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KNOWLEDGE ACQUISITION FROM TIME SERIES DATA THROUGH ROUGH SETS ANALYSIS

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Abstract. *Z. Pawlak proposed rough set theory in 1982. This theory provides a tool to mine knowledge as decision rules from a database, web-based information and so on. Decision rules are also used for data analysis. These decision rules can reason the conclusion of an unknown object using various premises. The objective of this paper is to apply the rough set theory to the analysis of time-series data. Using an example, this paper shows how knowledge is acquired and illustrates the difference among decision rules obtained using different time periods.*
Keywords: Rought sets, Time series data, Knowledge acquisition

1. **Introduction.** Currently, changes in economic trends included in time-series data are related to opportunities to profit. Therefore, various researchers are working to develop methods to forecast changes in economic trends. For example, the following methods are widely employed in analyzing the market trends of stocks: (1) technical analysis, which analyzes market trends based on graphical recognition; and (2) fundamental analysis, which analyzes market trends based on the achievements of corporations and changes in economic circumstances. On the other hand, a chaotic system is employed to forecast time-series data [8,9]. However, acquiring knowledge concerning the forecasts in these methods is difficult.

The objective of this paper is to retrieve knowledge from time-series economic data using Rough Sets Theory [10,12,14,18] and to apply the obtained knowledge to forecasting economic trends. In rough set analysis, knowledge can be acquired from data as IF-THEN rules. In rough set analysis, we first obtain a regression and trend from each interval in time-series data and then employ these trends as conditional attributes. In rule acquisition by rough set analysis, the up and down movements in a current period are used as a decision attribute. We use discrete periods to obtain knowledge, compare the obtained knowledge in each period, and examine whether different economic periods have different knowledge. The most crucial issue to know is whether the knowledge obtained from different periods can be applied to another period. As an illustrative example, we build several periods by dividing each of six years of time-series data of stock price indices (TOPIX) of the Tokyo Stock Exchange and compare the difference in rules obtained from these periods. The acquired knowledge of each period is then employed to improve forecast precision.