**OVERVIEW**

This repository contains all the use cases produced by the Fintech-ho2020 network on the topic: **Blockchain Application in Finance.** Below a short overview of the use cases included in the repository (title of use case, partner, authors and abstract).

**Table 1. Brief Overview of Papers Collected**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Paper Title** | **Partner** | **Open Access Publication** | **Code** | **Data** |
| 1 | Metcalfe's law and log-period power laws in the cryptocurrencies market | ASE | Yes | - | - |
| 2 | A Statistical Classification of Cryptocurrencies | ASE, UBER | In review (European Journal of Finance) | Yes | Yes |
| 3 | Using High-Frequency Entropy to Forecast Bitcoin’s | ASE | Yes | - | - |
| 4 | Fostering consumer bargaining and e-procurement through | Inesc-Tec | IEEE | - | - |
| 5 | A Probative Value for Authentication Use Case Blockchain | Paris 1 | Yes | - | - |
| 6 | The other side of the Coin Risks of the Libra Blockchain | Paris 1 |  | - | - |
| 7 | FRM | UBER | Yes | Yes | Yes |
| 8 | A Decentralised Digital Identity Architecture | UCL | Yes | - | - |
| 9 | Can Cryptocurrencies Preserve Privacy and Comply With Regulations? | UCL | Yes | - | - |
| 10 | Analysis of the cryptocurrency market applying different prototype-based clustering techniques | UCM | In review | Yes | Yes |
| 11 | Initial Coin Offerings risk or opportunity | UNIPV | Yes | Yes | Yes |
| 12 | Libra or librea? | UNIPV | In review (Financial Research Letters) | Yes | Yes |
| 13 | Cyber risk ordering with rank-based statistical models | UNIPV | Yes | Yes | Yes |
| 14 | Benefits of sectoral cryptocurrency portfolio optimization | UR |  | Yes | Yes |
| 15 | Momentum and contrarian effects on the cryptocurrency | UW | - | Yes | Yes |

1. **ASE - The Bucharest University of Economic Studies**

**Title: A Statistical Classification of Cryptocurrencies**

Authors: Daniel Traian Pele, Niels Wesselhöfft, Wolfgang K. Härdle, Michalis Kolossiatis, Yannis G. Yatracos

Abstract: The aim of this paper is 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 are able to 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 a synchronicity in the evolution of the cryptocurrencies, compared to the classical assets, mainly due to the tail’s behavior of the log-return distribution.

**Title: Metcalfe’s law and log-period power laws in the cryptocurrencies market**

Authors: Daniel Traian Pele and Miruna Mazurencu-Marinescu-Pele

Abstract: In this paper the authors investigate the statistical properties of some cryptocurrencies by using three layers of analysis: alpha-stable distributions, Metcalfe’s law and the bubble behaviour through the LPPL modelling. The results show, in the medium to long-run, the validity of Metcalfe's law (the value of a network is proportional to the square of the number of connected users of the system) for the evaluation of cryptocurrencies; however, in the short-run, the validity of Metcalfe’s law for Bitcoin is questionable. According to the bidirectional causality between the price and the network size, the expected price increase is a driver for more investors to join the Bitcoin network, which may lead in the end to a super-exponential price growth, possibly due to a herding behaviour of investors. The authors then used LPPL models to capture the behaviour of cryptocurrencies exchange rates during an endogenous bubble and to predict the most probable time of the regime switching. The main conclusion of this paper is that Metcalfe’s law may be valid in the long-run, however in the short-run, on various data regimes, its validity is highly debatable.

**Title: Using High-Frequency Entropy to Forecast Bitcoin’s Daily Value at Risk**

Authors: Daniel Traian Pele and Miruna Mazurencu-Marinescu-Pele

Abstract: In this paper we investigate the ability of several econometrical models to forecast value at risk for a sample of daily time series of cryptocurrency returns. Using high frequency data for Bitcoin, we estimate the entropy of intraday distribution of logreturns through the symbolic time series analysis (STSA), producing low-resolution data from high-resolution data. Our results show that entropy has a strong explanatory power for the quantiles of the distribution of the daily returns. Based on Christoffersen’s tests for Value at Risk (VaR) backtesting, we can conclude that the VaR forecast build upon the entropy of intraday returns is the best, compared to the forecasts provided by the classical GARCH models.

1. **INESC-TEC**

**Title: Fostering consumer bargaining and e-procurement through a decentralized marketplace on the blockchain**

Authors: João Martins, Manuel Parente, Mário Amorim-Lopes, Luís Amaral, Gonçalo Figueira, Pedro Rocha, Pedro Amorim

Abstract: In most products and services markets, some firms reach multinational status either by organic growth or through mergers and acquisitions, which brings about economies of scale and additional market power. While acting as buyers, firms can also come together and form purchasing cooperatives to gain bargaining power. Customers, however, have few mechanisms for collaborating, leading to an unbalanced buyer-supplier relationship and economic surpluses shifting from consumers to producers. Some group buying websites helped alleviate the problem by offering bulk discounts, but more advancements can be made with the emergence of technologies such as the blockchain. In this paper, we propose a customer-push e-marketplace built on top of Ethereum, where customers can aggregate their proposals, and suppliers try to outcompete each other in reverse auction bids to fulfil the entire order. Furthermore, smart contracts make it possible to automate many operational activities such as payment escrows/release upon delivery confirmation, increasing the efficiency along the supply chain. The implementation of this network is expected to improve market efficiency by reducing transaction costs, time delays and information asymmetry. Furthermore, concepts such as increased bargaining power and economies of scale, and their effects in buyer-supplier relationships, are also explored.

1. **Paris 1 - The Pantheon-Sorbonne University**

**Title: A probative value for authentication use case blockchain**

Authors: Dominique Guégan and Christophe Henot

Abstract: The Fintech industry has facilitated the development of companies using blockchain technology. The use of this technology inside banking system and industry opens the route to several questions regarding the business activity, legal environment, and insurance devices. In this paper, considering the creation of small companies interested to develop their business with a public blockchain, we analyse from different aspects why a company (in banking or insurance system, and industry) decides that a blockchain protocol is more legitimate than another one for the business which it wants to develop looking at the legal (in case of dispute) points of view. We associate with each blockchain a probative value which permits to assure in case of dispute that a transaction has been really done. We illustrate our proposal using 13 blockchains providing in that case a ranking between these blockchains for their use in business environment. We associate with this probative value some main characteristics of any blockchain as market capitalization and log-return volatilities that the investors need to also take into account with the new probative value for their managerial strategy.

**Title: The Other Side of the Coin: Risks of the Libra Blockchain**

Authors: Louis Abraham and Dominique Guégan

Abstract: Libra was presented as a cryptocurrency on June 18, 2019 by Facebook. On the same day, Facebook announced plans for Calibra, a subsidiary in charge of the development of an electronic wallet and financial services. In view of the primary risk of sovereignty posed by the creation of Libra, regulators and Central Banks quickly took very clear positions against the project and expressed a lot of questions focusing on regulation aspects and national sovereignty. The purpose of this paper is to provide a holistic analysis of the project encompassing several aspects of its implementation and the issues it raises. We address a set of questions that are part of the cryptocurrency environment and blockchain technology that support the Libra project. We describe the governance of the project based on two levels, one for the Association and the other for the Libra Blockchain. We identify the main risks considering at the same time political, financial, economic, technological and ethical risks. We emphasize the difficulty to regulate such a project as it will depend on several countries whose legislations are very different. Finally, the future of this kind of projects is discussed through the emergence of Central Bank Digital Currencies.

1. **UBER – Humboldt-Universität zu Berlin**

**Title: FRM Financial Risk Meter**

Authors: Andrija Mihoci, Michael Althof, Cathy Yi‐Hsuan Chen, Wolfgang K. Härdle

Abstract: A systemic risk measure is proposed accounting for links and mutual dependencies between financial institutions ehavior tail event information. FRM (Financial Risk Meter) is based on Lasso quantile regression designed to capture tail event co-movements. The FRM focus lies on understanding active set data characteristics and the presentation of interdependencies in a network topology. Two FRM indices are presented, namely, FRM@Americas and FRM@Europe. The FRM indices detect systemic risk at selected areas and identifies risk factors. In practice, FRM is applied to the return time series of selected financial institutions and macroeconomic risk factors. We identify companies exhibiting extreme “co-stress”, as well as “activators” of stress. With the SRM@EuroArea, we extend to the government bond asset class, and to credit default swaps with FRM@iTraxx. FRM is a good predictor for recession probabilities, constituting the FRM-implied recession probabilities. Thereby, FRM indicates tail event ehavior in a network of financial risk factors.

1. **UCL - University College London**

**Title: A Decentralized Digital Identity Architecture**

Authors: Geoff Goodell and Tomaso Aste

Abstract: Current architectures to validate, certify, and manage identity are based on centralized, top-down approaches that rely on trusted authorities and third-party operators. We approach the problem of digital identity starting from a human rights perspective, with a primary focus on identity systems in the developed world. We assert that individual persons must be allowed to manage their personal information in a multitude of different ways in different contexts and that to do so, each individual must be able to create multiple unrelated identities. Therefore, we first define a set of fundamental constraints that digital identity systems must satisfy to preserve and promote privacy as required for individual autonomy. With these constraints in mind, we then propose a decentralized, standards-based approach, using a combination of distributed ledger technology and thoughtful regulation, to facilitate many-to-many relationships among providers of key services. Our proposal for digital identity differs from others in its approach to trust in that we do not seek to bind credentials to each other or to a mutually trusted authority to achieve strong non-transferability. Because the system does not implicitly encourage its users to maintain a single aggregated identity that can potentially be constrained or reconstructed against their interests, individuals and organizations are free to embrace the system and share in its benefits.

**Title: Can Cryptocurrencies Preserve Privacy and Comply with Regulations?**

Authors: Geoff Goodell and Tomaso Aste

Abstract: Cryptocurrencies offer an alternative to traditional methods of electronic value exchange, promising anonymous, cash-like electronic transfers, but in practice they fall short for several key reasons. We consider the false choice between total surveillance, as represented by banking as currently implemented by institutions, and impenetrable lawlessness, as represented by privacy-enhancing cryptocurrencies as currently deployed. We identify a range of alternatives between those two extremes, and we consider two potential compromise approaches that offer both the auditability required for regulators and the anonymity required for users.

1. **UCM - Universidad Complutense de Madrid**

**Title: Analysis of the cryptocurrency market applying different prototype-based clustering techniques**

Author: Luiso Lorenzo and Javier Arroyo

Abstract: Since the appearance of Bitcoin, cryptocurrencies have experienced enormous growth not only in terms of capitalization but also in number. As a result, the cryptocurrency market can be an attractive arena for investors as it offers many possibilities, but a difficult one to understand as well. In this work, we aim to summarize and segment the whole cryptocurrency market in 2018 with the help of data analysis tools. We will use three different partitional clustering algorithms each of them using a different representation for cryptocurrencies, namely: yearly mean and standard deviation of the returns, distribution of returns, and time series of returns. Since each representation will provide a different and complementary perspective of the market, we will also explore the combination of the three clustering results to obtain a \_ne grained analysis of the main trends of the market. Finally, we will analyse the association of the clustering results with other descriptive features of the cryptocurrencies, including the age, technological attributes, and financial ratios derived from them. This will help to enhance the profiling of the clusters with additional insights. As a result, this work offers a description of the market and a methodology that can be reproduced by investors that want to understand the main trends on the market and that look for cryptocurrencies with different financial performance.

1. **UNIPV – University of Pavia**

**Title: Initial Coin Offerings: Risk or Opportunity?**

Author: Anca Mirela Toma and Paola Cerchiello

Abstract: Initial coin offerings (ICOs) are one of the several by-products in the world of the cryptocurrencies. Start-ups and existing businesses are turning to alternative sources of capital as opposed to classical channels like banks or venture capitalists. They can offer the inner value of their business by selling “tokens,” i.e., units of the chosen cryptocurrency, like a regular firm would do by means of an IPO. The investors, of course, hope for an increase in the value of the token in the short term, provided a solid and valid business idea typically described by the ICO issuers in a white paper. However, fraudulent activities perpetrated by unscrupulous actors are frequent and it would be crucial to highlight in advance clear signs of illegal money raising. In this paper, we employ statistical approaches to detect what characteristics of ICOs are significantly related to fraudulent behavior. We leverage a number of different variables like: entrepreneurial skills, Telegram chats, and relative sentiment for each ICO, type of business, issuing country, team characteristics. Through logistic regression, multinomial logistic regression, and text analysis, we are able to shed light on the riskiest ICOs.

**Title: Libra or Librae? Basket Based Stablecoins to Mitigate Foreign Exchange Volatility Spillovers**

Authors: Paolo Giudici, Thomas Leach, Paolo Pagnottoni

Abstract: The paper 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, we first find the optimal weights of the currencies that can comprise our basket. We then employ volatility spillover decomposition methods to understand which foreign currency mostly drives the others. We then look at how the stability of either stablecoin is affected by currency shocks, by means of VAR models and impulse response functions. Our empirical findings show that our basket based stablecoin is less volatile than all single currencies. This result is fundamental for policy making, and especially for emerging markets with a high level of remittances: a librae (basket based stable coin) can preserve their value during turbolent times better than a libra (single currency based stable coin).

**Title: Cyber risk ordering with rank-based statistical models**

Authors: Paolo Giudici and Emanuela Raffinetti

Abstract: In a world that is increasingly connected on-line, cyber risks become critical. Cyber risk management is very difficult, as cyber loss data are typically not disclosed. To mitigate the reputational risks associated with their disclosure, loss data may be collected in terms of ordered severity levels. However, to date, there are no risk models for ordinal cyber data. We fill the gap, proposing a rank-based statistical model aimed at predicting the severity levels of cyber risks. The application of our approach to a real-world case shows that the proposed models are, while statistically sound, simple to implement and interpret.

1. **UR - The University of Rijeka**

**Title: Benefits of Sectoral Cryptocurrency Portfolio Optimization**

Authors: Maria Čuljak, Bojan Tomić, Saša Žikovic

Abstract: When creating a portfolio, investor should consider the dynamics of the income ratio of the portfolio asset selected in order to identify and quantify the taken risk of the investment. This research paper will formally identify and describe the benefits of sectoral cryptocurrency classification portfolio optimization and it’s performance. Six optimization targets will be formed: MinVar, MinCVaR, MaxSR, MaxSTARR, MaxUT and MaxMean. The formed portfolio is compared with the performance of the CRIX index over the same period. The results suggest that five of the six portfolio strategies performed better if they included cryptocurrencies from financial, exchange and business services sectors.

1. **UW - The University of Warsaw**

**Title: Momentum and contrarian effects on the cryptocurrency market**

Authors: Krzysztof Kosc, Pawel Sakowski, Robert Ślepaczuk

Abstract: We report the results of investigation of the momentum and contrarian effects on cryptocurrency markets. The investigated investment strategies involve 100 (amongst over 1200 present as of date Nov 2017) cryptocurrencies with the largest market cap and average 14-day daily volume exceeding a given threshold value. Investment portfolios are constructed using different assumptions regarding the portfolio reallocation period, width of the ranking window, the number of cryptocurrencies in the portfolio, and the percent transaction costs. The performance is benchmarked against: (1) equally weighted and (2) market-cap weighted investments in all of the ranked assets, as well as against the buy and hold strategies based on (3) S&P500 index, and (4) Bitcoin price. Our results show a clear and significant dominance of the short-term contrarian effect over both momentum effect and the benchmark portfolios. The information ratio coefficient for the contrarian strategies often exceeds two-digit values depending on the assumed reallocation period and the width of the ranking window. Additionally, we observe a significant diversification potential for all cryptocurrency portfolios with relation to the S&P500 index.