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Econometric and Python-Based Forecasting Tools for Global Market Price Prediction in the Context of Economic Security

Abstract. Debate persists over whether classical econometric or modern machine learning (ML) approaches provide superior forecasts for volatile monthly price series. Despite extensive research, no systematic cross-domain comparison exists to guide model selection across diverse asset types. In this study, we compare traditional econometric models with classical ML baselines and hybrid approaches across financial assets, futures, commodities, and market index domains. Universal Python-based forecasting tools include month-end preprocessing, automated ARIMA order selection, Fourier terms for seasonality, circular terms, and ML frameworks for forecasting and residual corrections. Performance is assessed via anchored rolling-origin backtests with expanding windows and a fixed 12-month horizon. MAPE comparisons show that ARIMA-based models provide stable, transparent benchmarks but often fail to capture the nonlinear structure of high-volatility series. ML tools can enhance accuracy in these cases, but they are susceptible to stability and overfitting on monthly histories. The most accurate and reliable forecasts come from models that combine ARIMA-based methods with Fourier transformation and a slight enhancement using machine learning residual correction. ARIMA-based approaches achieve about 30% lower forecast errors than pure ML (18.5% vs. 26.2% average MAPE and 11.6% vs. 16.8% median MAPE), with hybrid models offering only marginal gains (0.1 pp median improvement) at significantly higher computational cost. This work demonstrates the domain-specific nature of model performance, clarifying when hybridization is effective and providing reproducible Python pipelines suited for economic security applications.

Keywords: timeseries; forecast; econometrics; market price; economic security; commodity; stocks; financial assets; Fourier transform; ARIMA; machine learning; Python tools