PhD Research in Artificial Intelligence and Financial Market Microstructure

Marcelo T. Marchi

Fundação Getulio Vargas (FGV EESP) — São Paulo School of Economics, Brazil

marcelo.marchi@fgv.edu.br

Academic background and graduate study

I am a PhD candidate in the Professional Doctoral Program in Economics, with a research focus on quantitative finance and financial market microstructure, at Fundação Getulio Vargas (FGV EESP), São Paulo, Brazil. My doctoral advisor is Professor Marcelo Fernandes. I also hold a master's degree from FGV EESP. I recently completed a visiting scholar appointment at Columbia University, hosted by Professor Agostino Capponi, whose research group studies digital finance and financial technologies.

I enrolled in the PhD program in **2024**. My graduate study and doctoral research emphasize empirical finance, econometrics, market microstructure, and computational methods.

Research interests and ongoing doctoral work

My research examines what modern artificial intelligence methods can reveal about the sequential economic decisions of financial market intermediaries. In particular, I study whether the recent history of orders contains information about future behavior that is not captured by conventional state-based descriptions of the limit order book. The broader goal is to better understand history dependence, heterogeneity across intermediaries, and the information embedded in actions taken within digital markets.

My current working paper, *Is Attention to the Latest Orders All You Need? Predicting Broker-Attributed Order Flow in B3 Mini-Ibovespa Futures*, trains transformer models on broker-attributed order-book messages from the Brazilian futures market. The training sample contains approximately **196 million broker decisions**, including order submissions, cancellations, and modifications. This unusually detailed dataset enables a direct analysis of intermediary-specific decision sequences.

Preliminary out-of-sample results indicate that a transformer trained on event histories improves predictive log likelihood substantially relative to a deep queue-reactive benchmark. Additional experiments suggest that recent order-flow history supplies meaningful predictive information beyond the contemporaneous book state, with much of the gain concentrated in a short window of recent events. These are predictive findings, not yet evidence of causal behavioral mechanisms. I am also studying the roles of representation and pretraining in learning these decision processes.

Research motivation and fit with the tutorial

I am particularly interested in the intersection of AI and economics: how high-capacity sequence models can be used not simply to forecast outcomes, but to develop sharper empirical questions about economic behavior, information processing, and interactions among agents. Financial exchanges are digital environments where large numbers of participants interact through precisely recorded actions, providing an informative setting for these questions.

The NBER tutorial would help me connect my market microstructure research to the broader literature on AI and digital economics, refine the economic interpretation of my findings, and learn from researchers studying the implications of AI for economic analysis. I would value the opportunity to participate in both the tutorial and the subsequent Digital Economics and AI meetings.

Dissertation and academic supervision

Dissertation research focus: AI-based modeling of broker-attributed decisions and history dependence in limit-order-book markets.

Current working paper: *Is Attention to the Latest Orders All You Need? Predicting Broker-Attributed Order Flow in B3 Mini-Ibovespa Futures.*

Advisor: Professor Marcelo Fernandes (FGV EESP).

Qualification committee: Professor Marcelo Fernandes; Professor Fernando Chague; Professor Bruno Cara Giovannetti.

The qualification committee is identified as such; final dissertation committee membership may differ.