economics-Varna.

The session was devoted to the analysis of Big Data and Peer-to-Peer Lending platforms, their associated risks, and the methods and tools by which these risks can be best measured. Presentations were given by Assoc. Prof. Dr. Silvia Parusheva and Assoc. Prof. Dr. Yanka Alexandrova (Department of Informatics), and chief assistant professor Lyubomir Lyubenov (Department of Statistics and Applied Mathematics). The doctoral student at the Department of Informatics Peter Dimitrov also participated.

The event aroused great interest among the FSC's representatives-more than 35 specialists and experts from different departments and departments of the commission participated in it.

The second two-day knowledge sharing session, held again in Sofia on June 20 and 21, 2019. Welcoming words came by prof. Stefan Vachkov, project manager at the University of Economics-Varna. The session was dedicated to risk prediction in crowdfunding and peer-to-peer lending platforms. presentations were made by the chief assistant professor Nedyalko Valkanov, PhD (Department of Finance), assoc. prof. Silvia Parusheva, chief assistant professor Yanka Alexandrova (Department of Informatics), chief assistant professor Lubomir Lyubenov and chief assistant professor Dimitria Karadimova (Department of Statistics and Applied Mathematics). Doctoral student at the department of informatics Peter Dimitrov also participated.

Once again, the session aroused great interest among FSC representatives. On behalf of the Bulgarian regulator with a presentation on the topic "peer-to-peer lending" participated Tsvetomir Yakov. During the two-day seminar, discussions were also held between the participants, which raised current questions in the areas concerned and outlined some directions for future collaboration. The FSC participants praised the topicality of the discussed issue and the presentation of our academic representatives during the two sessions.

- Parties participating, their roles and their responsibilities:

The following departments of the Bulgarian Financial Supervision commission were present within BDA SupTech :

- Analyses, Complaints and Resolution Directorate
- Insurance Supervision

- Insurers and insurers group and risk assessment
- Legal Enforcement department
- International Cooperation Department
- Public Companies, Issuers and SPICs Department
- Investment Intermediaries, Undertakings for Collective Investment and Markets in Financial Instruments Department
- Legal enforcement Department
- Regulatory Regimes of Investment Activities Directorate

The role of the participants is the following: actuaries, financial analysts, heads of departments, senior and junior experts.

- How will they stay involved?

Further involvement of the participants will be achieved through invitations for participation in the next SUP-TECH events as well as with organising local events, sharing project results and research papers in the areas of interest.

- What is their feedback on the use cases presented?

The regulator representatives expressed interest in crowdfunding platforms as a new emerging and fast-growing business model. Our research team developed and presented a use case which was added to the common project use cases. The feedback on all the use cases has been positive. The presented use cases have been found useful for implementing in regulators activities.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most? yes;

The audience understood how P2P lending works and from where it starts, as well as what kind of models are in P2P lending.

The audience was briefed with the legal part of the P2P lending in Bulgaria and the main issues that stand at the moment.

The main insight will be the legal part and how the future P2P companies will start working in the local market. FSC will continue to contribute to the companies offering financial innovations.

The FSC will take extra measures to achieve the aims set out in our Fintech monitoring strategy.

2) LOCAL EVENT-VARNA-October 2019-International round table "Peer to peer lending in Europe and the Balkan Peninsula"

- Parties participating, their roles and their responsibilities:

Experts from FIN-TECH project team, academic community at the national and international level, Bulgarian Financial Supervision Commission, FSC, Innovation hub and Fintech Expert Group at FSC, National community services providers, Law firms, Varna Chamber of commerce and industry, Regional information Center.

- The role of the participants is the following:

Professors, Associate Professors, Chief Assistants, Heads Of University Of Economics-Varna Departments, Students (PhD Students And Postdoctoral Students),Actuary And Founders And Partners Of FIN-TECH Companies In Bulgaria,Chairmen,Experts.

- How will they stay involved?

further involvement of the participants will be achieved through invitations for participation in local events, sharing project results, news and research papers in the areas of interest.

- What is their feedback on the themes presented?

The focus of the international roundtable was the exchange of knowledge on the application of new technologies in the field of financial services on a national, regional and international level, as well as the challenges and experience of business, consumers, higher education institutions and competent regulators in implementing fine-tuning innovations.

The feedback from all participants was very positive in several aspects. The event aimed and managed to meet academia, business and regulator in a very actual and interesting theme. The students attending the event benefited by hearing all points of view from all relevant bodies in the FIN-TECH business. Many interesting discussions were initiated by the speakers who talked about practical issues and legal aspects of peer to peer lending; The current state and prospects for the FIN-TECH environment in neighbouring Romania, the history, difficulties, successes and opportunities that accompany the functioning of A Peer to Peer Lending Platform operating in Bulgaria, along with details of the loans provided, including number, total and average amount of credit;

- Are the selected themes, in the end, the ones that meet the expectations and requirements at most? Yes

6. Dissemination-WP7

Description of the main promotional activities within each main event.

June 2019

- SupTech I, „Credit risk in peer to peer lending”, Sofia, Financial Supervision Commission, June 6th-7th and June 20-21st, 2019. Topic covered: Big Data Analysis;

Press release on the new webpage of the University of economics-Varna.

Press release on the Bulgarian regulator webpage:

- October 11, 2019, Local event: "International Round Table "Peer to Peer Lending in Europe And The Balkan Peninsula" Hosted By University Of Economics – Varna"

International round table „peer to peer lending in Europe and the Balkan peninsula” was held at the university of economics - Varna on October 11, 2019. the forum is organized with the institutional support of the financial supervision commission within the fin-tech project "a financial supervision and technology compliance training program ", funded by the Horizon 2020 research and innovation program.

The forum was opened by Assoc. prof. dr. Radan Miryanov, deputy rector for internationalization of University of Economics - Varna. The participants in the event were also welcomed by prof. Stefan Vachkov, team leader for the organization, management and implementation of the fin-tech project for UE-Varna. the focus of the international roundtable was the exchange of knowledge on the application of new technologies in the field of financial services on a national, regional and international level, as well as the challenges and experience of business, consumers, higher education institutions and competent regulators in implementing fine-tuning innovations.

The coordinator of the fin-tech lead partner - prof. Paolo Giudici of the University of Pavia, Italy, presented the "European Fintech risk management platform for promoting financial innovation", and dr. Yanka Alexandrova, chief assistant professor at the Department of Informatics and expert from the team of UE - Varna informed the audience about the project activities done so far, as well as with the sessions of knowledge exchange with the experts from the Bulgarian Financial Supervision Commission.

Representatives of the innovation hub and Fintech expert group at the Financial Supervision Commission participated in the forum, whose main purpose is to promote innovation in the non-banking financial sector and protect the interests of consumers. the financial supervision commission team shared expertise on practical issues and legal aspects of peer to peer lending.

The current state and prospects for the fin-tech environment in neighbouring Romania was shared by assoc. prof. Vasile Alexandru Strat from the university of economic sciences in Bucharest, a partner university in the implementation of the fin-tech project.

Mr. Loic-le-Pichoux, one of the founders of Klear, presented the history, difficulties, successes and opportunities that accompany the functioning of the Klear peer to peer lending platform operating in Bulgaria. participants had the opportunity to see how the platform works from the inside out, along with details of the loans provided, including number, total and average amount of credit, etc.

Students and representatives of the academic community of UE - Varna and the Varna University of Management, who participated in the discussions, showed interest in the event. the business was represented by Energo-pro, law companies, the founders and partners of companies, acting in the relevant fields, the Varna chamber of commerce and industry, the regional information center and more.

The topics covered in the program of the event, as well as the presentations of the participants provoked an interesting discussion between the academy, business and the regulatory body on a national and international scale, which was the main goal of the organizers and made this pilot event a success.

Posters, promoting the project and the local event in paper, digital and vinyl versions have been created and showed up. The vinyl one is exposed in the university for the time of the implementation phase of the project.

Announcement of the forthcoming event planned for oct. 11th , 2019:

<http://old.ue-varna.bg/en/article.aspx?id=23486>

The Team for management and implementation of project FIN-TECH "A FINancial supervision and TECHnology compliance training programme" on behalf of University of economics - Varna has the pleasure to invite you to participate in

INTERNATIONAL ROUND TABLE

"PEER TO PEER LENDING IN EUROPE AND THE BALKAN PENINSULA"

organized in the framework of the international project FIN-TECH "A FINancial supervision and TECHnology compliance training programme", funded under the European union programme for research and innovation HORIZON 2020.

The focus of the current International round table is the exchange of knowledge on the application of new technologies in the field of financial services at national, regional and international level as well as the challenges and experience of business, consumers, higher education institutions and the competent regulatory bodies when introducing fin-tech innovations.

October 11th, 2019 9:00 a.m. /subject to agenda/ University of Economics - Varna, Hall 1

ROUND TABLE THEMES:

- Advantages and threats to peer to peer lending.
- Regulation systems of peer to peer lending.
- Crowdfunding platforms and their regulation in Europe.

REGISTRATION FORM

<https://ue-varna.bg/bg/news/fin-tech-mezhdunarodna-kragla-masa-peer-to-peer-lending-in-europe-and-the-balkan-peninsula/152>

https://www.eufunds.bg/bg/oic/event/2903?fbclid=IwAR1bjEWKnS91fYCFv_Ij_lZQhPLp9uObWU5IFy3GAV8sB0SvJxP4n8lTeXQ



Bulgarian Fintech Association

1 октомври 2019 г. ·

На 11 октомври заповядайте на международна кръгла маса "Peer to peer lending in Europe and the Balkan Peninsula", организирана от Икономически университет - Варна / University of Economics - Varna. Фокусът ще бъдат fintech компаниите, като целта е обмяна на опит между академици, бизнес, регулятори и браншови организации.

Повече информация относно събитието можете да откриете в линка.



<https://facebook.com/events/659438267899040>

#fintech #roundtable #economics #knowledgesharing #fintechbulgaria

The event cover features the European Commission logo and the FINTECH RISK MANAGEMENT logo. The text reads: "Икономически университет – Варна и Комисия за финансов надзор ВИ КАНЯТ НА МЕЖДУНАРОДНА КРЪГЛА МАСА "PEER TO PEER LENDING IN EUROPE AND THE BALKAN PENINSULA" Посветена на 100 годишнината на Икономически университет – Варна ПТ. 11.10.2019 Г. FIN-TECH:Peer to Peer Lending in Europe and The Balkan Peninsula 25 отидаха · 66 имат интерес".



Viktoria Marinova ► Областен информационен център - Варна

3 октомври 2019 г. ·

МЕЖДУНАРОДНА КРЪГЛА МАСА "PEER TO PEER LENDING IN EUROPE AND THE BALKAN PENINSULA" организирана в рамките на международен проект FIN-TECH "A FINancial supervision and TECHnology compliance training programme", финансиран по програма за научни изследвания и инновации HORIZON 2020.

11 октомври 2019 г., 9:00 ч., Икономически университет - Варна, Зала 1

<https://www.ue-varna.bg/bg/news/fin-tech-mezhdunarodna-kragla-masa-peer-to-peer-lending-in-europe-and-the-balkan-peninsula/201?fbclid=IwAR05kuH4TceVweBCQGcFnJnLcrKSs0FI7TpajpTSK8TE3AHqHIBe-cc8kY>

The event cover features the European Commission logo and the FINTECH RISK MANAGEMENT logo. The text reads: "Икономически университет – Варна и Комисия за финансов надзор FIN-TECH: Международна кръгла маса Викта ТАМАТИЧНИТА НАПОЯЗЛЯНИЯ И СА БАГИСТРИРАТА ЗА УЧАСТИЕ UE-VARNA.BG FIN-TECH: Международна кръгла маса".

Press release following the event:

University of Economics – Varna, official website"

<https://ue-varna.bg/bg/news/fin-tech-inovatsii-obsadiha-na-mezhdunarodna-kragla-masa-v-iu-varna/234>

Municipality of Varna, [official website](#):

Official Information portal on the European structural and investment funds:

<https://www.eufunds.bg/bg/node/2960>

May 2020

11-12 May 2020

Assoc. Prof. Nedyalko Valkanov, PhD presented a scientific report on the topic „Fintech-RegTech-SupTech or Vision for High-Tech Financial Regulation“ in Section 1 „ECONOMY AND DIGITAL TRANSFORMATIONS“ of The Jubilee International Scientific Conference dedicated to the 100 th anniversary of the University of Economics–Varna „ECONOMIC SCIENCE, EDUCATION AND THE REAL ECONOMY: DEVELOPMENT AND INTERACTIONS IN THE DIGITAL AGE“ on 11 and 12 May 2020.

The conference was attended by 348 scientists, lecturers, PhD students, students, business representatives from the country and abroad. Reports were presented by participants from 23 Bulgarian universities and 15 universities from Germany, Poland, Lithuania, Portugal, Romania, Croatia, Slovakia, Russia, Serbia, Ukraine, Lebanon.

Publication: Valkanov, N. The symbiosis "Fintech-RegTech-SupTech" or Vision for High-Tech Financial Regulation. Jubilee International Scientific Conference ECONOMIC SCIENCE, EDUCATION AND THE REAL ECONOMY: DEVELOPMENT AND INTERACTIONS IN THE DIGITAL AGE. Conference proceedings, Volume I. University publishing house „Science and Economics“, 2020, p. 173-185. Available [here](#).

June 2020

Dissemination activities, related to online events, organised by consortium partners:

Event: Online research seminar Momentum and contrarian effects on the cryptocurrency market - an interactive shiny application, by Paweł Sakowski, Assistant Professor at University of Warsaw", organised by ZHAW, held on June 19th, 2020

The following was made in order to raise awareness and interest for joining the event among stakeholders namely – academia, regulator, students and business:

- event created on the university webpage, with all departments targeted for better visualization;
- event is visible in our official and public event' calendar;
- event in Fb with all my hundreds university contacts invited to join;
- invitation sent to the participants in the SUP-TECH BDA held already, to join the webinar;
- email communication within our academic society here;

The screenshot shows the homepage of the University of Economics, Varna. The main navigation menu includes 'ЗА НАС', 'ПРИЕМ', 'ОБУЧЕНИЕ', 'НАУЧНА ДЕЙНОСТ', 'МЕЖДУНАРОДНА ДЕЙНОСТ', 'БИБЛИОТЕКА', and language links '360° EN & Q'. The sidebar on the left has a dropdown menu under 'Събития' (Events) which is currently selected. The main content area displays two event cards. The first event card is for 'FIN-TECH HO2020' on June 19th, 2020, at 11:00-12:00 online. The second event card is for 'ВОТО НЕЧ-БИЗНЕС' on June 13th, 2020, at 09:30-11:30 in Varna. The bottom of the screen shows a taskbar with various icons and the date 18.6.2020.



R. University of Tampere

1. Management-WP1

Antti Talonen and Lasse Koskinen attended Kick-off Workshop, (Kickoff, 1st of February, Pavia, Italy) Antti Talonen attended Mid-term Research Workshop, 15th November 2019, Bucharest.)

Three teleconferences with Coordinators

The following list is for the events in which UTA participated to disseminate the project:

- 1 February 2019 Kick-Off Meeting, Pavia
- 29 March Milan RegTech
- 9 April Meeting Basel
- 4 September Research Workshop, RegTech Winterthur
- 14 15 November Intermediate Research Workshop, Bucharest

A PhD thesis is being developed in the field: NEW METHODS IN PENSION EVALUATION: APPLICATIONS OF TRAJECTORY ANALYSIS AND DYNAMIC MICROSIMULATION, Ph.D. thesis by Janne Salonen, Tampere University.

2. Big Data Research-WP2

Research conducted within the BDA topic in Tampere University was related to the needs and expectations expressed by the Finnish and Swedish regulators.

We performed a literature review related to methodological aspects of Big Data Analytics, the development of peer-to-peer lending, peer-to-peer insurance and regulatory challenges, which results were used in the preparation of the first SupTech workshop materials. We also presented some model validation results of related new PhD thesis.

We have written two manuscripts related to the consumer perspective to Big Data and AI.

3. SupTech Workshops-WP5

- 1) SupTech I Workshop, FINLAND and SWEDEN Financial Services Authority, 4th March and 8th of May 2019. Topic covered: Big Data Analysis; four Use-Cases presented:
 - a) Overview of the project and the background/overview for Use Cases 1-4 (Helsinki)
 - b) Overview of the project and background/overview for Use Cases 1-4 (Stockholm)
 - c) Use Cases 1 and 2 and insurance specific perspective (Helsinki)
 - d) Use Cases 1 and 2 and insurance specific perspective (Stockholm)
 - e) Use Case 3 and 4 and related supervisory issues (Helsinki)
 - f) Use Case 3 and 4 and related supervisory issues (Stockholm)
- 2) SupTech II Workshop, FINLAND and SWEDEN Financial Services Authority, Between 22nd October 2019 and 12th December 2019. Topic covered: AI, Market Risk and Robo Advisory; three use cases presented:
 - a) Use e Case (Robo Advisory) and Deep Learning (Helsinki)
 - b) Use Case (Robo Advisory) and Deep Learning (Stockholm)
 - c) Ethical and technical aspects and USE CASES (Bond convergence (2 CASES) and AI in P2P loans) (Helsinki)
 - d) Ethical and technical aspects and USE CASES (Bond convergence (2) and AI in P2P loans) (Stockholm)
 - e) Three Use Cases and Risk, Ethics and Supervision (Helsinki)
 - f) Three Use Cases and Risk, Ethics and Supervision (Stockholm)

Workshops: Three Big Data and three AI workshops were given for Finnish and Swedish supervisors.

- Participants: In Finnish FSA the audience included experts (risk, law, analysis, actuarial, technology) and managers of Finnish Supervisory Authority and Bank of Finland. In Swedish FSA the audience included expert (risk, law, analysis, actuarial, technology) and managers of Finnish Supervisory Authority.
- Preparation and Activities: Preparation of cases included the review of associated literature and case-paper reading and sending the papers and slides of the cases to the regulator. Preparation of the answers of the regulator's questions to be discussed at the workshop event. During meeting there was active communication between supervisors and researchers. Supervisors learned necessary statistical and mathematical background for use cases. Integrating banking and insurance experts in teams turned out to be a good choice during the workshop. Preparation of a feedback report including comments session.
- Engagement: Participants stayed involved through follow up communications by Tampere University and Twitter.

S. WU Vienna

The following sections contain a description of the work carried out in the respective work package, as reported in table Project Monitoring 1.

1. Management-WP1

Coordination efforts were especially necessary in the first two months of the project to create trust between WU and FMA. However, the WU Vienna does have very good contacts within the Austrian Financial Market Authority (FMA), mainly due to Prof. Kurt Hornik who is running a special FMA-Master program at the WU Executive Academy. Thus, it is easy to get listened to. To kickstart the project a special workshop has been held at the FMA on January 15th, 2019, i.e. even before the project kick-start-meeting in Pavia at the beginning of February 2019. This workshop was attended by more than 30 participants and raised a huge interest in the project. Further coordination actions were carried out on June 14th, 2019, July 15th, 2019, July 31st, 2019 and October 17th, 2019 at FMA. There were a few discussions between the beginning of the year 2020 and the RegTech workshop at the end of February 2020, however, between March and June 2020, there was a weekly Jour Fixe between WU and FMA to coordinate the joint actions even further.

2. Big Data Research-WP2

Activities in this work package included the Editorial work on the first official publication of the project as well as the creation and delivery of research talks at various international conferences and workshops to promote the project and to improve knowledge internally.

Publications

- R. Hochreiter, P. Giudici, J. Osterrieder, J. Papenbrock, P. Schwendner. AI and Financial Technology. *Frontiers in Artificial Intelligence* 2, 25. 2019. (open access)

Presentations

- November 14-16, 2019: EU H2020 Fin-Tech Meeting in Bucharest, Romania.
- October 29, 2019: Financial Evolution: AI, Machine Learning & Sentiment Analysis Conference in Zurich, Switzerland.
- September 18-20. Second International Conference on Data Science in Finance (DSF-R 2019) at WU Vienna University of Economics and Business.
- September 12, 2019. Panel at Bloomberg Event on "Future of Finance"- "Digital disruption in the world of finance: AI in Finance, Robo-Advising & Digital Asset Management and Big Data". Palais Hansen Kempinski, Vienna.
- September 11-13, 2019. 37th International Conference on Mathematical Methods in Economics. České Budějovice, Czech Republic.
- September 3-5, 2019. EU H2020 Fin-Tech Meeting & "4th European Conference on Artificial Intelligence in Finance and Industry" in Winterthur, Switzerland.
- July 10-12, 2019: 25th International Conference on Soft Computing (MENDEL 2019) in Brno, Czech Republic.

3. Artificial Intelligence Research-WP3

In this work package, the development of a series of research papers and their respective open-source R code on “Individual Machine Learning-based Robo Advisory Portfolio Strategy Selection” to enable a Machine Learning empowered Robo Advisory system allowing for personalized individual portfolios has been conducted. The current code can already be used to create a full-fledged Robo Advisor. The code is already available at the platform of the project. Feedback and improvement of the paper, the associated code as well as its analysis will be applied through 2020 activities in this work package. The project is already pretty advanced, and it will be possible to generate a number of research papers out of this work.

The paper was presented at the 4th RegTech workshop in Vienna on February 26th, 2020 and at the National Bank of Slovakia on June 23rd, 2020 on invitation by the Slovak project leader Jana Peliova.

4. SupTech Workshops-WP5

Within this work package the SupTech teaching units have been coordinated, designed and delivered. The exact dates of delivery were as follows:

- SupTech BDA 1 & 2 (whole day) on June 19th, 2019 at WU Vienna.

- SupTech BDA 3 on June 26th, 2019 (half day) at WU Vienna.
- SupTech BDA 4 on June 27th, 2019 (half day) at WU Vienna.
- SupTech AI 1 on September 30th, 2019 (half day) at FMA.
- SupTech AI 2 on October 7th, 2019 (half day) at FMA.
- SupTech AI 3 on November 6th, 2019 (half day) at FMA.
- SupTech AI 4 on November 13th, 2019 (half day) at FMA.

Feedback SupTech

SupTech BDA I, II, III & IV-Vienna-19th, 26th, 27th June 2019

- Parties participating, their roles and their responsibilities:

Approximately 30 persons of the FMA, the Austrian Financial Market Authority attended the three days (one full day and two half days).

- The role of the participants:

Basically RegTech/IT staff, financial market supervisors as well as financial market experts. As opposed to the heterogeneous set of persons which attended the broader field of SupTech AI, the scope of the participants in this SupTech section had rather technical background only.

- How will they stay involved?

From the beginning of the project there has been a specially dedicated contact person, Thomas Schneckenleitner, who is the one-stop-shop for the communication between the FMA and the project team at the WU. We keep in touch regularly, i.e. at least once a month (most of the time twice a month) and exchange ideas and updates.

- What is their feedback on the use cases presented?

Overly positive. The FMA highly appreciates the application of Big Data Analytics to problems in the realm of FinTech, RegTech and SupTech . They are interested in more cases. They could easily connect to the content. However, three to four cases are not enough-they'd love to have an overview over a larger set of cases, especially as the cases were almost all centered around P2P lending, which is interesting but a restricted topic.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

They were basically pretty interested in the general topic of the first three use cases (P2P lending) and highly enjoyed the overview of Machine Learning and Deep Learning methods in the fourth use case.

- Parties participating, their roles and their responsibilities:

A large subset (almost 80 persons) of the FMA, the Austrian Financial Market Authority attended the four meetings (split into two groups) whereby each and every group was pretty heterogeneous.

- The role of the participants:

Division leaders, group leaders, legal experts, IT staff, financial market supervisors from pretty much every domain within the FMA.

- How will they stay involved?

From the beginning of the project there has been a specially dedicated contact person, Thomas Schneckenleitner, who is the one-stop-shop for the communication between the FMA and the project team at the WU. We keep in touch regularly, i.e. at least once a month (most of the time twice a month) and exchange ideas and updates.

- What is their feedback on the use cases presented?

Overly positive. The FMA highly appreciates the application of Artificial Intelligence to problems in the realm of FinTech, RegTech and SupTech . They are interested in more cases. They could easily connect to the content. However, three to four cases are not enough-they'd love to have an overview over a larger set of cases.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Each use case ignited a huge interest by the diverse crowd. However, the Explainable AI case never ceased to amaze the participants. However, also the Robo Advisory and Peter Schwendner work did raise interest and discussions.

Furthermore, the weekly Jour Fixe between FMA and WU (March 2020 until June 2020) can be seen as a continuation of the SupTech workshops as a Corona-induced bridge between the part II - AI and part III - Blockchain.

5. RegTech Workshops-WP6

The RegTech activities are two-fold, i.e. the 4th RegTech workshop as well as related follow-up workshops as well as the coordination of the input from the R Consortium and the R core development.

The major highlight was the coordination and planning effort for the RegTech Workshop IV, AI in Finance, on February 26th, 2020 in Vienna, i.e. the 4th RegTech Workshop organized by WU Vienna, which is the second one on AI for Robo Advisory and Market Risk. This workshop also included the first review session for the project. The review session was scheduled on February 25th and led by the project officer Rapolas

Lakavicius. It was an extensive day, started by an overview of the WU Vienna, i.e. the architecture of the campus as well as the educational philosophy behind it.

The agenda looked as following:

- 9.30-9.45 Welcome remarks Ronald Hochreiter (WU Vienna)
- 9:45-10.00 Overview Paolo Giudici (UNIPV)
- 10.00-12.00 Technical Workpackages WP2 BDA: Ren Rui (UBER) moderates presentations by Arianna Agosto (UNIPV, use case BDA III) and Jochen Papenbrock (FIRAMIS, use case AI IV) WP3 AI: Tomaso Aste (UCL) moderates use case presentations by Peter Schwendner (ZHAW, use case AI I) and Ronald Hochreiter (WU Vienna, use case AI II) WP4 BLOCKCHAIN: Joerg Osterrieder (ZHAW) moderates use case presentations by Paolo Pagnottoni (UNIPV, use case I) and Rui Ren (UBER, use case III)
- 12.00-12.30 Coffee break
- 12.30-13.00 Workpackages WP1, WP5 Paolo Giudici (UNIPV)
- 13.00–13.30 Workpackages WP6, WP7 Jochen Papenbrock (FIRAMIS)
- 13.30-15.00 Lunch break and discussion
- 15.00-18.00 Review discussion Rapolas Lakavicius (European Commission)

Every work package and all available AI use cases have been intensively covered. The review discussion was nonetheless even more intense, and the three-hour slot was not sufficient. The bus to the intended workshop dinner had to be let go and another restaurant was booked on short notice. However, the PO mentioned that the project team should celebrate as everything went very fine! The project team did so in the Augustiner Keller close to the Viennese Opera in the heart of Vienna.

The RegTech workshop itself took place on February 26th, again in one of the nicest lecture rooms in the whole university - in the main headquarter designed by Zaha Hadid.

The program was as follows:

- 8:30-9:00 Registration
- 9:00-9:30 Welcome & Introduction (Ronald Hochreiter & Paolo Giudici)
- 9.30-10.30 Use case I: Convergence and Divergence in European Bond Correlations (Schwendner P., Schüle M., Hillebrand M.)
- Use case II: Network models to improve robot advisory portfolio management (Giudici P., Polinesi G., Spelta A.)
- 10.30–11.00 Coffee break and discussion
- 11.00–12.30 Use Case III: Explainable Artificial Intelligence in credit risk management (Niklas Bussmann, Paolo Giudici, Dimi Marinelli, Jochen Papenbrock)
- Use Case IV: Artificial Intelligence for Robo Advisory to compute optimal asset allocations (Ronald Hochreiter)
- 12:30-13:00 Wrap-Up Session – Q&A on all Use-Cases.
- 13:00-14:30 Lunch
- 14:30-16:30 Hands on Coding Session & Coding/Data Support
- 16:30-17:00 Wrap-Up Session
- 17:00-18:00 Open Discussion with Fingerfood

There was some overlap of the content of day 1. However, the important and innovative part was the hands-on coding session exactly as envisioned by the project leader Paolo Giudici. The audience enjoyed it. One can consider this run as a positive result for this project presentation format.

One drawback was that not too many people showed up, probably because the early phase of Corona already left some people at home. While there were more than 60 registrations, only about 25 participants showed up. However, the mix of participants was interesting. There were officials from the Austrian FMA as well as the Austrian National Bank, Fin-Tech representatives and employees from banks and insurance companies.

The dissemination has been a joint effort together with the Academy of Data Science in Finance, an Austrian institution that was founded in 2017 to bridge the gap between Academia and Industry. Thus, a wide range of interested parties could be reached. The Academy employs a Social Media expert and is online at LinkedIn, Facebook and Instagram.

Feedback

- Parties participating, their roles and their responsibilities:

Fin-Tech project members, H2020 project officer and the review team, members from the Austrian FMA (Financial Market Authority) and Austrian National Bank. Fin-Tech representatives, employees from banks and insurance companies as well as Data Science and Finance students.

- The role of the participants:

Division leaders, group leaders, IT experts, financial market supervisors, students.

- How will they stay involved?

After giving their consent they agreed to be added to the official mailing list of the Academy of Data Science in Finance and will be kept in the loop. A few people requested a permanent access to the platform because they are interested in staying involved directly.

- What is their feedback on the use cases presented?

Overly positive. Especially the fact that each and every case was also shown within the coding sessions - thus the cases were not seen as too academic, even if they are thorough and scientifically interesting and sound.

- Are the selected use cases in the end the ones that meet the expectations and requirements at most?

Each and every use case ignited a huge interest - again, especially due to the coding sessions. However, the Explainable AI case definitely raised lots of interest. However, also the Robo Advisory and the case by Peter Schwendner did raise interest and lively discussions.

The second part of this work package concerns the input of Prof. Kurt Hornik in his role as a R core developer and important member of the R consortium. His input on BDA within R is important and highly appreciated by the FMA. This feedback was extended by his comprehensive input on the AI part.

6. Dissemination-WP7

The work in this package was mainly because the Austrian FMA like the German Bundesbank as well as the Irish regulator did opt-out from filling out the official forms within the evaluation process set up for the project. Unfortunately, due to internal policies, the Austrian FMA is unable to use the platform as expected by the project lead. Finally, these additional tasks related to evaluation reporting have cost some time to coordinate them successfully. For the AI part, the FMA internal feedback system has been used and needed some conversion efforts.

Other dissemination activities in 2020 were related to the RegTech workshop - for more dissemination strategy discussion see above in the description of WP6.