17TH FINANCIAL RISKS INTERNATIONAL FORUM

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BIG DATA & ALGORITHMIC FINANCE

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Yadh Hafsi, my academic journey commenced in Tunisia, laying a solid foundation in mathematics and physics at the Preparatory Institute for Engineering Studies of Tunis. Transitioning to France, I pursued an Engineering degree in Applied Mathematics at ENSTA Paris, followed by a Master's in Financial Mathematics at Institut Polytechnique de Paris, specializing in stochastic control and algorithmic trading. Currently pursuing a Ph.D. in Applied Mathematics at Université Paris-Saclay under the guidance of Vathana Ly Vath and Etienne Chevalier, my research delves into stochastic control, optimal execution, and market microstructure within financial markets. Professionally, I apply my research findings directly to Horizon Software's algorithmic trading platform, enhancing its functionality and effectiveness. At HEC Paris, my role entails serving as a teaching assistant focused on statistics. Notable contributions include publications like «Uncovering Market Disorder and Liquidity Trends Detection» (submitted to Mathematical Finance) and «Optimal Execution in a Multi-Agent Simulator with Reinforcement Learning» (accepted abstract at AAAI 2024).

UNCOVERING MARKET DISORDER AND LIQUIDITY TRENDS DETECTION

Etienne CHEVALIER, Yadh HAFSI and Vathana LYVATH

The primary objective of this paper is to conceive and develop a new methodology to detect notable changes in liquidity within an order-driven market. We study a market liquidity model which allows us to dynamically quantify the level of liquidity of a traded asset using its limit order book data. The proposed metric holds potential for enhancing the aggressiveness of optimal execution algorithms, minimizing market impact and transaction costs, and serving as a reliable indicator of market liquidity for market makers. As part of our approach, we employ Marked Hawkes processes to model trades-through which constitute our liquidity proxy. Subsequently, our focus lies in accurately identifying the moment when a significant increase or decrease in its intensity takes place. We consider the minimax quickest detection problem of unobservable changes in the intensity of a doubly-stochastic Poisson process. The goal is to develop a stopping rule that minimizes the robust Lorden criterion, measured in terms of the number of events until detection, for both worst-case delay and false alarm constraint. We prove our procedure's optimality in the case of a Cox process with simultaneous jumps, while considering a finite time horizon. Finally, this novel approach is empirically validated by means of real market data analyses.

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