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Predictive Performance of Stochastic Processes, Machine Learning, and Technical Indicators: Evidence from Equity and Bitcoin Markets

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Abstract

This paper provides a comparative analysis of price direction predictability in traditional equity markets and the Bitcoin market using three families of predictive approaches: stochastic process models, technical analysis indicators, and machine learning algorithms. Equity markets are represented by sectoral exchange-traded funds (XLF, XLK, and XLV) [1], while Bitcoin captures high-frequency cryptocurrency dynamics. The study considers stochastic models (GBM, Vasicek, CIR), machine learning methods (Random Forest, SVM, KNN), and standard technical indicators (SMA, MACD, RSI) within a unified directional forecasting framework [2].

The results reveal a clear contrast between markets. While some stochastic models achieve relatively strong predictive performance in equity indices, all approaches exhibit weak, unstable, and near-random forecasting ability in the Bitcoin market [3]. This poor performance is especially evident at high frequencies, where extreme volatility, rapid regime shifts, and market noise dominate price dynamics [4]. Overall, the findings highlight the limited predictability of Bitcoin prices and the inherent difficulty of short-term directional forecasting in cryptocurrency markets [5].

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