MATEUS HIRO NAGATA
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Graduate Studies:

Ph.D. in Economics, HEC Paris, 2023 to present

M.A in Economic Theory, Instituto Tecnologico Autonomo de Mexico (ITAM), 2023

Undergraduate Studies:

B.A. in Economic Sciences, University of Brasilia (UnB), 2021

Exchange semester, National Chengchi University (NCCU), Spring 2019

External Courses

Masters level	General Topology (UnB), Optimization (IMPA)
Ph.D. level	Functional Analysis (IMPA)

Research Interests

Primary fields: Game Theory, Finance

Secondary fields: Rationality, Learning in Games, Networks, Time-series Analysis, Power-laws

Teaching Experience:

2023 Spring	Advanced Microeconomics 1, ITAM, teaching assistant for Professor Xinyang Wang.
2019 Fall and 2020 Fall	Econometrics (Advanced Undergraduate), UnB, teaching assistant for Professor Maria Eduarda Tannuri Pianto.

Research Experience and Other Projects:

2019 - 2022	Machine Learning Laboratory in Finance and Organizations (LAMFO): Fake-news detection AI and Google Chrome extension, presentations on Quantum Computing, GARCH, Genetic Algorithms and Vapnik-Chervonekis Dimension
2017-2021	Research assistant for Professor Raul Matsushita
2019	Programming Club NCCU MITc

Professional Activities

Presentations	21th Brazilian Finance Meeting (SBFin), 45th ANPAD Annual Meeting EnANPAD 2021

Honors, Scholarships, and Fellowships:

2023	HEC Paris Foundation Scholarship
2021-2022	Instituto Tecnologico Autonomo de Mexico (ITAM) Scholarship
2017-2021	Tutorial Education Program (PET - UnB) Fellowship
2017-2021	Scientific Initiation Fellowship - Federal District Research Foundation
2021	Outstanding Award Nominees - University of Brasilia/Brazil
2020	Caixa Econômica Federal Fellowship

Languages

Vernacular	Portuguese (Native), Japanese (Native), English (Fluent), Mandarin Chinese (Advanced), Spanish (Advanced), Korean (Intermediate), Hebrew (Basic)
Programming	Python, R, LaTeX, C

Publications:

Matsushita, R., Brom, P., Nagata, M., & Da Silva, S. (2023). Retrodicting with the truncated Lévy flight. *Communications in Nonlinear Science and Numerical Simulation*, *116*, 106900.

Matsushita, R., Nagata, M., & Da Silva, S. (2022). The duration of historical pandemics. *Communications in Nonlinear Science and Numerical Simulation*, 106565.

Peng, Y., & Nagata, M. H. (2020). An empirical overview of nonlinearity and overfitting in machine learning using COVID-19 data. *Chaos, Solitons & Fractals*, *139*, 110055.

Matsushita, R., Da Silva, S., Da Fonseca, R., & Nagata, M. (2020). Bypassing the truncation problem of truncated Lévy flights. *Physica A: Statistical Mechanics and its Applications*, *559*, 125035.

Research Papers in Progress

"*Stability and Risk Aversion on Games with Noisy Payoffs"* (with Xinyang Wang) [Master's thesis]

Are learning algorithms in game theory robust against noise in the payoff? I find that it is not always the case. Adding uncertainty in the payoff can dramatically change the converged strategies for both players, and when it happens, it always increases the propensity of the no-noise equilibrium to be played. Hence, generating an unexpected "risk-aversion" and path dependence. We test this idea in several learning algorithms, using the Experienced-weighted attraction (EWA) generalization. Fictitious play, best-response dynamics are all particular cases of it. The phenomenon, which we call noisy divergence, happens for some limiting parametrizations but it seems to be also prevailing in the interior of the parameter space, which is much harder to interpret. Furthermore, we find that the increase in variance always enhances the probability of the non-disturbed Nash equilibrium.

"Topological Analysis of Shuffled Financial Networks" (with Daniel Cajueiro) [Senior Thesis]

I apply the small-shuffle surrogate (SSS) algorithm on the S&P 500 stocks price data and study the shuffled time-series, representing it as a big undirected, unweighted, and connected network, using stock network correlation techniques (minimal spanning tree). Then, I analyze the topological properties such as the power law, the efficiency, and the topological robustness of the network. The outcome shows that, in fact, the network found is efficient and scale-free, yet topologically fragile against directed attacks and topologically robust against random errors; which is all recurrently found in the literature. My contribution is finding the existence of a short-term dynamic in the price movements of the stocks, which are responsible for the correlated movement of the stocks of the same sector, and when this dynamic is canceled, the sectors lose clustering. However, the topological characteristics remain the same regardless of that dynamic, stipulating that the stock market has some fundamental mechanism in the long-run, with no regard to short-term fluctuations.

"The Tail and the Center - Truncated Lévy Flights and Hill estimator on Bitcoin" (with Raul Matsushita)

This work examines the volatile movements of Bitcoin price returns from 2014 to 2021. We consider the Lévy flight distributions to analyze its volatility, where the tail index parameter (α_{Hill}) varies over the time. Based on the Hill estimator, we found that Bitcoin returns follow an extremely heavy-tailed distribution, being therefore quite volatile ($\alpha_{Hill} < 1$). Meanwhile, from the truncated Lévy process perspective, is characterized by a power law with a scaling index of 1.40. Interestingly, we observe that the time-varying estimates of α_{Hill} remains approximately constant all over the times series, including before and during the pandemic period.