

Financial management based decision making in the big data era

Ting Hao^{1,2*}, Xi Zhao¹

¹Tianjin University, Tianjin, 300072, China

²Inner Mongolia University of Science & Technology, Inner Mongolia, 014010, China

Received 1 March 2014, www.cmnt.lv

Abstract

Financial management are derived for the profitability analyses of demand-side management (DSM) alternatives. The present value of cost and equivalent uniform annual cost models are selected to determine the least-cost solution, while the net present value, pay back year and benefit/cost ratio models are proposed for the execution of cost-benefit analyses. In a market economy, Market orientation is the only correct choice for economic development strategy, so it is also significant for financial management innovation. While most studies in the past decade focused on the consequences of fund in financial management, few have investigated antecedents to market orientation concept. This paper derives two fuzzy financial profitability models, namely, a least cost solution model and a cost-benefit analysis model, to evaluate the fuzzy financial profitability of load management alternatives. A straightforward vertex parameters' fuzzy mathematics operation using the function principle is de-ri-ved as an alternative to the traditional extension principle and is applied to evaluate a number of different financial decision indexes. The developed models represent readily implemented possibility analysis tools for use in the arena of uncertain financial decision-making.

Keywords: financial management, decision making, finance decision making, big data

1 Introduction

Financial management includes the functions of activities for solution to enterprise funds, costs, capital structure, cash flow, financial risk control, etc. As the innovation of financial in management level, Financial management innovation is the re-combination of elements of financial management to adapt to environmental change, then thereby remodelling and the establishment of their own financial capability. Market orientation has received much attention for its apparent positive effect on organizational performance. In a market economy, Market orientation is the only correct choice for economic development strategy, and the poor or rich of natural resources is the second. Because financial activities are the lifeline of business operations and financial management innovation is an important part of business innovation, so Market orientation is also significant for financial management innovation.

With the advances of information communication technologies, it is critical to improve the efficiency and accuracy of modern data processing techniques. The past decade has witnessed the tremendous technical advances in Sensor Networks, Internet/Web of Things, Cloud Computing, Mobile/Embedded Computing, Spatial/Temporal Data Processing, and Big Data, and these technologies have provided new opportunities and solutions to data processing techniques. Big data is an emerging paradigm

applied to datasets whose size is beyond the ability of commonly used software tools to capture, manage, and process the data within a tolerable elapsed time. Such datasets are often from various sources (Variety) yet unstructured such as social media, sensors, scientific applications, surveillance, video and image archives, Internet texts and documents, Internet search indexing, medical records, business transactions and web logs; and are of large size (Volume) with fast data in/out (Velocity). More importantly, big data has to be of high value (Value) and establish trust in it for business decision making (Veracity). Various technologies are being discussed to support the handling of big data such as massively parallel processing databases, scalable storage systems, cloud computing platforms, and MapReduce. Big data is more than simply a matter of size; it is an opportunity to find insights in new and emerging types of data and content, to make business more agile, and to answer questions that were previously considered beyond our reach.

Strategic financial planning, or strategic planning for short, is a common way for organizations to plan to achieve their long-term financial objectives by focusing on where best to invest and allocate resources. Typically, strategic planning starts by establishing a baseline of performance and setting up goals over the planning horizon, including financial objectives. A strategic plan is then developed to map out the path to achieving these goals, along with indicators to track and measure per-

*Corresponding author's e-mail: tinghao_tju@126.com

formance with respect to the plan. While there is extensive agreement among business leaders that strategic planning is essential to enabling the continued success of a company, there are differences in the approaches used. Most of these, at least implicitly, acknowledge the uncertainties associated with the future as well as the existence of risks that may interfere with achieving the planned objectives. However, these approaches have proven not to be effective in reflecting and managing strategic risks. In fact, a recent study finds that over 80% of all cases of significant value loss among Top 1000 companies over the last 10 years are attributable to failure to adequately recognize and manage strategic risks.

Conventional fuzzy mathematical operations using the extension principle are applicable only to normalized fuzzy numbers. However, generalized fuzzy numbers (i.e., normalized and non-normalized fuzzy numbers) have the advantage that the degrees of confidence of a decision-makers' opinions can be represented by their heights. Moreover, fuzzy mathematical operations using the extension principle change the membership function type of the fuzzy number following mathematical manipulation and involve complex and laborious mathematical operations. Accordingly, Chen proposed the function principle, which can be used to perform fuzzy mathematical operations on generalized fuzzy numbers. The authors pointed out that the fuzzy mathematical operations preserve the membership function type of the fuzzy number following mathematical manipulation and reduce the complexity and tediousness of the mathematical operations. Consequently, the present paper develops an easily implemented and conceptually straightforward vertex operation using the function principle for application to fuzzy mathematics. The developed fuzzy mathematics operations are then applied to evaluate fuzzy financial indexes as part of a decision-making process. The proposed financial decision analysis method is more flexible and more intelligent than other methods since it takes the degree of confidence of the decision-makers' opinions into account.

Following the manipulation of fuzzy financial functions by fuzzy mathematics, the task of comparing or ranking the resultant fuzzy numbers can invoke a further problem since fuzzy numbers do not always yield a totally ordered set in the same way that crisp numbers do. Many authors have investigated the use of different fuzzy set ranking methods. These methods have been reviewed and compared. However, the majority of previous studies focused on the ranking of normalized fuzzy numbers, while relatively few considered the case of non-normalized fuzzy numbers. In this paper, a geometric moment model is derived to rank generalized fuzzy numbers based on the probability measure of fuzzy events. The geometric moments of a fuzzy number comprise the domain moment and the grade moments.

2 Related works

Over the years, scholars have different opinions and views of what is Market orientation. After years of debates, at present, there are two points of view of Market orientation: Market orientation concept of culture and behavior. In the two views, formed different definitions and division of content of the Market orientation. Several scholars describe the marketing concept as a form of organizational culture. Deshpande & Webster [1-3] put forward a Market orientation is a kind of organizational culture, which could have the efficiency and effectiveness of the creation of the necessary acts and create outstanding customer value. Narver and Slater [4-6] further defined Market orientation in terms of culture and related it to the fundamental characteristics of the organization, although they asserted that it is the organization culture that most effectively creates the necessary behaviors for creating superior value for buyers, and thus, continuous superior performance for the business. And it is characterized by:

- 1) Aim to profit and excellent customer value, whereas taking into account other interests of stakeholders;
- 2) To provide the behavior of organizational development and reflecting market information.

MO in their structure included elements of the three acts: customer orientation, competitor orientation and intersectoral collaboration, and there have two decision-making criteria: long-term perspective and attention to profits. As two of the components of Market orientation, customer orientation focuses on "the sufficient understanding of one's target buyers," whereas competitor orientation emphasizes the understanding of "the short-term strengths and weaknesses and long-term capabilities and strategies of both the key current and potential competitors" [7-9]. Further, customer and competitive orientations are two primary means that firms employ to interact with environments [10]. Behavior perspective of Market orientation Kohli and Jaworski [11] use the term Market orientation to describe organizational behaviors and activities that manifest the adoption of the marketing concept philosophy. Different from Culture Perspective of MO, Behavior Perspective is more focused on the study of specific behaviors related to MO [12]. Kohli and Jaworski [13-15] define market-oriented behaviors (MOBs) in terms of three behavioral processes, namely the generation and dissemination of, and responsiveness to, market intelligence [16]. Concepted in the conduct of information infrastructure point of view, evolved several other acts of behavior perspective of MO.

The cash-flow models applied in many financial decision-making problems often involve some degree of uncertainty. In the case of deficient data, most decision-makers tend to rely on an expert's knowledge of financial information when carrying out their financial modelling

activities. Since the nature of this knowledge often tends to be vague rather than random, Dr. Zadehi introduced fuzzy set theory, which aimed to rationalise the uncertainty caused by vagueness or imprecision. However, practical applications of fuzzy set theory in the profitability arena require two laborious tasks, namely fuzzy mathematical operations and the comparison or ranking of the resultant complex fuzzy numbers. Fuzzy mathematics is based on the extended principles presented in [17], in which the traditional addition, subtraction, multiplication, division, power, logarithmic and exponent mathematical operations are applied to fuzzy numbers. Dubois and Prade [18] demonstrated that, when performing the binary manipulation of fuzzy numbers, the resultant increasing (decreasing) part arose from binary operations on the non-decreasing (non-increasing) parts of the two fuzzy numbers. The extended operations ensured that the resultant fuzzy number continuously maintained its fuzzy properties during the arithmetic operating procedure. It is found that fuzzy mathematics tends to be cumbersome for even the more straightforward operations such as addition and subtraction. Unfortunately, financial and engineering applications involving fuzzy sets typically require the more complex nonlinear mathematical operations such as product, division, power and logarithmic manipulations [19]. In some cases, fuzzy operations of this type may require an insurmountable computational effort. Consequently, it has been proposed that approximated triangular fuzzy numbers be used to examine the resultant fuzzy profitability indexes [20].

3 Methodology and analysis

3.1 MARKET ORIENTED FINANCIAL MANAGEMENT

The goal of financial management is to maximize stakeholder's value. In broader terms, business stakeholders include shareholders, creditors, and employees, suppliers, senders, the Government and the public. Because multiple targets will draw away financial manager's attention and not been as an action standard, selection the part of stakeholders in many stakeholders and maximizing their value is essential to the target of financial management. According with the foregoing summary, Culture Perspective of MO consider that Market orientation is an organizational culture containing behavior elements. Its characteristic is that let create profit and superior customer value as the supreme principle, while taking into account the interests of other stakeholders. This orientation point out the new standards to ensure financial management objectives.

In accordance with the time the methods of financial management including the operating methods of asset management, cost management, investment and financial management, income distribution methods, can be divided into financial decision-making and budgeting, finan-

cial control, financial analysis. As the traditional financial sector usually directly faces to the capital market but not to the product market, therefore, in terms of cost control, investment and financing management and distribution of income, the financial sector obtain corresponding data from the enterprise but not the market to carry out the management activities.

Market orientation has a greater impact on the use of financial management methods in enterprises. Under Market orientation, it requires the financial sector to face directly the product market and capital market at the same time, and access to product market information and capital market information related with financial management, to analysis customer and competitor, let financial activities directly linked to customer value.

Actions of decision-making, budgeting, control and analysis of financial management need to obtain a variety of financial information, including internal and external financial information, and the macro-and micro-financial information. To deal with the financial information cannot be separated from the market. Behavior Perspective of Market orientation hold that MO is the implementation of marketing concepts, as generation, dissemination of and response to market intelligence to the main line. Behavior Perspective of Market orientation can conduct the behavior criterion for financial work and market information response. This behavior criterion requires not only dealing with information on the capital market, but also carrying out customer orientation and competitor orientation to collect information on customers and competitors. In order to fully understand the needs of current and future customers, and competitors strengths, weaknesses and trends, coordinate financial sector functions with other internal departments in the financial management of enterprises, so as to give best to create more customer value than competitors offer, and then come true the purpose of maximizing customer value.

3.2 FINANCIAL MANAGEMENT BASED DECISION MAKING

The value creation mechanism and management of logistics financial management of supply chain system as shown in Figure 1. The external influence factors of the value creation of logistics financial management of supply chain system are macroeconomic environment, market environment, supply chain length and related parties factors, etc. The logistics financial management value of supply chain system mainly influenced by the supply chain cost and profit. The supply chain system value chain contains suppliers, manufacturers, distributors, final customers, reverse logistics and their respective logistics financial management elements such as technology infrastructure investment, financing costs, warehousing costs, supply chain optimization cost, customer service cost, reverse logistics cost, logistics transport cost, etc., respectively constitutes the subsystem's logistics financial management

structure of a supply chain system. Logistics financial management of supply chain system through use of logistics financial planning, organizing, control and other methods. Effect on the role of capital flow, logistics, information flow, and obtain a corresponding logistics financial

management performance, optimize suppliers, manufacturers and distributors of their respective logistics financial management activities, so as to create the overall value of logistics financial management of supply chain system.

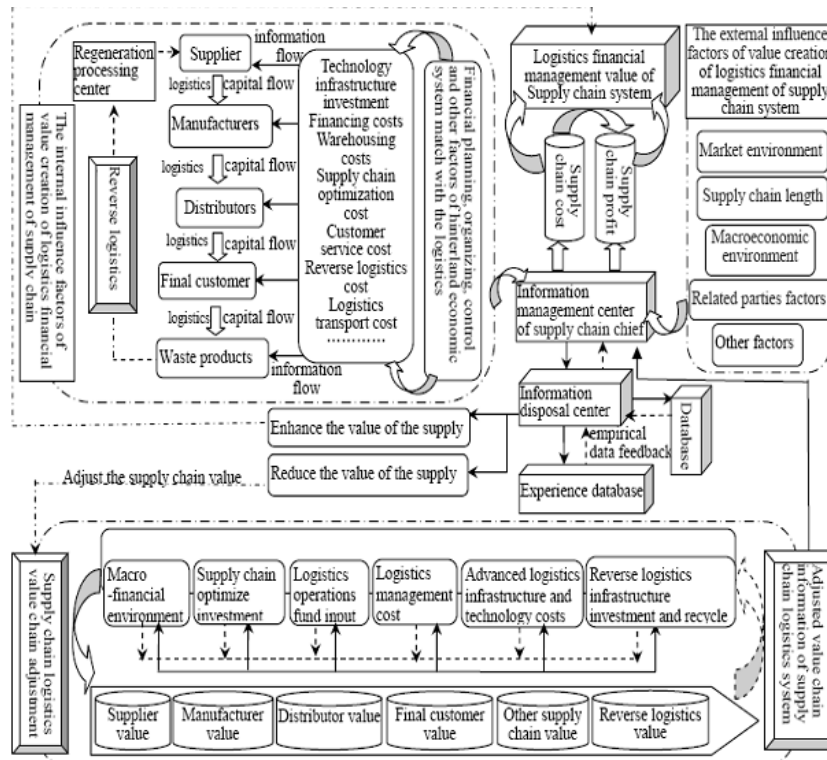


FIGURE 1 Logistics financial management

The status and data of the subsystems of the logistics financial management of supply chain system are changing constantly, and it can collect, dispose and feedback data depending on the information management center, information disposal center, data base and experience data base that built by the chief of supply chain. The advance or reduction of the value of logistics financial management of supply chain system can be measured through making the best of the data proposal function of information management center, receiving the input of information data from every process of supply chain and internal and external environment. The value chain of logistics financial management of supply chain will make adjustment according to the feedback received from information disposal center of the chief, and hammer at the adjustment and improvement of logistics financial management during every part of value chain of logistics financial management of supply chain, so that the systematic value creation level of financial management is improved. As a result every aspect that affects the value improvement of logistics financial management of supply chain shapes the feedback loop of value creation mechanism and management.

Value chain is the process of value increase through the production of final products or services inside and between manufacturers. It covers all phases experienced by the commodities or services in the creation process from raw

materials to final consumer goods. Logistics financial management of supply chain can achieve value maximum of the subsystem of every parts through value chain management, increasing combined running efficiency, in order to get competitive advantages through the improvement of market reaction speed, and the value creation efficiency of systematic logistics financial management will be improved finally. During the value chain of logistics financial management of supply chain, every logistics point of suppliers, manufacturers, distributors, final customers, reverse logistics and other stakeholders will be affected by macroscopic financial environment. Supply chain optimize investment, logistic operation fund input, logistic operation management cost, logistic technical investment, and reverse logistic infrastructure investment and recycle, and so forth, so that the efficiency of financial management and even the value creation efficiency of logistics financial management of supply chain will be affected.

3.3 LOGISTICS FINANCIAL MANAGEMENT MECHANISM

Macroscopic financial influencing factors: value creation of logistics financial management of supply chain can be influenced by macroscopic financial environment, and the main influencing factors include unemployment rate, market rate of interest, inflation rate, exchange rate and

international balance of payment, and so on. It is positive correlation with target variable.

Supply chain optimization: the value variable of supply chain optimization is mainly the increase or decrease of logistics points, making the currency of logistics reduced in supply chain system, logistics cost decreased, logistics points more reasonable, and supply chain more smooth. At present, the important problems of supply chain optimization are selecting suppliers, transfer warehouse and distributions, building proper inventory, establishing supplies related to the uncertainty of market demands, and fully displaying storage worth of supply chain. It is also possible to use logistics storage financing of supply chain to avoid financial deposit. Logistics storage financing is supply chain financing points using the document of title to get loan from business bank. Storage logistics finance can be third-party warrantor, avoiding financial risks efficiently, and also can accommodate logistics capital flows to blow up systematic logistics quantity and efficiently use long-standing inventory. Logistics finance/storage financing is one of the approaches of supply chain optimization, positive correlated to target variable.

Logistics operation fund input: under the influence of demand and supply of logistics finance, supply chain forms comparative condition of supply and demand of logistics fund and cost of supply chain. The comparative condition may be that the supply of logistics fund fulfils the demand of logistics fund, reaching the balance, so that the logistics of supply chain runs smoothly. Therefore, this variable is correlated positively to target variable in system.

Logistics operation management cost: relating to the manufacturing cost and quantity during logistics system of supply chain in ports-hinterland, including material cost, transportation, load and unload, transit, inventory, package, process, dispatching, wages and tax and interest and so on. It is correlated negatively to target variable. Backward status of logistics infrastructure and technology: it is necessary to increase investment to keep the advancement of logistics technical infrastructure of supply chain, and it is also good to improve logistics finance management value of supply chain through enhancing technology and consummating infrastructure.

While backward logistics infrastructure and technology block the logistics finance management value of supply chain, mainly incarnating at the aspects of transportation technology, load and unload technology, inventory technology, package technology, containerization technology and logistics information technology and so forth. It is correlated negatively to target variable. Reverse logistics infrastructure investment and recycle value: as a result of the pressure of living environment and law and regulations, and the drive of economic benefit, the reverse logistics is getting more and more attention. It contains reverse logistics in manufacture, reverse logistics in distribution, reverse logistics after distribution, customer B2B business reverse logistics, reverse logistics of customer service, and reverse logistics after use. The investment and recycle value of reverse logistics can improve supply chain value.

Almost every parts of supply chain will come down to reverse logistics. So it is correlated positively to target variable

4 Case study

The fuzzy financial decision-making procedures are described briefly. First, the estimated input parameters, such as interest rate, inflation rate, investment, and operating revenue and/or cost, which are needed in financial index calculation, should be provided by the expert in form of fuzzy numbers. The fuzzy financial decision indexes are then calculated according to the models developed in Section III. The fuzzy financial decision is made finally according to the relative ranking of the resultant fuzzy financial indexes, which is performed following the process described in Figure 2.

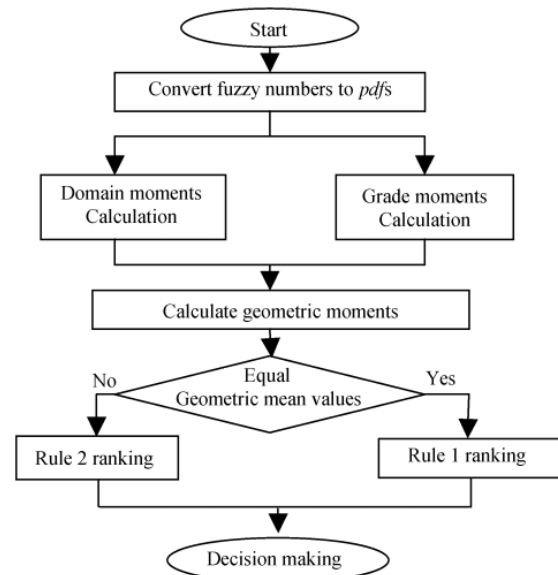


FIGURE 2 Flow chart of fuzzy number ranking process

A Cool Energy Storage air conditioning system (CES-system) functions by removing heat from a thermal storage medium during periods of low cooling demand and then releasing the stored cooling at a later time to meet an air-conditioning or process' cooling load. A CES-system has the advantage that it can meet the same total cooling load in a given period as a non-storage system but with a lower instantaneous cooling capacity. From the perspective of the utilities, a CES-system not only generates a reduction in the electrical demand but also shifts the consumer's energy consumption from peak time to off-peak hours. By decoupling the chiller operation from the instantaneous loads, CES-systems enable a more stable loading on the refrigeration equipment and increase the chiller efficiency due to the lower condensing temperatures associated with night time operation. It has been demonstrated that the use of cheaper off-peak energy and the reduction or elimination of peak-time charges enables CES-systems to provide substantial operating cost savings. Various forms of cool storage

media may be used, including chilled water, ice, or a eutectic salt phase-change material. Depending upon the desired mode of operation, various combinations of these coolant paths can be achieved through the appropriate adjustment of the CES-system control mode.

5 Conclusions

This study contributes to the existing literature in three ways. First, most financial management innovation studies have been conducted at the fund orientation. The present study focuses on the financial management innovation at the MO. Second, this paper takes a first step on researching the impact of culture of Market orientation on financial management. The next Market orientation's three core activities (market information generation, dissemination

and responsiveness). Finally, we research financial management innovation across four different aspects of the financial management, and thereby show the consequences of financial management innovation more than previous studies. While most studies in the past decade focused on the consequences of fund in financial management, few have investigated antecedents to Market orientation concept. To our knowledge, no study has investigated several of the antecedents included here. We hope to fill a part of this gap in extant knowledge.

Acknowledgement

Doctoral Research Fund of Ministry of Education, Grant No.: 2011002110035; Issue of Philosophy and Social Science of Baotou, Grant No.: 2014-sk30

References

- [1] Vine E 2003 Public policy analysis of energy efficiency and load management in changing electricity business *Energy Policy* 31 1307-14
- [2] Talukdar S, Gellings C W 1986 Load Management *New York IEEE Press*
- [3] Nahmais S 1977 Fuzzy variables *Fuzzy Sets Syst* 1(2) 97-110
- [4] Dubois H, Prade D 1978 Operations on fuzzy numbers *Int. J. Syst. Sci* 9(1) 613-26
- [5] Zadeh L A 1975 The concepts of a linguistic variable and its application to approximate reasoning *Part 1, 2 and 3* *InfSci* 8 199-249
- [6] Dubois D, Prade H 1980 Fuzzy Sets and Systems: Theory and Applications *New York Academic*
- [7] Kaufmann A, Gupta M M 1985 Introduction to Fuzzy Arithmetic: Theory and Applications *New York: Van Nostrand Reinhold*
- [8] Chen S H 1985 Operations on fuzzy numbers with function principle *Tamkang J Manage Sci* 6(10) 13-25
- [9] Chen S J, Chen S M 2003 *IEEE Trans Fuzzy Syst* 11(1) 45-56
- [10] Chen S H 1998 Operations of fuzzy numbers with step form membership function using function principle *InfSci* 108 149-55
- [11] Hsieh C H 1999 A model and algorithm of fuzzy product positioning *Inf. Sci* 121(1-2) 61-82
- [12] Chang W 1981 Ranking of fuzzy utilities with triangular membership function in *Proc Int Conf Policy Analysis Information Systems* 263-72
- [13] Jain R 1976 Decision-making in the presence of fuzzy variables *IEEE Trans. Syst., Man, Cybern* 6(10) 698-703
- [14] Dubois D, Prade H 1983 Ranking fuzzy numbers in the setting of possibility theory *InfSci* 30 183-224
- [15] Chen S J, Hwang C L 1992 Fuzzy multiple attribute decision making methods and applications in *Lecture Notes in Economics and Mathematical Systems New York Springer-Verlag*
- [16] Klir G J, Folger T A 1988 Fuzzy Sets, Uncertainty, and Information. Englewood Cliffs NJ: *Prentice-Hall*
- [17] Delgadoet M, et al 1988 A procedure for ranking fuzzy numbers using fuzzy relations *Fuzzy Sets Syst* 26(1) 49-62
- [18] Lee E S, Li R J 1988 Comparison of fuzzy numbers based on the probability measure of fuzzy events *Comput Math Appl* 15(10) 887-896
- [19] Yoon K P 1996 A probabilistic approach to rank complex fuzzy numbers *Fuzzy Sets Syst* 80 167-76

Authors	
	<p>Ting Hao, born in January 1987, Baotou, Inner Mongolia, China.</p> <p>Current position, grades: a PhD Candidate in Tianjin University, a lecturer in Inner Mongolia University of Science & Technology, China. University studies: management science and engineering. Scientific interest: cost control, financial management, management science and engineering. Publications: 15 papers.</p>
	<p>Xi Zhao, born in June 1955, Tianjin, China.</p> <p>Current position, grades: a professor in Tianjin University, China. University studies: Management Science and Engineering Scientific interest: corporate cost control and budget management, financial management. Publications: 50 papers.</p>