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Machine-Oriented Representation of Technical Indicators for Bitcoin Price Direction Forecasting

Ákos Rázer

Doctoral School of Business Administration, University of Pécs

Abstract

Technical indicators such as the Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Average Directional Index (ADX), and Bollinger Bands are widely used in financial market analysis and machine learning-based forecasting. However, these indicators were originally designed primarily for human interpretation and visual analysis, while their raw numerical representation may not necessarily provide the most informative input for machine learning models. This study examines whether alternative feature-engineering approaches can improve the predictive value of technical indicators in Bitcoin daily price direction forecasting. The analysis compares multiple representations of four commonly used technical indicators: RSI, MACD, ADX with its directional components, and Bollinger Bands. Separate forecasting models are constructed using raw indicator values and engineered features derived from their traditional interpretation and mathematical structure. These transformations include threshold-based variables, relative distances, indicator spreads, directional relationships, normalized measures, and selected dynamic changes. All model variants are evaluated on the same temporally ordered dataset and under identical forecasting conditions to isolate the effect of feature representation. The study aims to determine whether machine-oriented transformations of technical indicators provide better out-of-sample classification performance compared with raw indicator inputs. The results may contribute to a more systematic use of technical indicators in machine learning-based financial forecasting.

Keywords: Computational Finance; Cryptocurrency; Feature Engineering; Machine Learning; Predictive Modelling