International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **6**, June **2010**

 ISSN 1349-4198
pp. **2449–2457**

A MIXED FUZZY EXPERT SYSTEM AND REGRESSION MODEL FOR FORECASTING THE VOLUME OF INTERNATIONAL TRADE CONTAINERS

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Received November 2008; revised May 2009

Abstract. *The forecast of volumes of import/export containers is one of the most important issues for government transportation departments and seaport organizations. In the past, although a number of studies focus on the subject of forecast of import/export containers, most studies have not considered the forecast error due to the "non-stationary" relationship between the volumes of import/export containers and the economic variables. Thus this article attempts to fill this gap in the current literature by establishing a mixed fuzzy expert system and regression model. An empirical study in Taiwan is conducted to demonstrate the effectiveness of the proposed mixed fuzzy expert system and regression model. Finally, this paper compares the accuracy of this proposed mixed fuzzy expert system and regression model, the traditional linear regression model, and the traditional non-linear regression model for forecasting the volumes of Taiwan's import containers. The comparison results show that the proposed mixed fuzzy expert system and regression model exhibits higher prediction accuracy than previous models.*
Keywords: Fuzzy expert system, Forecast, Fuzzy sets, Regression, International trade, Containerization

1. **Introduction.** Forecasting of the volumes of import/export containers is central to the planning and the operation of seaport organizations and government transportation departments. At the seaport organization level, forecasts of container volumes are needed as the essential inputs to many decision-making activities in various functional areas such as building new container terminals, warehouses, logistics centers, expansion plans, operation plans, as well as marketing strategies. Whether new container terminals should be built is a controversial issue in Taiwan. One reason for this is the huge and irreversible investment in new container terminals and related infrastructure. Another reason is the different ways of forecasting the volumes of containers, which lead to quite different conclusions. At the government transportation department level, forecasts of containers volumes also provide basis for marine transportation planning and marine policies.

The improvement trade for export, the dominant trade policy in Taiwan since 1960s, was replaced by the high-technology product outward-oriented trade policy. The current government continues to view the high-technology product outward-oriented trade policy as a key component of Taiwan's overall strategy to put its economy back on a steady growth path. Since 1960s, the manufacturers in Taiwan imported a lot of cheap and large factory equipments and machinery equipments. Those import trade activities produce many import containers. The high-technology product outward-oriented trade has been the dominant trade policy in Taiwan since 1990s. The high-technology companies import many small and expensive high-technology raw materials. But these import trade