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In this work we adress the near-critical case. Each vertex of the family tree is independently marked with a small probability. The branch connecting the root with a marked vertex is called a marked branch. The marked branches form a subtree of the family tree of the branching process and this will be called a skeleton. Such a skeleton is approximated, when marking is a rare event, by a birth-death process.

Keywords: Bienaymé-Galton-Watson process, decomposable multi-type process, birth and death process

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Estimating multi-factor discretely observed Vasicek term structure models with non-Gaussian innovations

Takayuki Shiohama
Faculty of Engineering, Tokyo University of Science, Japan

In this paper, we propose a multi-factor model in which the discretely observed short-term interest rates follow a non-Gaussian and dependent process. The state space formulation has the advantages of taking into account both the cross-sectional and time-series restrictions on the data and measurement errors in the observed yield curve. Clarifying the non-Gaussianity and dependency of the dynamics of short-term interest rates, we show that these features are important to capture the dynamics of the observed yield curve.

Key Words: Term structure, Vasicek model, state-space model

Probabilistic Approach for Comparing Partitions

Osvaldo Silva[1], H. Bacelar-Nicolau[2], Fernando C. Nicolau[3], Áurea Sousa[4]
[1]Dep. of Math., CES-UA, CMATI, University of Azores, [2]Faculty of Psychology, LEAD; ISAMB, CEA; University of Lisbon, [3]FCT, Department of Mathematics, New University of Lisbon, [4]Dep. of Math., CEEAplA, CMATI, University of Azores, Portugal

The comparison of two partitions in Cluster Analysis can be performed using various classical coefficients (or indexes) in the context of three

approaches (based, respectively, on the count of pairs, on the pairing of the classes and on the variation of information). However, different indexes usually highlight different peculiarities of the partitions to compare. Moreover, these coefficients may have different variation ranges or they do not vary in the predicted interval, but rather only in one of their subintervals. Furthermore, there is a great diversity of validation techniques capable of assisting in the choice of the best partitioning of the elements to be classified, but in general each one tends to favor a certain kind of algorithm. Thus, it is useful to find ways to compare the results obtained using different approaches. In order to assist this assessment, a probabilistic approach to comparing partitions is presented and exemplified. This approach, based on the VL (Validity of Linkage) Similarity, has the advantage, among others, of standardizing the measurement scales in a unique probabilistic scale. In this work, the partitions obtained from the agglomerative hierarchical cluster analysis of a dataset in the field of teaching are evaluated using classical and probabilistic (of VL type) indexes, and the obtained results are compared.
Keywords: Hierarchical cluster analysis, comparing partitions, affinity coefficient, VL methodology

Spectral analysis of Markov chains and graphs for ranking of evolving data and information

Sergei Silvestrov
Mälardalen University, Sweden

Spectral analysis of nonnegative matrices play fundamental role for the theory of Markov chains and the spectral graph theory. The common foundation is the Perron-Frobenius theory for matrices with non-negative entries. In this article we will present some of the main results and notions of this fruitful interplay in context of ranking and relevance analysis in complex evolving data and information structures as well as some novel approaches to ranking based on spectral properties of matrices and Markov chains, in particular modifying and extending the famous PageRank algorithm. We will also present new results and a number of new open problems in this direction.
Keywords: Perron-Frobenius theory, Markov chain, spectrum, matrix, graph, PageRank