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A Hybrid Probabilistic Fuzzy ARIMA Model for Consumption Forecasting in Commodity Markets

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Abstract

Consumption forecasting is a critical issue in commodity markets on which financial decision-makers depend for accuracy. To adequately handle the complexity and uncertainty associated with real-world market problems, forecasting needs to be capable of handling complex situations. The steel industry is a strategic one for Iran playing a critical role in the national economy. Using time series models, this study aims to forecast the future trend of Iran's crude steel consumption. Although autoregressive integrated moving average (ARIMA) models are regarded as the most important time series models and are extensively employed in forecasting financial markets, they are hampered by certain limitations that detract from their popularity. They are based on the assumption that a linear relationship holds between future values of a time series and its current and past values. Moreover, they depend heavily on a large amount of historical data to provide the desired results. To overcome the limitations in such conventional models, fuzzy autoregressive integrated moving average models have been proposed as improved versions of the ARIMA models. Unfortunately, the former are also plagued by very wide forecasted intervals in cases where there are outliers that create instability in the data. The present paper proposes a hybrid model which is a combination of computational intelligence tools and soft computing techniques. In such a form they take advantage of their unique properties which, when exploited, can provide more accurate financial forecasts. The main objective of the proposed model is to identify nonlinear patterns with probabilistic classifiers to obtain narrower intervals than would be otherwise possible under the traditional FARIMA models. The empirical results obtained from applying the proposed model to forecasting Iran's steel consumption provide significantly improved accuracy.

Keywords: time series forecasting, probabilistic neural networks, fuzzy logic, auto-regressive integrated moving average, hybrid models, commodity markets, steel consumption.

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