Study about Supply Chain Risk Conduction

Yunjuan Ge[*]**, Jiling Hu**
East China University of Science and Technology , Shanghai
EMAIL: geyunjuan@126.com

Abstract: Aiming at the supply chain risk conduction on the companies ,this paper introduced elasticity coefficient and a two stage supply chain game model to analyze the price risk and the profit risk of the supplier and the vendor brought by the basic material price risk of the supplier.The results showed that the price risk became weaker gradually following supply chain.The profit risks of the supplier and the vendor were the sameBut the degree of profit risks was related to the basic material price and the market demand function.

Keywords: Elasticity coefieient；Supply chain risk；Risk conduction

I. Introduction

About the concept of risk, domestic and international academic community have many interpretations. March, etc Consider that the risk is the uncertainty of possible outcomes of things; Bmmiley considers that risk is the uncertainty of revenue streams [1]. The risk is defined as the loss of uncertainty by Rosenbloom . I believe that risk is the uncertainty of future results. For enterprises, enterprise risk management refers to the process of production, as foreign within the enterprise sector, the environment and the impact of uncertain factors to the expected business.Business objectives and the actual occurrence of a certain bias potential targets. As the company there are various direct or indirect association, making the risk of transmission companies generally exist. Supply chain enterprise risk transfer is in the system, because companies can not to avoid uncertainty by the internal and external interference and influence, making the initial moment at some point the uncertainty risk attached to a variety of conduction carriers in various form is passed and spread to the enterprise and supply chain associated companies production and management process, which led to supply chain management objectives in production capacity health deviation from or failure of a process[2]. General business risk carrier conduction a price, technology, information, interest rates, confidence, and policies. Vector is the Enterprise Risk Communication guide the process of media, but also the risk of inter-related elements of the bridge, is an effective form all factors interact to achieve [2]. I study the price for the set body of the supply chain enterprise risk transfer.

Current risks are concerned by the general scholars of home and abroad. Abroad scholars have the type of risk, causes and characteristics, and risk assessment and management into bank of extensive research. The research of risk transmission for home and abroad, focusing primarily on financial risk and crisis-related research. The risk of financial crises in countries pass; Kaminsky and Reinhart study the credit risk transfer between different countries[3] Cui doubts such research micro-enterprise risks and macro-financial crisis, asked the conduction mechanism ; Zhu Jingyi demonstrated financial risks such as the three main transmission mechanism[5]. However,the risk of the company asked the dynamic study,in particular the risk of transmission of business-related research, few studies abroad. However, such discussions out of steady and unsteady conduction enterprise Risk.The definition of the path and the carrier, leaf construction wood and other characteristics of the enterprise risk transfer, profile control analysis of the underlying causes of risk ransfer[7].Only from the macro aspects of these studies summary and description, and quantitative analysis of enterprise supply chain asked or the risk of transmission.

II. Elasticity coefficient

Elasticity coefficient refers to the other conditions unchanged, the initial point of change in risk 1% lead to the other risks associated with changes in percentage points. In other words, bombs coefficient measure of risk points associated point response to the initial risk degree.

Has two kinds of risk points M, N, Nfor the initial risk point, the bomb coefficient of M and Nis:

$$S_{MN} =(\partial M/M)/ (\partial N/N)= (\partial M/\partial N)(N/M) \qquad (1)$$

The formula, SMN denote that the risk ofM on the N coefficient of elasticity. That is when the M's other conditions are not variable time, N will make M 1% change in the percentage of change.

Will take the absolute value of elasticity coefficient to measure the degree of risk response. By reaction extent the size of the elasticity of risk can be divided into five regions:

(1) $0 <| S_{MN} | <1$, known as the reduced risk of transmission, that changes in N 1%, M changes less than 1%.

(2) $| S_{MN} | > 1$, known as the risk of transmission to strengthen that change in N 1%, M change moving more than 1%.

(3) $| S_{MN}| = 1$, as a considerable risk of transmission, that changes in N 1%, M with like changes in 1%.

(4) $| S_{MN} | =\infty$, referred to as full risk transfer, said the change in N 1%, M change infinity.

(5) $| S_{MN} | = 0$, known as a full risk transfer, said the change in N 1%, M no change.

III. Supply Chain Risk Transfer Model

A two stage supply chain model as the backgroun.The supply chain from the upstream producers and downstream retailers. According to the retailer demand forecast Q order quantity for the manufacturer of the goods, the manufacturer according to the retailer orders a single price to the retailers. Manufacturer's purchase of the unit cost C.

Manufacturers and retailers，s profit is $\pi s,\pi v$ then

Manufacturer's profit function :

$$\pi s\,(W) = (W-c)\,Q \tag{2}$$

Retailer's profit function:

$$\pi v\,(P) = (P-W)\,D\,(P) \tag{3}$$

s. t. $c <i < P$, the restriction that only manufacturers and retailers can ger the profit that the case can be done.The formula, C denotes that the procurement unit cost; W denotes the wholesale unit price; P denotes retail Price;Q denotes that number of orders; D (P) denotes market demand. Convenient for the analysis, the model assumptions are as follows:

①Manufacturers and retailers into this structure is perfect information and market demand,manufacturers and retailers are risk nature;

②Manufacturers and retailers to separate economic entity;

③Manufacturer for the core business for the supply chain, that is the dominant.

④Manufacturer;not consider inventory and shortage;

⑤Final product demand is uncertain demand.

The model can be regarded as manufacturers and retailers of Stackelberg Game model, first manufacturer to make decisions, retailers, according to the manufacturer's decision to make sinceown decision-making. The order of the decision: Firstly wholesale manufacturers give W, retailers Observe, select the order Q, and decide that the retail price P. *Set D (P) is the product of the demand* function. D (P) with the increasing price of P reduce .Demand functions are often used in literature are two kinds of addition and multiplication form type, the paper uses the additive form, that is to take D (P) =a-bp (a> 0, b> 0).

Because they do not consider the inventory and shortage, that theQ= D (P), the production operators on the order quantity in accordance with retailers to produce. Using backward induction, first consider the case of given wholesale price, the retailer's optimal choices:

$$Max\pi v(p)=(p-w)(a-bp) \tag{4}$$
$$\partial\pi v\,/\partial p=0 \quad p=a/2b+0.5w \tag{5}$$

Manufacturers predict that retailers will be based on equation (5) choose P and p. Therefore,manufacturer's optimal choice is

$$\partial\pi s\,/\partial w=0 \quad w= a/2b+0.5c \tag{6}$$

Bundles (5) and (6) were substituted into the above kinds, get:

$$P=0.75a/b+0.25c \tag{7}$$
$$Q=D(p)=a/4-bc/4 \tag{8}$$
$$\pi s=0.125(a2/b-2ac+bc2) \tag{9}$$
$$\pi v =0.0625(a2/b-2ac+bc2) \tag{10}$$

Here analysis of the wholesale price, retail price, demand and profits relative to the original material a function of feed prices, followed raw material price risks of produce supply chain to the price of risk and profit risk.

IV. Analysis of the risk of transmission of the supply chain price

The price risk

Taking (6), (7) the natural logarithm of both sides, then derivative :

d(w)/w=d(c)/[(a/b)+c]   Swc = d(w)/d(c)*(c/w)=c/[(a/b)+c]

d(p)/p=d(c)/[(3a/b)+c]   Spc = d(p)/d(c)*(c/p)=c/[(3a/b)+c]

0 <Spc<Swc<1, indicating P, W for c risk is the risk of transmission by weak, that is, c increased risk of 1%, W, P less than 1% increased risk. Can be seen in other condition remains unchanged, the producer prices of raw materials to lower the risk of transmission when raw material price changes is higher than the wholesale price and retail price rate of change. This shows the base basis of price changes of raw materials price movements will be along the supply chain down travel direction is gradually reduced, that price risks in the supply chain will be reduced gradually along the downstream direction weak, the risk of transmission of enterprises in price from a buffer. Reduced the degree of risk the demand function, a / b the smaller the effect of weakening the worse.

Profit risk

Taking (9), (10)the natural logarithm on both sides of the derivative:

d(πs)/ πs =2d(c)/[c-(a/b)]

 Sπsc = d(πs)/dc*(C/πs)=-2c/((a/b)-c)

d(πv)/ πv =2d(c)/[c-(a/b)]

 Sπvc = d(πs)/dc*(C/πv=-2c/((a/b)-c)

From (8) we can get ：Q=0.25a-bc/4>0 ,a/b-c >0,let

| Sπc |=| Sπsc |=| Sπvc |

The results indicate that, other things being equal, the producer price of raw materials georgia's rose, making profits of manufacturers and retailers are down. But whatever city market demand function and how much raw material prices, the profits of manufacturers and retailers rate of change is the same, that is, the profits of both bear the same risk. Manufacturers and retailers and manufacturers profit rate of change in prices of raw materials and market demand letter few are related. When C <a / b <3c. | Sπc | > 1, the risk of transmission to enhance that 1% change in raw material prices, the profit of over 1%; when the a / b> 3c, the | Sπc | <1, reduced risk of transmission, namely, 1% change in raw material prices, small changes in profit 1%; when the a / b = 3c when, | Sπc | = 1, the risk of transmission rather, that raw material prices change of 1%, 1% change in profits equally; when a / b→∞, | Sπc | =0,the complete risk-free movement, that is, 1% change in raw material prices, profits unchanged.

V. Conclusion

Stackelberg Game in a single manufacturer and retailer, the most final product demand functions for the addition of the supply chain, risk transfer has the following features:

(1) From basic raw material price changes will lead to changes in product prices along the supply chain to the downstream direction is gradually reduced, the supply chain will be along in the price risk downstream direction is gradually reduced, the risk of transmission of enterprises in price from a buffer.

The degree of risk weakening the demand function, a / b the smaller the effect of weakening worse.

(2) The producer prices of raw materials would make manufacturers and retailers profits are down. But whether the market demand function and price of raw materials and more less, the profits of manufacturers and retailers is the same rate of change, that is both affordable risk consistent profits.

(3) The profits of manufacturers and retailers to change rates and raw material producers.Price and market demand for the function. When C <a / b <3c, the risk of transmission strengthening; when the a / b> 3c, the risk of transmission decreased; when the a / b = 3c, the wind significant risk transfer; when a / b→∞, totally risk-free transmission.

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Background of Authors

Ge Yunjuan, graduate of   East China University of Science and Technology

Hu Jiling ,professor of East China University of Science and Technology.