Short-term electricity demand and gas price forecasts using wavelet transforms and adaptive models

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Descriptores:
*REGRESSION analysis
*AUTOCORRELATION (Statistics)
*RADIAL basis functions
*GARCH model
*PERCEPTRONS
*KALMAN filtering
*PREDICTION theory
*STOCHASTIC processes

Palabras clave proporcionadas por el autor:
absolute values of correlation matrix (AVCM)
Adaptive models
artificial neural network (ANN)
autocorrelation function (ACF)
automatic relevance determination (ARD)
autoregressive (AR)
autoregressive integrated moving average (ARIMA)
autoregressive moving average (ARMA)
benchmark model (BM)
correlation matrix (CM)
extended Kalman filter (EKF)
GARCH
generalised autoregressive conditional heteroschedastic (GARCH)
improvement ratio (IR)
Linear regression
linear regression (LR)
mean absolute error (MAE)
mean absolute percent error (MAPE)
mean squared error (MSE)
Multi-layer perceptron
multi-layer perceptron (MLP)
neural networks (NN)
normalised mean squared error (NMSE)
normalised squared errors (NSE)
partial autocorrelation function (PACF)

particle filter (PF)
Radial basis function
radial basis function (RBF)
random walk model (RW)
redundant Haar wavelet transform (RHWT)
state space model (SSM)
sum of P-values (SP)
Wavelet transform
wavelet transform (WT)

Resumen: Abstract: This paper presents some forecasting techniques for energy demand and price prediction, one day ahead. These techniques combine wavelet transform (WT) with fixed and adaptive machine learning/time series models (multi-layer perceptron (MLP), radial basis functions, linear regression, or GARCH). To create an adaptive model, we use an extended Kalman filter or particle filter to update the parameters continuously on the test set. The adaptive GARCH model is a new contribution, broadening the applicability of GARCH methods. We empirically compared two approaches of combining the WT with prediction models: multicomponent forecasts and direct forecasts. These techniques are applied to large sets of real data (both stationary and non-stationary) from the UK energy markets, so as to provide comparative results that are statistically stronger than those previously reported. The results showed that the forecasting accuracy is significantly improved by using the WT and adaptive models. The best models on the electricity demand/gas price forecast are the adaptive MLP/GARCH with the multicomponent forecast; their NMSEs are 0.02314 and 0.15384 respectively. [ABSTRACT FROM AUTHOR]

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