COMMON-SENSE KNOWLEDGE ENHANCED FINANCIAL DECISION SUPPORT: CONCEPTUAL MODELING, FRAMEWORK DESIGN AND PROTOTYPE DEVELOPMENT

KUN CHEN

DORCTOR OF PHILOSOPHY
CITY UNIVERSITY OF HONG KONG
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Kun Chen

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ABSTRACT

The demand for computer-based intelligent decision support is soaring in the modern financial world, as the financial decision making involves much more available information and more complex business relations. Driven by this requirement, many financial decision support systems (FDSSs) have been researched, designed and implemented covering almost all critical financial market activities. However, those existing FDSSs, which are claimed to be intelligent enough, are mostly constructed with a pre-defined domain knowledge base and rely on the quantitative financial models, and thus suffer from the drawbacks such as insufficient knowledge, lack of information and weak reasoning abilities. In order to overcome these limitations, common-sense knowledge is incorporated into the financial decision support domain in this research to deal with the complex real world financial problems, especially to exploit the intertwined relations between market activities and public news to provide sufficient underling evidences for decision making.

The essential principle of design-science research in IS field is that developing knowledge and understanding about a design problem and acquiring its solution in the building and applying of an artifact. Under this guideline, we summarize a class of meta-requirements that is embedded in the common-sense enhanced financial decision making process. To meet the requirements, four design principles are proposed for developing common-sense supported FDSSs. The presented meta-requirements and design principles are rooted in the kernel theories including market efficiency hypothesis and text understanding theories. As for the designed products, a conceptual modeling method is proposed to facilitate the confusion between common-sense knowledge and financial domain knowledge. Furthermore, a general system framework is proposed for developing the kind of common-sense enhanced FDSSs.
Abstract

To demonstrate the usability and effectiveness of the designed model and framework, prototypes in three applicable financial domains are presented in the study, including security market surveillance, portfolio risk management, and high-frequency market analysis. In each application domain, concrete conceptual model and system architecture are provided and discussed, and the prototype system is designed, implemented, and evaluated as well.

The major contributions of this research are the theoretical investigations of the feasibility of incorporating common-sense knowledge in the financial decision support domain, and the general design for developing of such common-sense knowledge enhanced FDSSs. This study provides a high-level conceptual model and design framework, on the basis of the description logic based knowledge representation and in-depth understanding of the general characteristics and requirements of the financial decision support problems. On the practical perspective, this research depicts three prototypes which are designed under the guides of the proposed general model and framework. The systems’ implementations and evaluations in three different financial application domains have also shown that the common-sense knowledge involved financial decision support effectively improve the efficient of decision making compared with traditional FDSSs.
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