CCC3 CryptoCurrency Conference 3
Berlin
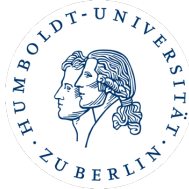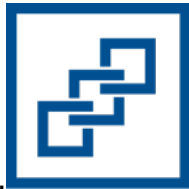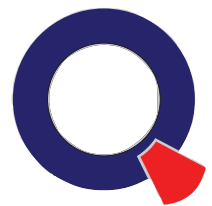
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Foreword

Dear distinguished speakers and participants,

We would like to welcome you to 3rd Crypto Currency Conference "Crypto-Currencies in a Digital Economy" (CCC3). This year the conference is organised by Blockchain Research Center (BRC) Humboldt University of Berlin, University of Applied Sciences for Engineering and Economics-HTW Berlin, University College Dublin, UZH Blockchain Center and Austrian Blockchain Center. The conference is sponsored by DFG, Royalton Partners, COST action CA19130 "Fintech and Artificial Intelligence in Finance" and the CENTRAL Project. This year we are glad to host more than 100 participants online and on-site in Berlin. The conference will feature talks from 35 distinguished speakers both from academia and industry.

The emerging digital (r-)evolution has generated a radically new thriving data-driven economy and, consequently, both business opportunities and threats. Innovative data processing and communication technologies facilitate access to financial services and promote economic growth. Entirely new platforms, such as P2P lending, decentralised financial services create new enormous opportunities. During the current COVID-19 pandemic, concerns about the debasement of traditional fiat currency brought about by accommodative monetary policy have renewed interest in cryptocurrencies (CC). Interest is not only based on innovative moves of traditional financial industry but also in seeing CCs as a novel asset class and, in addition, as an instance of a transaction ledger capable of transferring purchasing power without a central trusted party.

The CCC3 topics cover research on

- macro-economic consequences of the blockchain technology,
- CBDC = Central Bank Digital Currency,
- Legislation prospective and regulation of CCs market,
- risk-management with cryptocurrency derivatives,
- high-frequency markets of altcoins,
- financial inclusion and digital currencies,
- Quantlets for forecasting cryptocurrency markets,
- text-mining analysis of cryptos,
- energy market and cryptos.

We wish you an enjoyable, fruitful discussions and exiting time at our conference.

Sincerely,
The Conference organization committee

Alla Petukhina
Wolfgang Karl Härdle
Michael Burda
Hermann Elendner
Stefan Lessmann
Brenda Lopez Cabrera
Valerio Poti
Claudio Tessone

Programme "Cryptocurrencies in a Digital Economy"

Day 1	**November 26, 2021	09:00 — 17:30 (<u>Heilig-Geist-Kapelle, HU Berlin</u> and online)**
09:00 — 09:30	**Registration and Sound Check with online participants**
09:30 — 09:45	**Welcome and Introduction** Wolfgang Karl Härdle	BRC, Humboldt-Universität zu Berlin Organisation committee
09:45 — 10:30	**Keynote 1 CBDC: Macroeconomic or Political Risks** Dirk Niepelt	Study Center Gerzensee, University of Bern
10:30 — 11:00	**Coffee Break**

Session "Macroeconomic and monetary prospective" - Chair Michael Burda, Humboldt Universität zu Berlin

11:00 — 11:30	**Parallel digital currencies and sticky prices** Taojun Xie	National University of Sinagapore
11:30 — 12:00	**The Open Economy Macroeconomics of Central Bank Digital Currencies** Michael Kumhof (online)	Bank of England
12:00 — 12:30	**Valuing cryptocurrencies: Three easy pieces** Michael Burda	HU Berlin
12:30 — 13:30	**Lunch Break**
13:30 — 14:00	**Keynote 2 FinTech Econometrics: Privacy Preservation and the Wisdom of the Crowd** Steven Kou (online)	Boston University

Session "Analytics of Blockchain" - Stefan Lessmann, HU Berlin

14:00 — 14:20	**A network view of cryptocurrencies: the Bitcoin Lightning Network case-study** Tiziano Squartini (online)	IMT School for Advanced Studies Lucca
14:20 — 14:40	**Preferential Attachment in Ether and key Ethereum-Based Cryptoassets** Francesco Maria De Collibus	University of Zurich
14:40 — 15:00	**The complex structure of the Bitcoin correspondence Network** Claudio Tessone (online)	University of Zurich
15:00 — 15:20	**Exploring the Bitcoin mesoscale structure** Nicolo Vallarano	University of Zurich
15:20 — 15:40	**MicroVelocity - Rethinking the Velocity of Money for Digital Currency Systems** Carlo Campajola	University of Zurich
15:40 — 16:00	**Coffee Break**

Session "Legislation prospective and regulation of the Cryptocurrency market" - Chair Raphael Reule, BRC HU Berlin

16:00 — 16:30	**Secondary Trading on DLT-Platforms: The New Swiss Legal Framework** Rolf H Weber **|** University of Zurich
16:30 — 17:00	**Privacy in Cryptocurrencies. Does the MiCA-Regulation leave room for coins with AML-compliant privacy features?** Jörn Erbguth	University of Geneva, Geneva Macro Labs
17:00 — 17:30	**Digital Currencies and the Revolutionary Nature of Money** Andrew Dahdal (online)	Qatar University

Day 2	**November 27, 2021	09:00 — 17:30 (<u>HGK, HU Berlin</u> and online)**
09:00 — 09:30	**Welcome coffee and Sound Check with online participants**

Session "Cryptocurrency as an asset class" - Valerio Poti, University College Dublin

09:30 — 10:00	**Efficiency, risk and fraud - The Bitcoin price discovery network under the microscope** Simon Trimborn (online)	Hong Kong City University
10:00 — 10:20	**Pricing and hedging the inverse option under the SVCJ model** Hueiwen Teng (online)	National Yang Ming Chiao Tung University
10:20 — 10:40	**A Bayesian DSGE Approach for Modelling Cryptocurrency** Marco Lorusso	Newcastle University
10:40 — 11:00	**A Factor Model for Cryptocurrency Returns** Mykola Babiak	Lancaster University Management School
11:00 — 11:30	**Coffee break**

Session "CO2 on Blockchain" - Chair Brenda López Cabrera, HU Berlin

11:30 — 12:00	**DLT in CO2 certificate trading – opportunity or dead end?** Robert Richter	Frankfurt School Blockchain Center
12:00 — 12:30	**Greennovation, building a voluntary CO2 market** Leonardo Rodriguez MartInez	Greenovation
12:30 — 13:00	**Tokenization of Carbon Markets** Luisa Agudelo Blandón	Micobo
13:00 — 14:00	**Lunch Break**

Session "Origins and Flows of Digital Value" - Chair Hermann Elendner, ABC Vienna

14:00 — 14:30	**GraphSense: A General-Purpose Cryptoasset Analytics Platform** Bernhard Haslhofer	AIT - Austrian Institute of Technology
14:30 — 14:50	**From Curved Bonding to Configuration Spaces** Krzysztof Paruch (online)	WU Vienna
14:50 — 15:10	**Cryptocurrency: speculative asset and medium of exchange** Ingolf Gunnar Anton Pernice	Weizenbaum Institut
15:10 — 15:30	**Liquidity and Price Informativeness in Blockchain-Based Markets** Stefan Voigt (online)	Københavns Universitet
15:30 — 16:00	**Coffee break**

Session "Investments with cryptocurrencies" - Chair Alla Petukhina, HTW Berlin

16:00— 16:25   **Coins With Benefits: On Existence, Pricing Kernel and Risk Premium of Cryptocurrencies**
Cathy Yi-Hsuan Chen | University of Glasgow

16:25 — 16:50   **Diversification among cryptoassets: Bitcoin maximalism, active portfolio management, and survival bias**
Ladislav Kristoufek (online) | Charles University

16:50 — 17:10   **Deep learning-based forecasting and trading of Bitcoin: an evaluation of neural architecture search**
Georg Velev | HU Berlin

17:10 - 17:30   **Sectoral Cryptocurrency Portfolio Optimization**
Sasa Zikovic | University of Rijeka

17:30 — 17:45   **Wrap up and Closing remarks**

Day 2   **November 27, 2021 | 09:30 — 13:00 (R125, HU Berlin and online)**

Parallel PhD students Session I - Michael Althof, Royalton Partners

09:30 — 09:55   **Rodeo or Ascot: Which Hat to Wear at the Crypto Race?**
Konstantin Häusler | BRC Humboldt Universität zu Berlin

09:55 — 10:20   **Hedging Cryptocurrency options**
Jovanka Lili Matic | Humboldt Universität zu Berlin & Deutsche Bank

10:20 — 10:40   **Pricing Kernels and Risk Premia**
Julian Winkel | Humboldt Universität zu Berlin & Royalton Partners

10:40 — 11:00   **Non-Fungible Tokens & VizTech**
Bingling Wang | Humboldt Universität zu Berlin

11:00 — 11:30   **Coffee break**

PhD students Session II - Julian Winkel, HU Berlin & Royalton Partners

11:30 — 12:00   **Assessing Cryptocurrency Network Risk**
Anna Shchekina | BRC Humboldt Universität zu Berlin

12:00 — 12:30   **Understanding Jumps in High Frequency Digital Asset Markets**
Danial Saef | PWC & HU Berlin

12:30 — 13:00   **From Theory to Praxis - Managing Digital Asset Indexed ETPs**
Michael Althof | Humboldt Universität zu Berlin & Royalton Partners

13:00 — 14:00   **Lunch**

Speakers

Keynote — FinTech Econometrics: Privacy Preservation and the Wisdom of the Crowd

Abstract. After a brief overview of FinTech, this talk focuses on two timely topics in econometrics related to privacy and transparency issues: (1) Econometrics for sensitive financial data with privacy preservation in the era of big data. (2) The wisdom of the crowd and prediction markets, in the presence of new information from anonymous individual level trading data.

STEVEN KOU is a Questrom Professor in Management and Professor of Finance at Boston University. He teaches courses on FinTech and quantitative finance. Currently he is a co-area-editor for Operations Research and a co-editor for Digital Finance, and has served on editorial boards of many journals, such as Management Science, Mathematics of Operations Research, and Mathematical Finance. He is a fellow of the Institute of Mathematical Statistics and won the Erlang Prize from INFORMS in 2002. Some of his research results have been incorporated into standard MBA textbooks.

Keynote — CBDC: Macroeconomic or Political Risks

Abstract. When it comes to the perils of retail CBDC policy makers tend to stress macroeconomic threats including the disruption of bank business models, financial instability, and reduced investment. But whether retail CBDC would be disruptive depends on central bank choices, in particular on the choice of how the CBDC funds are invested. At the core, many `macroeconomic' risks therefore are political risks: Would central banks preserve the financing conditions that commercial banks enjoy in today's two-tiered monetary system? Would societies continue to restrict central bank facilities to a select set of counter parties? Or would the introduction of retail CBDC herald a new level of politicization of banking and central banking?

DIRK NIEPELT is director of the Study Center Gerzensee; professor at the University of Bern; president of the Swiss Society of Economics and Statistics; leader of the CEPR Research and Policy Network on FinTech and Digital Currencies; research fellow at the Centre for Economic Policy Research (CEPR, London); CESifo (Munich) research network member; and member of the macroeconomic committee of the Verein für Socialpolitik.
Prior to joining the Study Center, he was assistant professor at the Institute for International Economic Studies (IIES) at Stockholm University. He was an invited professor at the University of Lausanne; a visiting professor at the IIES; and held visiting positions at the European Central Bank, the International Monetary Fund and the Federal Reserve Bank of St. Louis. Before completing his doctoral education, he worked at applied research institutes in St. Gallen and Zurich (FEW, KOF).
Dirk Niepelt received his PhD in economics from the Massachusetts Institute of Technology and holds licentiate and doctorate degrees from the University of St. Gallen. His research and teaching covers topics in macroeconomics, monetary economics, international finance, public finance, and political economics and he frequently contributes to the public debate. He is the author of the MIT Press textbook "*Macroeconomic Analysis*."

Parallel digital currencies and sticky prices

Abstract. The recent rise of digital currencies opens the door to their use in parallel alongside official currencies ("dollar") for pricing and transactions. We construct a simple New Keynesian framework with parallel currencies as pricing units and sticky prices. Relative prices become a state variable. Exchange rate shocks can arise even without other sources of uncertainty. A one-time exchange rate appreciation for a parallel currency leads to persistent redistribution towards the dollar sector and dollar inflation. The share of the non-dollar sector increases when prices in the dollar sector become less sticky and when firms can choose the pricing currency.

TAOJUN XIE is a Senior Research Fellow at the Asia Competitiveness Institute, Lee Kuan Yew School of Public Policy, National University of Singapore. He obtained a PhD degree in Economics from Nanyang Technological University. At ACI, Taojun oversees the cost of living indices for expatriates and ordinary residents. He also examines the impact of the rise of FinTech and data technology on economic growth and business cycles, focussing on small open economies' and emerging markets' contexts. His recent works have assessed monetary policy frameworks with the presence of both privately-issued and central-bank-issued digital currencies.

The Open Economy Macroeconomics of Central Bank Digital Currencies

Abstract. We study the open-economy implications of introducing CBDCs into a 2-country DSGE environment that features a realistic financial system, with households deriving liquidity services from both CBDCs and bank deposits. We make several assumptions about the architecture and design features of CBDCs: 1) We focus on retail CBDC, and allow households to hold CBDCs in any currency; 2) CBDCs are strictly separated from reserves, and are remunerated at an interest rate below the policy rate due to their non-pecuniary convenience yield; 3) CBDCs are introduced via central bank purchases of government bonds or transfers to the government budget, ruling out direct and guaranteed conversion of bank deposits into CBDC at commercial banks; 4) CBDCs are separately issued in both countries. We show that the introduction of CBDCs by a single economy is highly beneficial in terms of output and welfare. The effects of financial disturbances are not exacerbated by the presence of CBDCs, in fact their effect on banks is typically mitigated. Large reallocations of liquidity between currencies, and between deposits and CBDC, yield benign balance sheet adjustments and small real effects. Finally, a more aggressively countercyclical use of the interest rate on CBDC could be highly beneficial in terms of stabilizing output and inflation.

MICHAEL KUMHOF is Senior Research Advisor in the Research Hub of the Bank of England. He is responsible for co-leading this unit, and for helping to formulate its research agenda. His previous position was Deputy Division Chief, Economic Modeling Division, IMF, where his responsibilities included the development of the IMF's global DSGE simulation model, GIMF. His main research interests are monetary reform (including central bank digital currencies and full reserve banking), the macroeconomic implications of the fact that banks are creators of money rather than intermediaries of savings, the role of economic inequality in causing imbalances and crises, and the macroeconomic effects of fossil fuel depletion. Michael taught economics at Stanford University from 1998 to 2004. He worked in corporate banking, for Barclays Bank PLC, from 1988 to 1993.His work has been published by AER, JME, AEJ Macro, JIE, JEDC, JMCB, EER, and Journal of Macroeconomics, among others. Dr. Kumhof is a citizen of Germany.

Valuing cryptocurrencies: Three easy pieces

Abstract. This paper surveys the capacity of simple macroeconomic models —"three easy pieces" — to account for persistent and positive valuations of privately issued assets based on the blockchain. Each of these three models — transactions demand for a means of payment, consumptionbased capital asset pricing, and search and matching — highlights important aspects of digital payments. The mutual interference of these jointly produced features may impede widespread use of cryptocurrencies until technological innovations have been developed to separate them.

MICHAEL BURDA received B.A., M.A. and Ph.D. (1987) at Harvard University.

Since 1993 he has served as director of the Institute for Economic Theory II and since 2007 visiting professor at the European School of Management and Technology (ESMT). He has also taught at Berkeley and INSEAD. In 1998, Burda received the Gossen Prize of the German Verein für Socialpolitik. He is research fellow at the Centre for Economic Policy Research (CEPR), Institute for the Study of Labor (IZA) and a fellow of the European Economic Association. He is a member of Scientific Advisory Board at IW-Halle (Institut für Wirtschaftsforschung, Halle); DIW-Berlin (Deutsches Institut für Wirtschaftsforschung, Berlin); Kiev School of Economics; Herbert-Giersch-Stiftung.
His research is primarily in macroeconomics, labor economics and issues of European integration and macroeconomic valuation models for cryptocurrencies.

A network view of cryptocurrencies: the Bitcoin Lightning Network case-study

Abstract. Cryptocurrencies are distributed systems that allow exchanges of native tokens among participants. The public availability of their complete historical bookkeeping opens up an unprecedented possibility, i.e. that of analysing the static and the dynamical properties of their network representations throughout their entire history. In this talk, some of the most recent results concerning the structural properties of the Bitcoin Lightning Network (BLN) will be reviewed: the picture that emerges is that of a system whose size enlarges while becoming increasingly sparse and whose mesoscopic structural organization becomes increasingly compatible with a (statistically-significant) core-periphery structure. Such a peculiar topology is matched by a very uneven distribution of bitcoins, a result suggesting that the BLN is undergoing a "centralisation" process at different levels.

TIZIANO SQUARTINI is a tenure track researcher at IMT School for Advanced Studies Lucca where he teaches the courses "Introduction to Network Science" and "Advanced Concepts in Network Theory". He holds a Master Degree in Physics (2008) and a PhD Degree in Physics (2011) from the University of Siena. Before moving to Lucca, he held positions as post-doctoral researcher at the Lorentz-Institute for Theoretical Physics (LION, University of Leiden, NL, 2012-2013) and at the Institute for Complex Systems (NRC, "Sapienza" University, Rome, 2014-2015). He is PhD board member of the national doctorate in Artificial Intelligence and visiting fellow at the Institute for Advanced Study (IAS - University of Amsterdam, NL). He currently collaborates with the Supervisory Policy Division of the Dutch National Bank, Bank of England and Bank of Mexico. He is author of around 70 publications in peer reviewed international journals (including major ones like Nature Reviews Physics, Physics Reports, Physical Review Letters), peer-reviewed book chapters and two co-authored monographs. His research interests lie at the intersection between statistical physics, graph theory, socio- and econo physics.

Preferential Attachment in Ether and key Ethereum-Based Cryptoassets

Abstract. We study the aggregated transaction networks of Ether and the three of the most market-capitalised ERC-20 tokens: Binance, USDT and Chainlink. We analyse a comprehensive dataset to understand the mechanism that drives their growth. We find that they present in general super-linear preferential attachment, i.e. the probability for a node to receive a new incoming link is proportional to k elevated to an exponent alpha, where k is the node's degree. These results reveal few nodes become hubs rapidly. We then analyse wealth and degree correlation between tokens, and conclude that, similarly to what happens in Bitcoin, "the rich indeed get richer" in the Ethereum world as well, with wealth much more concentrated than in-degree and out-degree.

FRANCESCO MARIA DE COLLIBUS is an experienced IT professional , with many years of international career in banking, software, telco and insurance companies. In 2018 he started as an external PhD student at the BDLT Group of University of Zurich, where he conducts research on Blockchain networks under the supervision of professor Claudio J. Tessone.

The complex structure of the Bitcoin correspondence Network

Abstract. Bitcoin is built on a blockchain, an immutable decentralised ledger that allows entities (users) to exchange Bitcoins in a pseudonymous manner. Bitcoins are associated with alpha-numeric addresses} and are transferred via transactions. Each transaction is composed of a set of input addresses (associated with unspent outputs received from previous transactions) and a set of output addresses (to which Bitcoins are transferred).
Despite Bitcoin was designed with anonymity in mind, different heuristic approaches exist to detect which addresses in a specific transaction belong to the same entity. By applying these heuristics, we build an Address Correspondence Network: in this representation, addresses are nodes are connected with edges if at least one heuristic detects them as belonging to the same entity. In this contribution, we analyse for the first time the Address Correspondence Network and show it is characterised by a complex topology, signalled by a broad, skewed degree distribution and a power-law component size distribution.   Using a large-scale dataset of addresses for which the controlling entities are known, we show that a combination of external data coupled with standard community detection algorithms can reliably identify entities. The complex nature of the Address Correspondence Network reveals that usage patterns of individual entities create statistical regularities; and that these regularities can be leveraged to more accurately identify entities and gain a deeper understanding of the Bitcoin economy as a whole.

CLAUDIO TESSONE is Professor of Blockchain and Distributed Ledger Technologies at the University of Zurich, and Chairman of the UZH Blockchain Center. He studies the link between microscopic agent behaviour, the rules they follow and the global, emergent properties of complex socio-economic and socio-technical systems. He holds a PhD in Physics and an Habilitation on "Complex socio-economic systems" from ETH Zurich in the area of Economics, Management and Technology.
Blockchain-based systems and cryptocurrencies are a pillar of his research. This includes modelling of consensus in blockchain-based systems, crypoeconomics (from financial aspects to meso- and macro-properties, such as understanding the emergent centralisation in cryptocurrencies), big-data blockchain analytics and forensics, design of blockchain-based systems, and characterisation and understanding the effects of incentives that are present (by design or set inadvertently) in them.
He is director of the Summer School: Deep Dive into Blockchain and is co-directs the Certificate of Advanced Studies on Blockchain at the University of Zurich.

Exploring the Bitcoin mesoscale structure

Abstract. The open availability of the entire history of the Bitcoin transactions opens up the possibility to study this system at an unprecedented level of detail. This contribution is devoted to the analysis of the mesoscale structural properties of the Bitcoin User Network (BUN), across its entire history (i.e. from 2009 to 2017). What emerges is that the BUN is characterized by a core-periphery structure a deeper analysis of which reveals a certain degree of bow-tieness. Interestingly, the evolution of the BUN structural organization experiences fluctuations that seem to be correlated with the presence of bubbles, i.e. periods of price surge and decline observed throughout the entire Bitcoin history.

NICOLO VALLARANO received his PhD in Economics, Management and Data Science at IMT Lucca school for advanced studies in july 2021. He is now working at the Blockchain and Distributed Ledger Technologies group at the institute of informatics, university of ZUrich. His research focus ranges from networks of cryptocurrencies transactions to the general modeling of consensus of decentralised digital currencies.

MicroVelocity - Rethinking the Velocity of Money for Digital Currency Systems

Abstract. In the quantity theory of money, the equation of exchange MV=PQ introduces the concept of Velocity of Money, measuring the average number of times a unit of currency is exchanged in a given time period. This quantity is relevant to monitor demand for money and the correct functioning of the economy, and is historically measured from aggregated data such as GDP. As many economic institutions make plans to adopt digital versions of cash money, the ability to tune the measurement of Velocity with micro-level, fine-grained data can be a game changer for regulators and policymakers in the implementation of monetary policy. Leveraging on the wealth of data made available by cryptocurrencies, we propose a microeconomical Velocity of Money - the MicroVelocity - measuring for each economic agent their contribution to the total Velocity at any point in time. We test our methodology on several cryptocurrencies and find that MicroVelocity is extremely heterogeneous across agents, with a distribution well approximated by a power law with exponent 1.5, and that the largest values are typically found for the very few wealthiest agents in the economy, a sign of extreme centralisation in the money supply. This metric provides an entirely new angle to the analysis of monetary systems, highlighting the complexity and heterogeneity of agents.

CARLO CAMPAJOLA is a postdoctoral researcher at the Blockchain and Distributed Ledger Technologies of the University of Zurich and a member of the UZH Blockchain Center. His current research activity, together with Prof. Dr Claudio J. Tessone, focuses on the analysis of cryptocurrencies from a complex systems perspective, with particular attention to the characterisation of individual properties of economic agents which affect the collective functioning of the system. Specific topics include analysis of transaction networks, modelling of the velocity of tokens and statistical methods for the detection of price manipulations.

Secondary Trading on DLT-Platforms: The New Swiss Legal Framework

Abstract. A

PROF. DR. ROLF H. WEBER is Professor of international business law at Zurich University acting there as co-director of the Research Program on Financial Market Regulation, the Center for Information Technology, Society, and Law and the Blockchain Center. Furthermore, he was Visiting Professor at Hong Kong University and he is practicing attorney-at-law at Bratschi Ltd. in Zurich. Prof. Weber is member of the Editorial Board of several Swiss and international legal periodicals and frequently publishes on issues of global law. His main fields of research and practice are IT- and Internet, international trade and finance as well as competition law.

Privacy in Cryptocurrencies. Does the MiCA-Regulation leave room for coins with AML-compliant privacy features?

Abstract. Art. 68 of the proposed MiCA-Regulation bans trading of coins with anonymization functions. This interdiction is not limited to anonymization functions that collide with anti money laundering measures. The surveillance of everyday transactions of small amounts is not mandated by AML-requirements. Privacy for these transactions might   be a human right (see for example https://www.theguardian.com/australia-news/2015/oct/01/cashless-welfare-card-could-breach-right-to-privacy-human-rights-committee) and mandated by Art. 8 of the Charter of Fundamental Rights of the European Union.

JÖRN ERBGUTH is a consultant on blockchain and data protection (GDPR). With majors in computer science and law, he takes a multidisciplinary approach to new technology. He is an enabler of privacy by design where legal and technological aspects need to be tightly integrated. Jörn has been invited to the European Commission, the German Bundestag and the Parliament of Sachsen to discuss Blockchain, data protection and information security. Jörn writes about technology and law and lectures at the University of Geneva, Geneva School of Diplomacy and the University of Lucerne. He is active in Blockchain standardization at the International Telecommunication Union (ITU) and was a member of DIN SPEC 4997 Privacy by Blockchain Design. He works with Geneva Macro Labs as Head of Technology Insights. Jörn also serves as a board member for the German EDV-Gerichtstag e.V. and the Swiss entscheidsuche.ch association.

Digital Currencies and the Revolutionary Nature of Money

Abstract. The intersection between money and government has long been critical to the distribution of power in a society and its prevailing political compact. The impact that digital currencies, in various forms, will have on constitutional relations between citizens and the state has yet to be fully unpacked. Professional and scholarly literature has thus far primarily focussed on understanding the technical and financial nature of the different forms of digital money and associated implications to capital markets and regulation. The broader political and constitutional aspects of the digital money revolution have received comparatively limited treatment. Given the enormous impact digital money is expected to have on all sectors of society in coming years, there is an urgent need for greater understanding and engagement in the political and constitutional ramifications. Digital currencies, of all kinds, will change the distribution and exercise of political power. There is currently no framework for understanding and assessing the nature and scope of such changes. This gap is in part due to the variety of existing and proposed digital currency models around the world (i.e. cryptocurrencies, stablecoins and CBDCs). It is also partly due to insufficient appreciation for the important historical developments that innovations in money have had on the formulation of modern constitutional principles. Informed by the role of money in both the English and American revolutionary periods, this paper presents a conceptual framework designed to explain the significance of digital money proposals in constitutional terms. Through that framework, the paper is able to identify the underlying normative characteristics of an 'optimal' digital currency model that would most faithfully accord with the Anglo-American constitutional heritage embodied in the concepts of limited government and individual rights.

ANDREW DAHDAL is an Associate Professor at the College of Law, Qatar University. He teaches commercial law and is the Section Head for Economic Diversification at the *Centre for Law and Development* (CLD). Andrew is also an industry consultant and writes on financial services particularly relating to technological innovations.

Efficiency, risk and fraud - The Bitcoin price discovery network under the microscope

Abstract. Understanding multi-market interactions and identifying leading markets in the global financial network is of interest to investors, regulators and policymakers. We study the price discovery network between Bitcoin exchanges with a focus upon market efficiency, market manipulation identification and systemic risk. We found that the market became more efficient over the years and that the systemic risk in the market decreased as well. We identified an exchange linked to fraud and another one which shows similar patterns in the network, which calls at question if it might be used for fraudulent behaviour as well. To study price discovery networks we propose a model, called TriSNAR, which is capable of identifying the leading exchanges in the network. We study the asymptotic and finite sample properties of TriSNAR. Compared to the other methods, TriSNAR excels in terms of accuracy, runtime and its ability to discover the network's structure. This study improves the understanding of the price discovery in the Bitcoin market and proposes a model, TriSNAR, to study such multi-market networks which outperformed competing methods.

SIMON TRIMBORN is an Assistant Professor at the Department of Management Sciences at College of Business and an Affiliate Assistant Professor with the School of Data Science, both at City University of Hong Kong. He received his doctorate (summa cum laude) in 2018 from the Humboldt-Universität zu Berlin for his thesis on "Statistics of Digital Finance". Before he took on his appointment as Assistant Professor at CityUHK, he was employed as Research Fellow for 2 years at National University of Singapore.

His work spans the areas of network & complex systems analysis, FinTech & investment methodologies, text mining & dimension reduction techniques, as well as cryptocurrency & blockchain analysis. He organized a seminar series on cryptocurrency and blockchain at National University of Singapore and created the market index and volatility index for the cryptocurrency market, CRIX and VCRIX: thecrix.de . The codes underlying his work serve as a basis for software packages, which are available via GitHub and CRAN. He has published in journals such as Journal of Financial Econometrics, The R Journal, Quantitative Finance and Journal of Empirical Finance. For more detailed information and updates, one may visit simontrimborn.de.

Pricing and hedging the inverse option under the SVCJ model

Abstract. The Deribit inverse option is the most popular type of derivatives in the cryptocurrencies derivatives market. Following Hou et al (2020), this paper investigates the pricing and hedging performances for the inverse option between the SVCJ and other competitive models.

HUEI-WEN TENG is an Associate Professor at National Yang Ming Chiao Tung University. She is interested in statistics and interdisciplinary applications.

She focuses on Monte Carlo methods and machine learning in financial engineering and FinTech.

A Bayesian DSGE Approach for Modelling Cryptocurrency

Abstract. We develop and estimate a DSGE model to evaluate the economic repercussions of cryptocurrency. We assume that cryptocurrency offers an alternative currency option to government currency, with endogenous supply and demand. We uncover a substitution effect between the real balances of government currency and cryptocurrency in response to technology, preferences and monetary policy shocks. We also observe a countercyclical reaction of real balances of cryptocurrency to these shocks. Cryptocurrency productivity shocks have negative effects on output, inflation and cryptocurrency exchange rate. Finally, output and inflation responses are stronger when cryptocurrency is introduced in the utility function in a non-separable way.

MARCO LORUSSO is Lecturer at the Newcastle University Business School. His main research interests are in the fields of Applied Macroeconomics, Fiscal and Monetary Policy, Energy Economics, Economics of Cryptocurrency and Defence Economics.

A Factor Model for Cryptocurrency Returns

Abstract. We investigate the dynamics of daily realised returns and risk premiums for a large cross-section of cryptocurrency pairs through the lens of an Instrumented Principal Component Analysis (IPCA) (see Kelly et al., 2019). We show that a model with three latent factors and time-varying factor loadings significantly outperforms a benchmark model with observable risk factors: the total (predictive) R_2 from the IPCA is 17.2% (2.9%) for individual returns, against a benchmark 9.6% (-0.02%) obtained from a model with six observable risk factors explored in previous literature. By looking at the characteristics that significantly matter for the dynamics of risk premiums, we provide robust evidence that liquidity, size, reversal, and both market and downside risks represent the main driving factors behind expected returns. These results hold for both individual assets and characteristic-based portfolios, pre and post the Covid-19 outbreak, and for weekly individual and portfolio returns.

MYKOLA BABIAK is an Assistant Professor of Finance at Lancaster University Management School. He was awarded a Ph.D. by CERGE-EI (Center for Economic Research and Graduate Education - Economics Institute) in Fall 2019. Previously, he was a visiting scholar at Columbia Business School and Warwick Business School. His research interests center around empirical and theoretical asset pricing, macro-finance, derivatives and cryptocurrency markets. He is particularly interested in understanding how investor expectations and macroeconomic uncertainty affect financial markets. Recently, his work is focused on unravelling the drivers of asset returns and premiums in the foreign exchange and cryptocurrency markets.

DLT in CO2 certificate trading – opportunity or dead end?

Abstract. Climate change is one of the key priorities for the European Union. Part of the solution is the EU Emission Trading System, which limits the amount of pollutants a company can emit. This lecture outlines the status quo, opportunities, and challenges that a shift to a DLT-based system would bring.

Since January 2020 **ROBERT RICHTER** is a research fellow at the Frankfurt School of Finance focussing on Decentralized Finance (DeFi). In addition, Robert is the project manager of the EU-funded project 'Blockpool' and part of a feasibility study investigating how DLT can be used in the CO2 emission trading process. Furthermore he has published several articles on portfolio optimization using crypto assets. Robert began his career in the financial services sector in 2012 at Lloyds Banking Group and has worked at Deloitte UK and Deloitte Switzerland since. Robert holds a Masters Degree in Economics from the University of Warwick and is a CFA Charter holder.

Greennovation, building a voluntary CO2 market

Abstract. The society awareness of climate change and GHG emissions has raised in the last years after the latest governments agreements and goals. In order to improve the transition into a sustainable model of economy and reduce GHG emissions, the worldwide governments, leading by the European Union, have adopted new measures as could be the creation of a regulated carbon market (EU ETS) for big companies.

But... What if we could accelerate this movement even more by offering people a voluntary market?

In Greenovation, we focus on all the process associated in the creation of value from GHG Emissions and the carbon offsetting for SME's and individuals, that represents the major share of emissions.

VERÓNICA RODRÍGUEZ BALLESTEROS and **LEONARDO RODRÍGUEZ MARTÍNEZ** represent **GREENNOVATION**, a startup founded by GreenB2E, that digitizes and tokenizes through blockchain technology assets associated with sustainability to offer their users a platform for access to a new *green* exchange market, with the aim of helping producers of climate impact reduction solutions to monetize their projects and investors to offset their carbon footprint or invest in new assets.

Tokenization of Carbon Markets

Abstract. Currently, cumbersome Cap-and-Trade schemes leave behind a vast portion of the carbon offsetting efforts of the production industry. Offering a trading venue, backed on an immutable supply chain management system opens the opportunity for industry participants to leverage their efforts to obtain climate goals, and reinvest to improve their sustainable practices. Through Distributed Ledger Technology (DLT), value-chain participants with sustainable production standards that manage to offset carbon emissions can offer full accountability of their claims. With a programmed scientific method to calculate the carbon intensity of production chains, the acute problem of double-counting can be solved.

At present, buyers and sellers are usually unable to verify and validate the true value of carbon credit and audit the carbon credit's value (i.e., determine that the carbon credit is derived from a legitimate environmentally conscious and carbon-friendly process). With immutably-recorder audit trails of the carbon intensity of a product, the market can be fully transparent. Tokenization of carbon markets solves both the efficiency and accountability problems urgently needed to service the growing demand for better and more sustainable practices.

LUISA AGUDELO BLANDÓN is a foreign lawyer with a Master's in European Governance & Regulations. She has a passion for meaningful projects and an avid curiosity for technology. For the past three years, she has been working on consultancy for blockchain projects. Now, she is leading the development team and the business operations as a project manager of a digital venue for Tokenized Carbon (credits & offsets).

MICOBO is an infrastructure and software provider for a state-of-the-art tokenization platform. We understand digitalization challenges and want to leverage all its opportunities to create more secure and efficient capital markets. Weempower our clients with the best infrastructure for the emerging digital assets global industries through blockchain and other Distributed Ledger Technologies.

We Are Developing The Infrastructure For Tomorrows Capital Markets

Within the next decade, most digital assets currently being issued and managed in central databases will transition to a decentralized infrastructure. Our mission is to provide an infrastructure that empowers issuers and financial institutions to access Blockchain-based assets and the great opportunities related to this. By integrating Blockchain and other Distributed Ledger Technologies in the capital markets, new asset classes will emerge, processes will become more efficient, and financial inclusion of specific investor groups will drastically increase.

GraphSense: A General-Purpose Cryptoasset Analytics Platform

Abstract. There is currently an increasing demand for cryptoasset analysis tools among cryptoasset service providers, the financial industry in general, as well as across academic fields. At the moment, one can choose between commercial services or low-level open-source tools providing programmatic access. In this paper, we present the design and implementation of another option: the GraphSense Cryptoasset Analytics Platform, which can be used for interactive investigations of monetary flows and, more importantly, for executing advanced analytics tasks using a standard data science tool stack. By providing a growing set of open-source components, GraphSense could ultimately become an instrument for scientific investigations in academia and a possible response to emerging compliance and regulation challenges for businesses and organizations dealing with cryptoassets.

BERNHARD HASLHOFER works as a Senior Scientist and Thematic Coordinator in the Data Science & Artificial Intelligence group of the AIT - Austrian Institute of Technology. Further, he leads the CryptoFinance Research Group at the Complexity Science Hub Vienna.

From Curved Bonding to Configuration Spaces

Abstract. Bonding curves are continuous liquidity mechanisms which are used in market design for cryptographically-supported token economies. Tokens are atomic units of state information which are cryptographically verifiable in peer-to-peer networks. Bonding curves are an example of an enforceable mechanism through which participating agents influence this state. By designing such mechanisms, an engineer may establish the topo- logical structure of a token economy without presupposing the utilities or associated actions of the agents within that economy. This is accomplished by introducing configuration spaces, which are proper subsets of the global state space representing all achievable states under the designed mechanisms. Any global properties true for all points in the configuration space are true for all possible sequences of actions on the part of agents. This paper generalizes the notion of a bonding curve to formalize the relationship between cryptographically enforced mechanisms and their associated configuration spaces, using invariant properties of conservation functions. We then proceed to apply this frame- work to analyze the augmented bonding curve design, which is currently under development by a project in the non-profit funding sector.

KRZYSTOF PARUCH is a key founding member of the Research Institute for Cryptoeconomics in Vienna (Austria) and is responsible for the development of the Token Engineering research stream. In his current role as a doctorate candidate and teaching assistant he contributes to the emergence of this nascent scientific field by - both in his research and academic teaching - bridging the gap between the Technical University Vienna (TU) and the Vienna University of Economics and Business (WU). He is a diligent co-creator of and vivid participant in crypto and academic communities regurarly presenting his research results at conferences and events as he creates his own PhD research curriculum for the unprecedented education in Token Engineering and Cryptoeconomics. With a background in mathematics his research focuses on synthesizing the formal engineering methodologies of modeling and simulation into the applied domain of cryptoeconomics. Kris has five years working experience in Finance, Banking & Software System Integration and understands the mindset and motivation as well as the financial and regulatory background at the intersection of real-world and cryptoeconomics.

Cryptocurrency: speculative asset and medium of exchange

Abstract. Cryptocurrency tokens, characterized by their usage, can be both - speculative investment or medium-of-exchange. We combine two models to form an abstraction capable of mirroring this Janus-like quality. Our approach merges an asset-flow approach modeling speculation around an asset's fundamental value into the transactions-form of the quantity equations of money, developed to analyze money as an exchange medium. Our novel approach allows to analyze the inter-temporal interplay of the quantity theory's crucial variables for cryptocurrencies with inflexible token supply in a more meaningful way. The intuitiveness of both component-models make the model simple to understand and applicable in empiric studies and simulations. We demonstrate the richness of the model by running simulations analyzing the adaption process of cryptocurrencies to novel fundamental values and study price instability. We find that higher fractions of tokens held back by speculators lead to disproportionate increases in the instability of price processes in response to shocks. This leads us to the conclusion that sustainable price increases of cryptocurrencies ought to be accompanied by low levels of tokens held back by speculators.

INGOLF GUNNAR ANTON PERNICE is a research associate at the Weizenbaum Institute in the interdisciplinary research group "Trust in Distributed Environments" and doctoral student at the Institute of Economics and Law at Technical University Berlin.

Ingolf holds a B.Sc. in Economics from the University of Leipzig and an M.Sc. in Financial Economics from Humboldt-Universität Zu Berlin. He was part of the "Accounting and Finance Fellows" promotion program. Ingolf completed internships at Targobank AG & Co. KGaA (Consumer Banking) and Ernst & Young GmbH WPG (Transaction Advisory). During his studies, Ingolf worked as a research assistant at the Corporate Finance Institute of the Humboldt University in Berlin and for research projects in SME and public administration at the Universidade Ijuí-RS. Recently, Ingolf collaborated as Visiting Scholar with the Department of Mathematics at Pittsburgh University.

His research focuses on digital, decentralized money systems. In particular, Ingolf investigates cryptocurrency price processes. Other areas of interest include stablecoins, regulatory approaches to cryptocurrencies and their social benefits and costs. Ingolf promotes the scientific exchange between industry and science within the organization of the Blockchain Nights of the Humboldt-Universität Zu Berlin.

Liquidity and Price Informativeness in Blockchain-Based Markets

Abstract. Blockchain-based markets impose substantial costs on cross-market trading due to the decentralized and time-consuming settlement process. I quantify the impact of the time-consuming settlement process in the market for Bitcoin on arbitrageurs activity. The estimation rests on a novel threshold error correction model that exploits the notion that arbitrageurs suspend trading activity when arbitrage costs exceed price differences. I estimate substantial arbitrage costs that explain 63% of the observed price differences, where more than 75% of these costs can be attributed to the settlement process. I also find that a 10 bp decrease in latency-related arbitrage costs simultaneously results in a 3 bp increase of the quoted bid-ask spreads. I reconcile this finding in a theoretical model in which liquidity providers set larger spreads to cope with high adverse selection risks imposed by increased arbitrage activity. Consequently, efforts to reduce the latency of blockchain-based settlement might have unintended consequences for liquidity provision. In markets with substantial adverse selection risk, faster settlement may even harm price informativeness.

STEFAN VOIGT is an assistant professor of Finance at the Department of Economics at the University of Copenhagen as well as a research fellow at the Danish Finance Institute. His research is centered around the impact of technological innovation on financial markets. Stefan has a deep interest in the economic implications of blockchain-based settlement and research questions pertaining to market fragmentation, high-frequency trading and big data in financial applications.

Coins With Benefits: On Existence, Pricing Kernel and Risk Premium of Cryptocurrencies

Abstract. Cryptocurrencies come with benefits, such as anonymity of payments and positive network effects of user adoption, and transaction risks including unconfirmed transactions, hacks, and frauds. They compete with central-bank-regulated money but consumers may prefer one currency over the other. In our arbitrage-free world utility from consumption depends on benefits, which are governed by distinct stochastic processes, implying incomplete markets and distinct pricing kernels. We characterize the cryptocurrency kernels, evaluate the otherwise unobservable benefits, and show their contribution to pricing. The model explains both the co-existence of the two currencies and the high volatility of the cryptocurrency price.

CATHY YI-HSUAN CHEN is a professor at Adam Smith Business School in the University of Glasgow. She is the Mercator Fellow of International Research Training Group 1792 in Germany since 2018. Her publications are deep in theory and broad in scope and have had a strong impact to appear in top econometric journals. She has specialized herself in Blockchain economy, FinTech era and data analytics. She is the fellow in Blockchain Research Center, a think-tank and research community established by the Universität Zürich and the Humboldt-Universität zu Berlin. She plays a major role in the FinTech master program at the University of Glasgow. She represents the UK government, Department of International Trade, for reviewing FinTech awards 2019. She has been nominated as Management Committee substitute representing the UK for the EU FinTech Action.

Diversification among cryptoassets: Bitcoin maximalism, active portfolio management, and survival bias

Abstract. The current study is a deep dive into active and passive investment strategies focusing on specifics of cryptoassets, the most important of which is the survival bias in the portfolio dataset construction and its implications. We show that survival bias does in fact drive the results at their very core and that the differences between using the backward-looking subset of assets and actual assets available at the time of portfolio construction are substan- tial and lead to completely different implications and investment suggestions. It turns out that active portfolio management does not pay off in most instances compared to simply holding Bitcoin.

LADISLAV KRISTOUFEK is a professor of economics and finance at Charles University Prague and a senior research fellow at the Czech Academy of Sciences. He is one of the early authors on economic aspects of Bitcoin and his research interests range from cryptoassets to financial econometrics, energy finance, multifractality, and online data to machine learning and data science.

Deep learning-based forecasting and trading of Bitcoin: an evaluation of neural architecture search

Abstract. Over the past years, Bitcoin market prediction has received a lot of attention. Numerous studies dealing with cryptocurrency forecasting have applied Long Short-Term Memory recurrent neural networks due to their ability to learn long-term dependencies from time-series data. In addition to that, neural architecture search has been reported in the literature to outperform hand-crafted architectures on machine learning tasks such as image and text classification. In this work, we apply neural architecture search using policy gradient, a type of reinforcement learning technique, for one timestep ahead prediction of the movement of Bitcoin closing price. On the micro-level, we focus on the search for novel tree-based recurrent cells. On the macro-level, we take the 10 cells that achieved the best results in terms of predictive accuracy on the validation set and optimize the remaining hyperparameters that were set to fixed values during the micro search as well as hyperparameters relevant for the macro architecture. We compare the results achieved by the best performing neural architecture with Long Short-Term Memory neural network and show that neural architecture search outperforms the benchmark in terms of the achieved accuracy. Furthermore, we explore the profitability of the models by using a simple trading strategy, which relies only on the predicted movement of the closing price of Bitcoin. In addition to that, we present a new trading strategy that takes into account the predicted movement of both the closing price and the trading volume to generate trading signals.

GEORG VELEV is a master's graduate of the Information Systems program at HU Berlin. Currently, he is a PhD candidate at the chair of Prof. Dr. Lessmann. The PhD is focusing on causal relationship identification in time series data. During his studies, he has gained experience both at technical and business roles. He has accomplished 8 Machine Learning projects including his master thesis. He is passionate about Artificial Intelligence, Big Data and technology-driven innovation. His scientific interests include, but are not limited to, Algorithmic Trading, Automated Machine Learning, Computer Vision, Causal Inference and IoT.

Sectoral Cryptocurrency Portfolio Optimization

Abstract. 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.

SAŠA ŽIKOVIĆ, Ph.D. is a tenured professor of finance at the Faculty of Economics and Business University of Rijeka, Croatia. He is a Vice Dean for Scientific Research and International Strategic Partnerships and a cofounder of a multidisciplinary MBA programme Energy Economics.

He has published over 100 scientific papers in international academic journals, as well as three books on the topic of Risk Management and Energy Economics. He is a regular contributor to top academic journals, such as: International Journal of Forecasting, Energy, Energy Strategy Reviews, International Journal of Greenhouse Gas Control, Journal of Energy Markets, Energy Research & Social Science, Sustainability etc. Research interests are: Risk management, Energy economics and Financial management.

Awarded several awards for academic excellence among which the Award for the best scientific researcher in the field of social and humanistic studies and the award "Ivo Sever" for the best scientific paper of the year.

Since 2011 he has been a member of the editorial board for the following academic research journals: Digital Finance, Springer; Qualitative Research in Financial Markets, Emerald Group Publishing, UK; International Journal of Economics and Financial Issues, EconJournals, UK; Journal of Islamic Finance Studies, Bahrein; Banking Gazette, Slovenia; Journal of Economics and Business, Faculty of Economics Rijeka, Croatia; Croatian Review of Economics, Business and Social Statistics.

He is a visiting professor at a number of foreign and domestic Universities, including: Humboldt-Universität zu Berlin, Ladislaus von Bortkiewicz Chair of Statistics (Germany), CERGE-EI, Prague (Czech Republic), KEDGE Business School (France), Ural Federal University (Russia), Almaty Management University (Kazakhstan), Faculty of Economics University of Ljubljana (Slovenia), Faculty of Administration University of Ljubljana (Slovenia), Faculty of Economics University of Split, Faculty of Economics University of Pula (Croatia), Faculty of Maritime Studies University of Rijeka (Croatia).

Besides his academic career he works as a consultant for a number of financial institutions, energy companies, energy market regulators and software companies in the field of risk management and energy economics. Currently, he is a project leader and researcher on two EC Horizon2020 scientific projects: „FIN-TECH: A FINancial TECHnology training platform" and „REPLACE: Making heating and cooling for European consumers efficient, economically resilient, clean and climate-friendly".

PhD Students

Rodeo or Ascot: Which Hat to Wear at the Crypto Race?

Abstract. We model the dynamics of the cryptocurrency (CC) asset class via a stochastic volatility with correlated jumps (SVCJ) model with rolling-window parameter estimates. By analyzing the time-series of parameters, stylized patterns are observable which are robust to changes of the window size and supported by cluster analysis. During bullish periods, volatility stabilizes at low levels and the size and volatility of jumps in mean decreases. In bearish periods though, volatility increases and takes longer to return to its long-run trend. Furthermore, jumps in mean and jumps in volatility are independent. With the rise of the CC market in 2017, a level shift of the volatility of volatility occurred.

KONSTANTIN HÄUSLER is a PhD Student in statistics at the International Research Training Group 1792 „High-dimensional, non-stationary Time Series" (Humboldt University Berlin). His research focuses on financial statistics and digital economy, with a special focus on the dynamics of the cryptocurrency sector, He holds a Master in Statistics (2021) and a Master in Economics (2019), both from Humboldt University Berlin.

Hedging Cryptocurrency options

Abstract. The cryptocurrency (CC) market is volatile, non-stationary and non-continuous. This poses unique challenges for pricing and hedging CC options. We study the hedge behaviour and effectiveness for a wide range of models. First, we calibrate market data to SVI-implied volatility surfaces, which in turn are used to price options. To cover a wide range of market dynamics, we generate price paths using two types of Monte Carlo simulations. In the first approach, price paths follow an SVCJ model (stochastic volatility with correlated jumps). The second approach simulates paths from a GARCH-filtered kernel density estimation. In these two markets, options are hedged with models from the class of affine jump diffusions and infinite activity Lévy processes. Including a wide range of market models allows to understand the trade-off in the hedge performance between complete, but overly parsimonious models, and more complex, but incomplete models. Dynamic Delta, Delta-Gamma, Delta-Vega and minimum variance hedge strategies are applied. The calibration results reveal a strong indication for stochastic volatility, low jump intensity and evidence of infinite activity. With the exception of short-dated options, a consistently good performance is achieved with Delta-Vega hedging in stochastic volatility models. Judging on the calibration and hedging results, the study provides evidence that stochastic volatility is the driving force in CC markets.

LILI MATIC is a PhD Student in Statistics at the International Research Training Group 1792 „High-dimensional, non-stationary Time Series" (Humboldt University Berlin). His research focuses on Financial Mathematics and Nonparametric Statistics. She also works as a Risk Manager in Theoretical Backtesting at Quant Institute, Deutsche Bank. She holds a Master in Statistics from Humboldt University Berlin.

Pricing Kernels and Risk Premia

Abstract. Using a BRC data set on Bitcoin options from Deribit, the largest exchange thereof, pricing kernels and corresponding confidence bands are inferred . State-Price-Densities are estimated with Rookley's method. The results allow arbitrage-free pricing of various instruments and to infer risk affinity of market participants.

JULIAN WINKEL holds a M.Sc. in statistics from Humboldt University Berlin, where he is currently enrolled as a Ph.D. student and a member of the IRTG 1792. His research is focussed on pricing kernels and reproducibility. He is employed at Royalton Partners and previously worked for Growney.

Assessing Cryptocurrency Network Risk

Abstract. The FRM Financial Risk Meter is a technique (Mihoci, Althof, Chen, and Härdle (2020) that — based on quantile Lasso regression — is able to identify individual risk characteristics in a network topology. We explain why variation in the FRM, being an average of penalisation parameters, proves to be a good estimator for variation in market risk, focusing particularly on the case of cryptocurrencies. As a highly connected asset class, any risk measure for portfolios of cryptocurrencies must account for links and mutual dependencies, especially with respect to tail events. Cryptocurrencies thus represent an ideal asset class to illustrate the properties and relative advantages of FRM.

ANNA SHCHEKINA is a PhD student in Statistics at International Research Training Group 1792 "High Dimensional Non Stationary Time Series" at Humboldt University of Berlin.

Anna's research focuses on statistical aspect of machine learning in computational finance, particularly applied to cryptocurrency market, including sentiment and network risk analysis and option pricing.

Anna has received her master's degree in Financial Mathematics at Uppsala University and bachelor's degree in Applied Mathematics and Computer Science at Saint Petersburg State University, worked as a research assistant at Sveriges Riksbank and as a quantitative engineering intern at Itiviti in Stockholm.

Understanding Jumps in High Frequency Digital Asset Markets

Abstract. While attention is a predictor for digital asset prices, and jumps in Bitcoin prices are well-known, we know little about its alternatives. Studying high frequency crypto ticks gives us the unique possibility to confirm that cross market digital asset returns are driven by high frequency jumps clustered around black swan events, resembling volatility and trading volume seasonalities. Regressions show that intra-day jumps significantly influence end of day returns in size and direction. This provides fundamental research for crypto option pricing models. However, we need better econometric methods for capturing the specific market microstructure of cryptos. All calculations are reproducible via the quantlet.com technology.

DANIAL SAEF is a Data Scientist at PWC and is an expert in using time series analysis and state-of-the-art financial analyses to solve complex business problems. Additionally, he is pursuing a PhD in Statistics at Prof. Wolfgang K. Härdle's International Research Training Group 1792 and is a visiting researcher at Prof. Tomaso Aste's research group in Financial Computing & Analysis at University College London. He holds a M.Sc. in Economics from Maastricht University.

From Theory to Praxis - Managing Digital Asset Indexed ETPs

Abstract. Michael's presentation will walk the audience through the legal, financial and organisational as well es executional items, which a potential investor will face. Various legal envelopes hitherto in use will be discussed and compared, including financial and organisational necessities. We then take the example of a cryptocurrency index to exemplify execution risk on fund transactions, and delve into how an index on NFTs could be developped.

MICHAEL ALTHOF is a portfolio manager and head of ETF Capital Marketsoffice. He leads the ETF capital markets team in Luxemburg and oversees Royalton Partners ETF trading activities across the dealer community and end clients. Michael Althof joined Royalton Partners in 2021. He has 19 years of investment experience. He previously lead the ETF Capital Markets team in EMEA for PIMCO Europe, and was fund manager for PIMCO Real Return inflation protected portfolios. Mr. Althof holds a master's degree from the Ecole Supérieure de Commerce de Paris, focused on financial maths. He also holds a certificate in quantitative finance (CQF) and is currently pursuing a Ph.D. in mathematical statistics at the Humboldt Universität zu Berlin.

Non-Fungible Tokens & VizTech

Abstract. None Fungible Tokens (NFTs), a type of digital asset (or a standard of smart contract) derives on Ethereum Blockchain, has aroused huge interest from investors in the begiing of 2021, and the craze seems to continue. We invested in the NFT market data and a representative collection: CryptoPunks, by applying Visualisation and clustering techniques, and found some significant features from the art work images that influenced the price.

BINGLING WANG is a Ph. D. student of Applied Statistics and Econometrics, IRTG 1792, Humboldt University of Berlin.

Conference Organizers

WOLFGANG KARL HÄRDLE attained his Dr. rer. nat. in Mathematics at Universität Heidelberg in 1982 and in 1988 his habilitation at Universität Bonn. He is Ladislaus von Bortkiewicz Professor of Statistics at Humboldt-Universität zu Berlin and the director of the Sino German Graduate School (洪堡大学 + 厦门大学) IRTG1792 on "High dimensional non stationary time series analysis". He also serves as head of the joint BRC Blockchain Research Center (with U Zürich). He is guest professor at WISE, Xiamen U, SMU, Singapore, NYCU, Hsinchu TW, Charles U, Prague CZ.

His research focuses on data sciences, dimension reduction and quantitative finance. He has published over 30 books and more than 300 papers in top statistical, econometrics and finance journals. He is highly ranked and cited on Google Scholar, REPEC and SSRN. He has professional experience in financial engineering, SMART (specific, measurable, achievable, relevant, timely) data analytics, machine learning and cryptocurrency markets. He has created the financial risk meter, FRM hu.berlin/frm, the CRIX thecrix.de Quantlets quantlet.com and quantinar.com His web page is: hu.berlin/wkh

ALLA PETUKHINA holds a M.Sc. in economics from the Ural state university, Russia. She received her Ph.D. degree in statistics and econometrics from Humboldt-University zu Berlin in 2018. In August 2021 she joined a School of Computing, Communication and Business at the University of Applied Sciences for Engineering and Economics (HTW Berlin).
She served as a coordinator for EU H2020 project on FinTech and risk management in Germany. She is Management committee member and co-leader of working group one at COST action CA1930 "Fintech and artificial intelligence in finance".
Dr Petukhina's research mainly focuses on asset allocation strategies for alternative asset class portfolios (mutual funds, cryptocurrencies), addressing both the high dimensionality problem and the dynamic non Gaussian structure.

STEFAN LESSMANN received a PhD from the University of Hamburg in 2007, where he also completed his habilitation on decision analysis and support using ensemble forecasting models in 2012. He then joined the Humboldt-University of Berlin in 2014, where he heads the Chair of Information Systems at the School of Business and Economics. He serves as an associate editor for the International Journal of Business Analytics, Digital Finance, and the International Journal of Forecasting, and as department editor of Business and Information System Engineering (BISE). Stefan has secured substantial amounts of research funding and published several papers in leading international journals and conferences. His research concerns the support of managerial decision-making using quantitative empirical methods. He specializes in applications of (deep) machine learning techniques in the broad scope of marketing and risk analytics. Stefan actively participates in knowledge transfer and consulting projects with industry partners; from start-up companies to global players and not-for-profit organizations.

BRENDA LÓPEZ CABRERA (Weather, Climate and Energy, WIWI-HUB)
Her area of expertise forms a valuable bridging function between empirical and quantitative research on climate and weather risks as well as sustainable and green finance. Her research deals with the statistical modelling, artificial intelligence and risk management of weather, climate and energy data related and concentrate on the decision making. She reinforces the conference with regard to the analysis of different social, economic and ecological factors, as well as the opportunities and risks in the area of Crypto and Energy Market.

VALERIO POTÌ is Professor of Finance in the Business School of University College Dublin, where he teaches portfolio and risk management and Banking & Finance. He is also a visiting professor of Econometrics in the University of Bari in Italy. He was previously in Dublin City University, where he was head of Economics, Finance and Entrepreneurship. He graduated in Banking and Finance from Bocconi University Milan and gained a Ph.D. in Finance from Trinity College Dublin, while also visiting the Finance department of New York University Stern Business School as an International Visiting Research Scholar, working on the study of currency markets and financial econometrics with Professor Richard Levich. His research interests, spanning Finance, Economics and Management, include asset pricing, performance attribution, market efficiency, behavioural finance, financial econometrics, corporate finance and SMEs financing and, more recently, digital finance and financial data science. His research has been published in international peer reviewed journals such as *Management Science*, the *International Journal of Forecasting*, the *Journal of Banking and Finance*, the *Journal of International Money and Finance*, *Journal of Business Ethics*, *European Financial Management*, and he has contributed to practitioner-oriented books on portfolio and risk management. He is the Main Proposer and co-Chair of the H2020 *COST Action "Fintech and Artificial Intelligence in Finance - Towards a transparent financial industry*" (CA19130) and a funded principal investigator on the Coordination and Support Action "FIN-TECH: a knowledge exchange platform for FINancial TECHnology risk management", which are two large-scale research projects on FinTech and Financial Data Science involving a very large network of universities, companies and regulators. He is a founding associate editor of the peer-reviewed scientific journal *Digital Finance* (Springer, https://www.springer.com/journal/42521). He has held visiting appointments at the European University Institute, New York University Stern School of Business, Nazarbayev University Graduate School of Business, Cattolica University at Piacenza. He also engages in consulting activities on risk and performance attribution and on issues related to the usage of derivatives to generate economic value. In the past, he taught International Finance at Queen's University Belfast and, before moving to academia, he worked as an equity option market maker on the Milan derivatives exchange and was the head of the Financial Engineering desk of the Dublin subsidiary of Banca Monte dei Paschi di Siena.

HERMANN ELENDNER is senior scientist at the Austrian Blockchain Center (ABC), senior research fellow at the Weizenbaum Institute for the Networked Society, and research associate at the Centre for Blockchain Technologies at University College London (UCL).

His research focus lies on crypto-assets and their role at the interface between finance and computer science: how they generate value and information, how the asset class of "cryptos" can be integrated into portfolio and risk management, and how the microstructure of DLT markets relates to stability and liquidity.

He has also developed the F5 Crypto Index, a momentum-based virtual-asset trading strategy invested in by the F5 Crypto Fonds 1 InvAG, where he serves as non-executive director.

Hermann has been a professor at Humboldt-Universität zu Berlin (HU), visiting scholar at the National University of Singapore (NUS), has co-founded the Crypto-Currency Conference (ccconf.org) and the BlockChainNights.de (BCN) discussion series, started HitCoinX with his blockchain-course students at HU, been consulted by ministries and agencies across continents, and has published "On the Emergence of Money" prior to Satoshi (sadly without blockchain).

He received his Ph.D. in Finance from the Vienna Graduate School of Finance (VGSF) and has a background (master's degrees) both in business from WU Vienna and in computer science and economics from the Vienna University of Technology.