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ANALYZING STRUCTURAL CHANGES USING CLUSTERING TECHNIQUES

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Abstract. *This study aims to apply the K-means clustering technique to analyze a time series. In this proposed method, we suppose that there exists at least one structural change in the time series. Structural changes are defined to represent the observations moving from "low" to "high" or moving from "high" to "low". The Taiwan Stock Exchange Capitalization Weighted Stock Index is used as the target. The empirical results, based on the proposed method, are validated against historical events as well as the results in previous studies. In addition to the empirical results, this study also demonstrates the advantages of applying a clustering technique to determine structural changes.*
Keywords: K-means, Stock index, Transient structural changes

1. **Introduction.** Structural changes have been applied to analyze many economic issues, such as stock markets [5,11,14], exchange rates [24], inflation rates [2], gross national products (GNP) [9], etc. Different techniques have been applied to the relevant issues of structural changes: The unit root test has been used to determine the number of structural changes [3], the Chow test has been applied to examine possible turning points [7], and fuzzy statistics have been used to detect change points within time series [10,21].

The objective of this study is to apply clustering analysis to analyze structural changes. The K-means clustering technique is applied to cluster the Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX). The clustering results are then validated against the research results of previous studies as well as historical events. Comparing with conventional approaches, the K-means clustering technique offers several key advantages in determining structural changes: it is straightforward to apply, it exhibits a time period (instead of a time slot) for each structural change, it covers structural changes as well as transient structural changes, and most importantly it can be applied to forecast the future.

The remainder of this paper is organized as follows: Section 2 proposes the research method and definitions, Section 3 describes the empirical results and implications, and Section 4 concludes the findings.

2. Research Method.

2.1. Data.

Many studies have argued that there are strong relationships between stock prices and macroeconomic events. The volatility of stock prices has been considered to be relevant to economic activities [13]. Significant relationships have been identified between stock prices and economic events, both domestically and internationally [15]. Three elements, the money supply, overall expenditure, and overall surplus, have greatly