The Hong Kong University of Science and Technology

Seminar on Business Data Science

Department of ISOM

Generative AI for Financial Time Series and an Application to Return Predictability

by

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Time: 11:00am – 12:00nn
Venue: Room 4047 (LSK Business Building)

Abstract

The effective application of machine learning in finance is fundamentally constrained by data scarcity, a problem compounded by the unique statistical properties of financial time series. Specifically, their scale-invariant patterns—irregular temporal dynamics that repeat across different time horizons and magnitudes—pose a significant challenge for existing models that assume regularity.

We introduce FTS-Diffusion, a novel three-module generative framework designed model scale invariance. First, a pattern recognition algorithm extracts recurring but irregular dynamics. Second, a conditional diffusion model synthesizes high-fidelity pattern segments. Third, a temporal evolution module reassembles these segments into a coherent series.

Empirically, FTS-Diffusion generates synthetic data that statistically resembles observed market data more closely than current state-of-the-art alternatives. Crucially, this synthetic data provides substantial practical utility: augmenting real datasets improves out-of-sample forecasting performance and increases the implied Sharpe ratios of market-timing strategies by 12.3–24.2%. By directly addressing the core challenge of data scarcity with realistic generation, FTS-Diffusion can promote broader and more powerful machine learning applications across finance.

Bio

Xiao Qiao is an Assistant Professor in the Department of Data Science at City University of Hong Kong and serves on the editorial board of the Journal of Portfolio Management. His research at the intersection of financial economics and data science has been recognized by Amazon Research Awards and Gradient AI Research Award, and featured in media outlets such as Forbes and Institutional Investor. Prior to CityU, he worked in the financial services industry where he helped to create several award-winning investment products, three of which have been listed on the New York Stock Exchange. He has held positions at Morgan Stanley, hedge funds, and a proprietary trading firm. He earned a Ph.D. in Finance from the University of Chicago and B.Sc and B.Eng degrees from the University of Pennsylvania.

All interested are welcome!

For details, please contact ISOM Department.