



POLITECNICO
MILANO 1863

Supervisor Expression of Interest MSCA-IF Marie Sklodowska Curie Action-Individual Fellowship

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Department Name: Research topic: (https://www.polimi.it/en/scientific-research/research-structures/departments/)	Department of Mathematics Quantitative Finance Risk and Potentialities of Cryptocurrencies
MSCA-IF Research Area Panels	<input type="checkbox"/> CHE_Chemistry *ECO_Economic Sciences <input type="checkbox"/> ENG_Information Science and Engineering <input type="checkbox"/> ENV_Environmental and Geosciences <input type="checkbox"/> LIF_Life Sciences <input type="checkbox"/> MAT_Mathematics <input type="checkbox"/> PHY_Physics <input type="checkbox"/> SOC_Social Sciences and Humanities
Politecnico di Milano Areas:	<input type="checkbox"/> Cultural Heritage <input type="checkbox"/> Smart Cities <input type="checkbox"/> Territorial Fragilities <input type="checkbox"/> Health *Industry 4.0
Brief description of the Department and Research Group (including URL if applicable):	Since 2005, the Quantitative Finance group of the Department of Mathematics is active on all area of quantitative methods applied finance. Methodologies mostly belong to stochastic analysis, statistics, computational methods. Areas of application include: pricing of financial derivatives, asset management, risk management. The group is active on fintech (with specific attention to blockchain and cryptocurrencies) and financial education with initiatives such as seminars, workshops (Polimi fintech journey), innovative education (first MOOC on financial education in Italy) and cooperation with the Italian Financial markets authority. Sites of interest: https://www.mate.polimi.it/qfinlab/index.php?cate=15 https://www.finriskalert.it/



Brief project description:
(max 1 page)

Digital payments are becoming pervasive in our life. The most tangible implication is fast transfer of funds with little constraints. Yet, the combination of electronic networks and cryptography has opened opportunities that go far beyond the reduction of transaction costs. In particular, the emergence of crypto-currencies has created new and decentralized media of exchange. Like fiat money, crypto-currencies provide no claim to any physical asset, but circulate on the basis of trust and credibility. They have already reached a significant role: market capitalization of crypto-currencies exceeds \$463 billion (<https://coinmarketcap.com>), the most widespread crypto-currency (Bitcoin) is used for 650 – 700K transactions per day.

In a sense, computer science has created the framework for Hayek money with denationalised and independent money creation. As a matter of fact, crypto-currencies require no trust in a third party. Agents do not necessitate a central authority or a central bank, trust originates from mathematical algorithms, and the blockchain technology ensures consensus on the rightful spending of each electronic coin in a purely peer-to-peer network.

Like all new technologies, money by cryptographic convention comes with costs, risks and opportunities. The research project addresses issues in the context of the creation, acceptance, dissemination, and potentially demise of crypto-currencies:

- How to model price dynamics of a crypto-currency? How to model transaction numbers and volumes?
- Are we facing virtual currencies or virtual assets?
- What are the factors that affect crypto-currency returns? How should we quantify the value of their liquidity?
- Can we forecast future transaction volume? What are the fundamentals driving the value of crypto-currencies?
- What are the risks for financial stability? How can we quantify and manage these risks?
- How to design crypto-derivatives, like options or ETFs? How to structure their market?

Beyond analyzing the evolution of a given crypto-currency, further questions originate from the presence of multiple crypto-currencies. The research questions addressing multiplicity of cryptocurrencies include their coexistence and the possibility of triangular arbitrage.