Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **13 (2006)** 441-449

MODELING THE TWO-POWER-LAW DEGREE DISTRIBUTION OF BANKING NETWORKS

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Abstract. Most of the social-economic systems are showing basic features of complex network structures. The banking network, which is formed by interbank credit lines, is just one of them. The empirical research on the structural features of the banking systems has shown that, a two-power-law degree distribution has been observed in these banking networks. But, to our knowledge, the features of these two-power-law degree distribution are still not illuminated by theoretical analysis. Based on the analysis of the structural features of banking networks, such as hierarchy and community, and the analysis of the interbank liability features, we present a model of network growth and theoretically explain the phenomenon of the two-power-law degree distribution in banking networks. We also show that this two-power-law degree distribution is a critical phenomenon.

Keywords. Interbank market, complex network, interbank lending and borrowing, network growth, two-power-law degree distribution.

1 Introduction

Complex network theories have attracted much interest in recent years. And the theories have been applied to analyze many complex systems in several fields, such as biological [1,9], engineering [8], social [10,16] and economic [7] systems, etc. One of the most popular topics within the interdisciplinary study of complex networks has been the research of the scale-free (SF) networks. The common feature of the SF networks is the power-law degree distribution in their node connectivity, that is $P(k) \sim k^{-\gamma}$, where γ is usually found to be between $2 < \gamma < 3$. The pioneering research of Barabási and Albert [1] on SF networks has revealed the evolutionary principles of SF networks and illuminated the power-law degree distribution features in many real complex networks.

However, recent research has shown multiplicity and complexity of the structural features in real complex networks. In the last few years, empirical

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