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# Forecasting Exchange Rate using Variational Mode Decomposition and Entropy Theory

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## Abstract

In this paper, we propose a new exchange rate forecasting model using Variational Mode Decomposition (VMD) with parameter optimization by the combined Mean Square Error (MSE) and Error Entropy (EE) criterion. Exchange rate is decomposed into a series of underlying data components in the transformed multiscale domain using the VMD model. A new MSE-EE criterion is proposed to determine the scale for transient factors among different extracted data components. The proposed model extracts the transient factor more accurately and produces more accurate forecasts. Empirical studies using extensive exchange rates confirmed that the multiscale data structure can be identified more effectively in the decomposed multiscale domain using the proposed methodology. The proposed model demonstrates the superior performance compared to the benchmark models.

*Keywords:* Variational Mode Decomposition; Exchange Rate Forecasting; Multi-scale Analysis; Minimum Error Entropy; Transient Factor; Signal Processing

*JEL:* F31, C45, C53

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