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图书在版编目(CIP)数据

中国管理研究与实践:复旦管理学杰出贡献奖获奖者代表成果集.2012/梁樑,黄海军著.
—上海:复旦大学出社,2014.11
ISBN 978-7-309-10985-6

Ⅰ.中… Ⅱ.①梁…②黄… Ⅲ.管理学-中国-文集 Ⅳ.C93-53

中国版本图书馆 CIP 数据核字(2014)第 220997 号

中国管理研究与实践:复旦管理学杰出贡献奖获奖者代表成果集.2012
梁 樑 黄海军 著
责任编辑/徐惠平 方毅超

复旦大学出版社有限公司出版发行
上海市国权路 579 号 邮编:200433
网址:fupnet@fudanpress.com http://www.fudanpress.com
门市零售:86-21-65642857 团体订购:86-21-65118853
外埠邮购:86-21-65109143
江苏凤凰数码印务有限公司

开本 787×1092 1/16 印张 21.25 字数 479 千
2014 年 11 月第 1 版第 1 次印刷

ISBN 978-7-309-10985-6/C·288
定价:48.50 元

内 容 提 要

复旦管理学奖励基金会由复旦校友、原中共中央政治局常委、国务院副总理李岚清同志发起， 成立于2005年9月。宗旨是奖励我国在管理学领域做出杰出贡献的工作者，倡导管理学理论符合中国国情，并密切与实践相结合，推动我国管理学长远发展，促进我国管理学人才的成长，提高我国管理学在国际上的学术地位和影响力。

复旦管理学奖励基金会设有“复旦管理学杰出贡献奖”，自2006年起，每年依次在管理学的三个子领域“管理科学与工程”“工商管理”和“公共管理”进行评奖。2012年评奖领域是管理科学与工程，产生了梁樑和黄海军两位获奖人。

本书汇集了2012年复旦管理学杰出贡献奖梁樑、黄海军两位获奖者的代表性学术成果，这些成果代表着目前我国管理学研究的领先水平，在创新性、学术性、实用性三个方面达到了一流标准，对广大管理学研究者有很强的借鉴意义和理论价值。

本书适用于高等院校管理学领域的研究者，也可作为政府经济管理部门工作人员、从事企业管理工作的基层管理者的参考用书。

序 言 一

李岚清

最近20多年来，管理学在我国日益受到人们的重视，这和我国的改革开放、经济社会快速发展有关，也和我国步入社会主义市场经济有关。其实，新中国建立以来，在经济和社会领域内都存在大量的涉及管理学的问题。我长期在大型企业、对外经济贸易部门和从事经济方面的领导工作中也都深切感受到这一点。但由于种种原因，管理学在相当长的时期内未能得到应有的重视。

管理学真正成为一门独立的科学，走进中国人的专业视野，全面进入中国的科学研究和高等教育体系，也就是最近20多年的事情。改革开放以来，中国的经济发展突飞猛进，科学技术日新月异，经济发展和社会进步越来越离不开管理科学的支撑。社会管理、环境管理、公共管理、企业管理等各个方面都对管理学提出了新的要求。经济社会领域改革的不断深入，在参与国际竞争中要取得持续的优势，这些都迫切需要进一步加强管理科学的研究，提高管理水平。可以说，需要管理学解决的问题越来越多，管理渗透到社会、经济生活的各个方面。当前，中国管理科学正迸发出空前的生机和活力，同时也面临着空前的机遇和挑战。

管理学是一门应用性、实践性很强的学科，作为一门科学，它的一些理论和方法在世界范围内具有共性。管理要获得成功，必须植根于一个国家的社会组织和民族文化之中。要真正解决好中国的管理问题，要让中国人对世界范围内涉及自己的管理问题有话语权和平等的参与权，最终还是要依靠中国人自己。管理科学是一个国家软实力的重要组成部分，我们要不断地构建有中国特色的管理科学理论，要具备并不断提高解决各类实际管理问题的能力，要培养出大批有很高学养和丰富经验的管理者，要花大力气建设高质量的管理教育体系，最关键的是要有一支高水平的管理学队伍。

复旦管理学奖励基金会的宗旨在于奖励在中国管理学领域作出贡献的学者和实践工作者，推动管理学的理论和实践相结合，形成中国特色的管理科学体系，最终推动中国管理学的长远发展，促进中国管理学人才的成长，提高中国管理学的国际学术影响力。

复旦管理学杰出贡献奖到今天已经是第5个年头了，12位在管理科学与工程、工商管理和公共管理等领域有杰出贡献的学者获得了这一奖项。这次，基金会把历届获奖人的代表性成果收录成册、公开发行，一方面是希望促进管理学研究成果在全社会的共享；另一方面也希望能够激励更多的中国管理学工作者潜心研究、勇于实践，产生高水准的学术成果，推动中国的管理创新和发展。

衷心祝愿中国管理学的明天更加美好！

序 言 二

成思危

管理学是一门应用性、实践性很强的学科，既有科学的规律可循，又有艺术的运用之妙。改革开放以来，我国管理学扎根于中国特色社会主义的实践沃土，积极回答了改革开放对理论和实践提出的新课题，适应了我国经济建设的迫切需要，并在多学科相互融合中不断发展，初步形成了比较适合我国国情的管理学科体系。

从管理科学与工程方面来看，我国的总体研究水平取得了显著提高。在分析预测方法、不确定性决策理论、群体决策理论、供应链管理、管理复杂性研究等领域，还产生了一批在国际上有影响力的优秀成果。从工商管理方面来看，改革开放的实践为中国特色工商管理模式的形成提供了成长沃土。我国学者在股份制公司的组织与运作、公司治理制度的建立与评价、企业战略制定与实施、企业信息管理与电子商务、非公有制企业管理等众多领域进行了深入探索，在建立符合国情的现代企业制度、提高企业管理水平等方面作出了重要贡献。在发挥市场资源配置方面的基础性作用的同时，也需要政府通过适当有效的宏观管理加以引导和调控，解决发展中产生的矛盾，维护有序的市场秩序，促进社会公平，保护生态环境，改善社会保障，实现可持续发展的和谐社会，公共管理研究为国家宏观政策制定提供了重要的理论支持。

为了推动我国管理学长远发展，促进我国管理学人才的成长，提高我国管理学在国际上的学术地位和影响力，复旦管理学奖励基金会自 2006 年起开始奖励我国在管理学学术领域作出杰出贡献的工作者，倡导管理学理论符合中国国情，并密切与实践相结合。获奖人都是活跃在当今管理学学术领域的最优秀学者，获奖人的产生经过了学界的广泛推选，经过了严格的评议过程，始终坚持“创新性、学术性和实用性”的基本评判标准，具有较高的程序公正性和实质公正性。复旦管理学杰出贡献奖是完全由学术界独立完成推选的学术奖项，现在，复旦管理学杰出贡献奖逐渐被更多的人了解，产生了一定知名度，在管理学界具有了越来越大的影响力，评选出的获奖人和他们的成果代表着目前我国管理学研究的先进水平。今后，我们将持续帮助获奖人出版他们的研究成果，促进学术交流，推动理论繁荣。

“创立中国特色的管理理论、建立中国自己的管理学派”不是一朝一夕可以完成的任务。复旦管理学奖励基金会将通过对中国管理学界的长期支持，努力促成这项事业的成功。基金会目前还只是做了一点基础性的工作。我相信通过 10 年、20 年的努力，通过一代又一代管理学者的辛勤工作，通过有选择地学习和吸收国外经验，有批判地继承中国传统的管理哲学和管理思想，一定能够达到这个目标。

目　　录

一、梁樑学术代表成果汇集篇

二、黄海军学术代表成果汇集篇

一、梁樑学术代表成果汇集篇

梁　樑

梁樑，男，1962年4月出生。教育部长江学者特聘教授，中国科学技术大学管理学院教授，东南大学系统工程专业博士。现任中国科学技术大学管理学院执行院长，兼任全国工商管理硕士(MBA)专业学位教育委员会委员和中国优选法统筹法与经济数学研究会副理事长。

梁樑教授因其在决策分析与供应链管理的学术成就得到了海内外管理学界的广泛认可，特别是将博弈理论与数据包络分析(DEA)相结合，研究了交叉效率的均衡问题，较好地解决了交叉效率分析中解的不唯一性和评估机制选择问题。梁樑利用非合作博弈原理，建立了供应链系统的DEA效率分析模型，从而可以深入分析系统内部子系统之间以及子系统与整个供应链之间的效率关系，为改善效率决策提供了方向性支持，其研究成果得到了国际学术同行的多次引用，带动了DEA在供应链中应用的研究。梁樑在供应链和闭环供应链系统资源配置及效率优化研究方面也取得了一定突破，研究成果对国内外的供应链效率优化应用工作起到了积极的引领作用。

梁樑教授在*Operations Research*，*Journal of Operations Management*，*IIE Transactions*，*Naval Research Logistics*等国际学术期刊上发表学术论文70余篇，参与出版英文学术专著5部。并兼任*American Journal of Operations Research*和*Asian-Pacific Business Reviews*以及《系统工程理论与实践》和《中国管理科学》等国内外学术期刊的编委工作。

梁樑教授曾获得国家自然科学基金杰出青年科学基金资助，其科研成果先后获得安徽省科技进步二等奖(1996年)、Best Theoretical Paper Award of The XVIII ACME International Conference on Pacific Rim Management(2008年)、教育部自然科学一等奖(2010年)等多项荣誉和奖励。其教学成果还曾获得省部级教学成果特等奖、中国科学院研究生优秀指导教师奖和国务院学位委员会和教育部授予的“全国优秀博士学位论文指导教师”称号。

An Option Contract Pricing Model of Relief Material Supply Chain①

Liang Liang, Xihui Wang, Jianguo Gao

1. Introduction

Relief material supply chain management differs from the traditional supply chain management. According to Beamon's[1] study, these differences include nonprofit identity of the buyer, high stakes (often life-and-death), unreliability, incomplete prior information and demand pattern. Since these features do not fit the profit-maximization assumption of traditional supply chain management, we cannot duplicate its methodology and put into practical use. Therefore, a new tool which more effectively suits relief material supply chain management is needed to improve the performance of relief material supply chain.

Option is a kind of derivatives, and for a long time it has been used as an effective tool to avoid risks and reduce uncertainty in finance. Many scholars had introduced the option as a kind of contract into real assets field and studied option contract in supply chain management. Essentially, option is a special right of choice: by pre-paying premium, the buyer gets the right to purchase (or sell) goods at fixed price before expiry date. This right of choice endows the buyer with the power to control large amount of materials with small amount of funds, reduce risk and delay decision. These three powers can cope with the problems of different demand pattern, high stakes and lack of prior information, respectively. Therefore, we believe the option contract can fit the specialties of relief material supply chain. However, the literatures on combining option contract with relief material supply chain can hardly be found. Our work would venture into this gap.

The purpose of this paper is to build an option contract pricing model in relief material supply chain and to find a feasible range of prices within which both the buyer and supplier are profitable and willing to conduct the transaction with option contract instead of wholesale price mechanism. To achieve this aim, firstly we design an option contract with two steps delivery process and present the conditions, which the pricing model must satisfy. Secondly, we build an alternative binomial option pricing model to estimate the

① *Omega-International Journal of Management Science*, 2012, 40(5): 594 - 600.

value of option contract for different members of supply chain. The option pricing model presented in this paper is more accurate and consists with reality for it takes account of the price fluctuation of relief material and subjective probability of disasters. The numerical example demonstrated at last shows that the feasible range exists as long as the option pricing model subjects to the given conditions.

The paper is organized as follows: In Section 2, related work from literature is reviewed. In Section 3, we design the option contract with two steps delivery and introduce conditions under which both the buyer and supplier are profitable and willing to conduct the transaction with option contract. Section 4 introduces the option pricing model and capital leverage index. Section 5 analyses the parameters in detail. The simulations results are presented in Section 6. Section 7 concludes the paper and presents perspectives for further work.

2. Literature review

In this section, we briefly review the literature in two areas, management of relief material and option contract in supply chain management.

Relief material management, as a kind of emergency management responding to unconventional disasters, can reduce the impact of unexpected events and maintain social stability. Whybark[2] studied the management of disaster relief material inventories, divided the management process into three stages including acquisition, storage and distribution, and analyzed the similarities and differences between traditional commercial materials and relief material inventory. He presented a definition that relief material management is a form of "social" management which serves broad social objectives as opposed to being used for the benefit of an individual enterprise, and has big differences from "strategic" material management and "defense" material management, which, respectively, aim to maintain national and regional economic stability and territorial security. Given the importance of relief material management, it is surprising to note that very little literature is available in this area. Scholars have long studied the relationship between commercial material management and economic behavior. However, research on disaster relief material is very limited. One exception can be found in the area of medical community that Bechtel et al.[3] studied the management of stockpiles of medicines, blood, and medical supplies and some of its approaches could serve as models for the management of other disaster relief material. Using stochastic programming, Barbarosoglu and Arda[4] built a disaster response model in an urban environment and explicitly studied the impact of uncertainty. Using a two-stage approach the authors first solved the response problem with stochastic estimates of transportation capacities, supply availabilities and demand based on various disaster scenarios. Beamon[1] considered humanitarian relief material supply process as a supply chain. By comparing and contrasting the commercial supply chain and

the humanitarian relief chain, he pointed out several specific characteristics of relief material supply chains which differentiate them from traditional commercial supply chains, including: zero (or approximately zero) lead times, high stakes, unreliable, incomplete or non-existent prior information and different demand pattern. Lately Beamon and Balcik[5] presented a framework which can be used as basis for a performance measurement system in the relief material management field. Present researches on relief material management focus on logistic and operation research (see for example, [6-11]). But still, the risk management methods and models of contracts which are commonly used in supply chain management (see [12-14]), are rarely introduced into relief material management.

Cachon[15] generalized supply chain contract theory in 2003. Since then, scholars had done a lot of researches on supply chain contract and made great progress in this area, see relevant studies in [16-23]. The major supply chain contract can be divided into the following four main types: the wholesale price contract, the buyback contracts, the revenue sharing contract, and the quantity-flexibility contracts. Besides the four kinds of contract models mentioned above, there are quantity discount contract, number committed contracts, options contracts, delay compensation contracts, futures contracts, and punishment feedback contracts model. Among all these contract models, option contract, which origins from financial derivatives, is a potential one. Kleindorfer and Saad[13] proposed the idea that the price of the contract should include two parts, reserve fee and executive fee. This idea introduced the concept of real option into contract pricing. Burnetas and Ritchken[19] used the case of supply chain with downward-sloping demand curve to study the option pricing problem and its impact to the supply chain. They are the first ones to analyze real option contract in supply chain from option pricing prospective. The value of option of service and nonstorage commodity with cost and demand uncertainty was studied by Spinler and Huchzermeier[24]. Cucchiella and Gastaldi[25] hold the idea that supply chain under uncertainty requires flexibility. Since real option can increase the degree of flexibility, he implied real options method to supply chain management as a risk management instrument. Fang and Whinston[26], using option contracts as a price distinguishing tool, measured the demand type of enterprise and got the conclusion that even if demand type of buyers cannot be distinguished, option contract can still guarantee manufacturer the same profit. Wang and Liu[27] gave two necessary conditions of coordination on retailer-led supply chain. One is that the executive price must negatively correlate with premium price. The other is that the obligations of manufactures must not be greater than the optimal yield under centralized system. Zhao et al.[28], taking wholesale price as a benchmark, studied the efficiency of options contracts in supply chain coordination. In the scenario analysis, individual risk preferences and bargaining power were taken in account. Guo's study[29] found that options contract is an effective risk management tool to overcome the problem of double marginalization, improve the

performance and efficiency of supply chain and coordinate the behavior of members of the supply chain so as to achieve a win-win situation. All these studies, however, still revolve around optimizing and coordinating problems of commercial supply chain. Little literature can be found involving the combination of option contract and relief material management.

In this paper, we design an option contract for relief material supply chain and try to find out a feasible range of prices, which can be accepted by both members of chain. Compared with the literature presented above, our study is different in a few ways. First, our paper employs option contract as a risk management tool to cope with the issues of inaccurate demand forecasting and overstock in relief material management. Second, we provide conditions under which both the buyer and supplier will prefer option contract to wholesale contract in relief material management. Third, we take into account of price fluctuation and risk-free interest rate in option pricing model which makes the pricing process more reasonable and practical. Different from the existing binominal option pricing model proposed by Cox et al. [30], the contract trigger condition of our pricing model is the occurrence of disaster instead of material's price. The objective of this paper is to provide the feasible price range rather than finding the optimization point of profit sharing. Therefore, the bargain power and risk preference are not considered.

3. Problem description and conditions

3.1 *Description*

We consider the relief material management system as a single-buyer, single-supplier supply chain, in which the buyer stands for Nonprofit Organization (such as department of civil affair, FEMA or Red Cross) while the supplier stands for cooperation (such as manufactory or supermarket), with one kind of relief material, i. e., food, drinking water or daily necessity. In this model, we assume that if the disaster does not happen, the buyer will not exercise the option contract even if he can make high profit from price volatility, and if a disaster occurred, the buyer will exercise option contract even if price volatility may cause financial loss. For the identity of buyers is NPO whose main aim is to manage risk rather than making profit, we consider this assumption is reasonable. Moreover, we adopt two steps delivery mechanism in this model. The supplier does not have to delivery all the relief materials at once. According to the delivery term of the contract, the supplier only has to stock part materials to satisfy the step I request. This will greatly reduce the storage holding cost of the supplier and makes him more willing to participate in transaction.

3.2 *Sequence of event*

The two members of relief material supply chain sign an option contract on certain

kind of relief material. Agree on according to the contract, the buyer purchases q units options at unit price O from the supplier and gets the right to buy no more than q units materials at fixed unit exercise price G at any time within the contract life time. The supplier receives premium qO and obligates to stock $q\theta$ $(0 \leqslant \theta \leqslant 1)$ units relief materials in advance and sell no more than q units materials to the buyer at unit exercise price G whenever the buyer decides to exercise the contract within the contract life time.

Within the contract life time, if disasters never happened, the option contract will not be triggered. The supplier can dispose the unpurchased stock relief materials after the option contract expires. If a disaster occurs, the buyer will execute the option contract and determine its ordering quantity $q\gamma$ $(0 \leqslant \gamma \leqslant 1)$ based on actual demand and buy materials at exercise price from the supplier. At meantime, the supplier has to start delivery process.

The delivery process consists of two steps. In step I, the supplier delivers stock $q\theta$ units material immediately after the option contract was triggered. In step II, the supplier has to deliver the remaining q $(\gamma - \theta)$ units material before the deadline agreed in the contract.

The event sequence of our option contract model is demonstrated in Fig. 1.

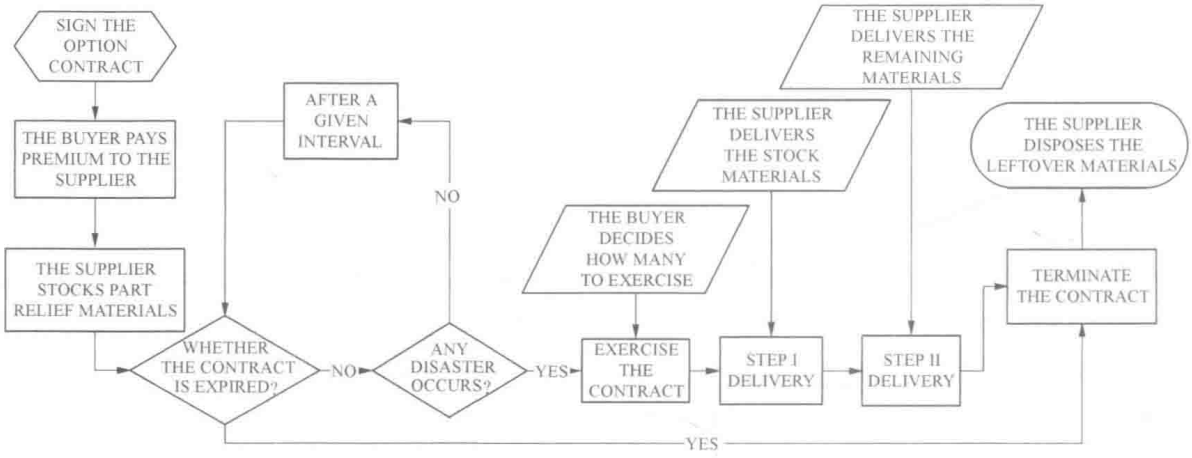

Fig 1 Flow chart of option contract model

We let the unit inventory holding cost of buyer be C and unit inventory holding cost of supplier be I. P is the present price of unit relief material and V is the salvage value of unit unpurchased stock material. We focus on the reasonable case where $P > C$, $P > I$, $P > V > 0$.

3.3 *Conditions*

In order to make this option contract model reasonable and interesting for both members of relief material supply chain, it has to satisfy certain conditions.

From the rational point of view, the option price per unit O should be less than the value of the option contract for buyer R^B. Only in this situation, the buyer is profitable and

has the motivation to participate in the transactions. This condition can be expressed as follows:

$$R^B > O \tag{1}$$

Furthermore, the pricing model must satisfy the condition that the unit price of material (sum of the unit option price O and unit exercise price G) is less than the sum of unit inventory cost of buyer C and unit capital occupation cost $P(1+r)$. Otherwise, the buyer would prefer to purchase and store the relief materials unilaterally. This condition can be expressed as follows:

$$C + P(1+r) > O + G \tag{2}$$

The identity of the supplier is usually commercial organization like manufactory or supermarket whose aim is to make profit by providing service or material. The supplier will participate in the transaction only if it is profitable. Therefore, the option price per unit O obtained by the supplier should be larger than the value of the option contract for the supplier R^S. Thus the supplier will consider this option contract profitable and have the motivation to participate in the transaction. This condition can be expressed as follows:

$$O > R^S \tag{3}$$

Moreover, the pricing model must satisfy that the unit price of material (sum of the option price per unit O and exercise price per unit G) is larger than the unit present price of the relief material P. Otherwise the supplier would rather sell the materials on market at present price than make the option contract with buyer. This condition can be expressed as follows:

$$O + G > P \tag{4}$$

Any option contracts subject to these four conditions simultaneously can make both the buyer and supplier profitable and willing to conduct the transaction with option contract. To find out the feasible range which suits these conditions, we have to evaluate the unknown parameter: the value of option contract R at first. However, the value of the very same option contract is different for buyer and supplier. For example, the value of option contract for buyer R^B mainly comes from the reduced inventory and capital occupation cost which, for the buyer, is a kind of gain, while the value of option contract for supplier R^S mainly comes from the storage holding fee which, for the supplier, is a kind of cost. Therefore the value option contract for buyer and supplier should be evaluated separately.

4. Option pricing model

To evaluate the values of option contract for buyer and supplier, we adopt an