

## Investigating Data Normalization Techniques in Swarm Intelligence Forecasting for Energy Commodity Spot Price

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**Abstract :** Data mining is a fundamental technique in identifying patterns from large data sets. The extracted facts and patterns contribute in various domains such as marketing, forecasting, and medical. Prior to that, data are consolidated so that the resulting mining process may be more efficient. This study investigates the effect of different data normalization techniques, which are Min-max, Z-score, and decimal scaling, on Swarm-based forecasting models. Recent swarm intelligence algorithms employed includes the Grey Wolf Optimizer (GWO) and Artificial Bee Colony (ABC). Forecasting models are later developed to predict the daily spot price of crude oil and gasoline. Results showed that GWO works better with Z-score normalization technique while ABC produces better accuracy with the Min-Max. Nevertheless, the GWO is more superior than ABC as its model generates the highest accuracy for both crude oil and gasoline price. Such a result indicates that GWO is a promising competitor in the family of swarm intelligence algorithms.

**Keywords :** artificial bee colony, data normalization, forecasting, Grey Wolf optimizer

**Conference Title :** ICCST 2014 : International Conference on Computer Science and Technology

**Conference Location :** Penang, Malaysia

**Conference Dates :** December 04-05, 2014