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Theoretical Research on the Impact of Country Risk on Insurance Demand

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ABSTRACT

Derive the optimal premium expenditure of the insured from the consumer expected utility maximization model. On this basis, the concept of country risk is introduced, and derive the optimal premium expenditure of the insured in the presence of country risk is. Then compare the optimal premium expenditure of the insured when there is country risk and when there is no country risk, and study the impact of country risk on insurance demand.

Keywords; Expected utility, Country risk, Insurance Demand

INTRODUCTION

In the era of major changes, risks are constantly deepening and alienating, which have a profound impact on the international situation, economic society and people's lives. In recent years, under the influence of global risk events such as stagnant global economic growth, geopolitical tensions, ecological and climate crises, international trade disputes, and the new crown pneumonia epidemic, the risks faced by countries and people around the world have gradually become frequent, rapid and sudden. With other characteristics, the perception, capture and management of risks has become more difficult than ever. Under the conditions of very close global economic and trade cooperation, risk events such as trade policies, debt crises, and regime changes in important economies will not only change their own national risk environment, but will also affect their negative effects spread to other countries across borders under the influence of economic globalization. Due to the differences in the political and economic systems and policies of countries around the world, the overall macro risk environment of a country, which is formed by the convergence of economic, financial and political risk factors, is quite different. Therefore, in the face of the turbulent international situation, the complex and sensitive geo-environment and the difficult recovery of the global economy, countries around the world need to deeply understand the changes, influencing factors and development trends of national risks, formulate a thorough national risk management plan, establish a complete national risk protection system, and study policies and policies to deal with changes in the risk environment of other countries, so as to face crises and changes in a strategic way.

In a complete national risk protection system, commercial insurance is an indispensable key element. The unique nature of insurance gives it the dual characteristics of providing risk protection and promoting the development of the real economy. It has a key role in economic and social development that cannot be replaced by other financial formats. Therefore, increasing the

demand for insurance in the market, expanding the capital scale of the insurance industry, and giving play to the scale effect of insurance capital can enable the insurance industry to more effectively provide stable, comprehensive and high-quality risk protection and financial support for economic and social development. At the same time, it is also an indispensable and important magic weapon for all countries in the world to cope with changes in current risks and resolve risk challenges.

After a long period of theoretical research and practical exploration, risk and insurance-related theories have been fully demonstrated and improved, and the research on the factors affecting the demand for life insurance has formed a basic research framework and logic. Risk is the prerequisite for the existence of insurance. Insurance has the ability to resist and prevent risks. The nature, volume and degree of influence of risks determine the scope, strength and demand level of insurance. Therefore, the research on risk is the foundation of insurance theory and has the important value of expanding the boundary between risk and insurance theory.

In the academic research on the influencing factors and effects of insurance demand, scholars mainly analyze the insurance consumption decisions of individuals or families from a micro perspective. The research content of risk on the demand for insurance mainly focuses on the insurable risk, and there are few researches on the demand for insurance that take macro-uninsurable risk as the influence factor. In this context, this article is based on risk management theory and insurance theory research, with insurance demand as the core, and studies the impact of country risk on insurance demand.

Country risk is a risk indicator that measures changes in a country's comprehensive risk environment based on changes in the country's overall economic risk environment, financial risk environment, and political risk environment, and by monitoring changes in corresponding indicators and data. Changes in the national risk index will also affect the country’s economic, financial, and political environments, which in turn will have an impact on the demand for life insurance. For external, macroscopic, and non-insurable risk indicators such as country risk, there is already a relevant theoretical research foundation in the world. This article will continue to use the existing mature research framework to study the impact of country risk on life insurance demand in terms of theoretical models.

Since the 1980s, the concept of background risk has been gradually cited and widely studied. Corresponding to the concept of insurable risk, background risk is generally used to represent exogenous uninsurable risk. On the macro level, the background risks in the insurance market include public health events, some natural disasters, political and economic policy uncertainties, etc.; In the mid-range aspect, it includes information asymmetry in the market, market premium scale structure risk, and insurance industry reputation risk, etc.; At the micro level, it includes the speculative risks and crime risks of consumers and their families.

In the past few decades, many scholars at home and abroad have carried out research on background risk theory, and there has been a certain foundation for research on how background risk affects insurance decisions about insurable risks and household insurance needs. H. Doherty and H. Schlesinger (1983) studied the influence of background risk on the insurance decision of arbitrary risk aversion utility function, and discussed the optimal insurance problem under

background risk conditions. It is an international research on the relationship between background risk and insurance demand. Earlier academic papers. The country risk studied in this paper belongs to the research category of background risk in theory, and the research framework of background risk will be used in theoretical research. The model will be established on the basis of consumer expected utility theory, background risk theory and risk management theory, and will be analyzed according to the actual situation of the research objects in this article. The model will be based on the optimization of the expected utility of the micro-agents. It is necessary to make assumptions and descriptions about the expected utility function and constraint conditions of the micro-agents in the economy.

CONSUMER EXPECTED UTILITY THEORY MODEL

Assumptions

In the theoretical model of consumer expected utility in this article, there are the following assumptions:

a. For consumers, they only face two risks: insurable risk and non-insurable risk;
b. Country risk and insurable risk are independent of each other;
c. The loss events of consumers are only two states: "loss" and "no loss";
d. Under the condition that there is no insurable loss, the insurance payment is zero.

Variable definitions

In the model for optimizing consumers' expected utility, we introduce the following variables:

U(·)−The utility function of the insured, $U'(\cdot)>0$, $U''(\cdot)<0$;

E−The expectation of the insured;

W−The initial wealth level of the insured;

L−Loss scale of insurable risk, $L \le W$;

p−Probability of insurable loss, pL is the expected loss value;

α−Insurance rate, $\alpha \ge 0$, αL is the compensation paid by the insurer after the loss occurs;

m−load factor of insurance premium, $m \ge 0$, $(1+\mathrm{m})p<1$;

P−Insurance premium, $P = (1+m)\alpha pL$, insurance premium P is proportional to the expected loss value pL。

Optimal premium conditions for the insured with no country risk

The variables are introduced into the model for calculation and derivation, and the formula for the optimal premium payment of the insured based on the expected utility theory is:

$$\max_{P} \quad pEU[W-P-(1-\alpha)L]+(1-p)EU(W-P) \qquad (2.1)$$

If $m=0$, the optimal value of the insurance rate $\alpha=1$, if $m>0$, the optimal value of the insurance rate $\alpha<1$。

According to the research of Wenan Fei et al. (2008), the first-order necessary conditions for achieving the optimal insurance rate is:

$$[W-P-(1-\alpha)L]U'[p(1-p-mp)L]-[p(1-p-mp+m)L]U'(W-P)=0 \quad (2.2)$$

In the next step, 由得$\alpha = \frac{P}{(1+\mathrm{m})\ pL}$ is obtained from $P = \ (1+\mathrm{m})\ \alpha pL$, which is then put into formula (3.1) to obtain:

$$\max_{P} \quad pEU\left[W - P - \left(1 - \frac{P}{(1+m)\ pL}\right)L\right] + (1-p)EU(W-P) \qquad (2.3)$$

After sorting, the optimal premium formula of the insured is transformed into:

$$\max_{P} \quad pEU\left[W - L + P\left(\frac{1}{(1+m)\ p} - 1\right)\right] + (1-p)EU(W-P) \qquad (2.4)$$
$$s.t.\ P \geq 0$$

Take the first-order derivative of the formula (2.4) with respect to the insurance premium P to obtain:

$$pU'\left[W - L + P'\left(\frac{1}{(1+m)\ p} - 1\right)\right]\left(\frac{1}{(1+m)\ p} - 1\right) - (1-p)U'(W-P') \leq 0 \qquad (3.5)$$

Therefore, formula (3.5) is the conditional formula for the optimal premium payment of the insured when there is no country risk, and P'is the optimal premium payment of the insured.

INSURED'S OPTIMAL PREMIUM MODEL INTRODUCING COUNTRY RISK

Variable Definitions

After introducing country risk, the initial wealth level of the insured is expressed as $[W + y]$, y is a random variable, which is the change in the wealth level of the insured caused by country risk, and represents statistically independent country risk. In the case of country risk, y=0 ; $U_y(\cdot)$ is the utility function of the insured under the influence of country risk, and P_y is the premium expenditure of the insured under the influence of country risk.

Optimal premium conditions for Insured's Optimal Premium Model Introducing Country Risk

The optimal premium condition formula of the insured under the influence of country risk can be written as:

$$\max_{P_y} \quad pEU_y\left[W + y - L + P_y\left(\frac{1}{(1+m)\ p} - 1\right)\right] + (1-p)EU_y\left(W + y - P_y\right) \qquad (3.1)$$

The first-order derivation of the formula (3.1) regarding the insurance premium expenditure P_y of the insured when there is a country risk obtains:

$$pU_y'\left[W - L + P_y'\left(\frac{1}{(1+m)\ p} - 1\right)\right]\left(\frac{1}{(1+m)\ p} - 1\right) - (1-p)U_y'\left(W - P_y'\right) \leq 0 \qquad (3.2)$$

Formula (3.2) is the optimal premium payment condition of the insured.

Simultaneous model derivation

Among the variables defined in 3.1 of this paper, the equation of Eeckhoudt and Kimball (1992) for the expected utility function of consumers is introduced:

$$U[W - P(W,y)] = E[U(W+y)] \qquad (3.3)$$
$$P \geq 0$$

P at this time is defined as the risk premium. According to the research of Pratt (1964), the risk premium P can be regarded as:

$$P \cong -\frac{U''}{U'} \cdot \frac{\sigma^2}{2}$$

Among them, $-\frac{U''}{U'}$ is the degree of absolute risk aversion[7].

Continue to introduce Kimball's (1990) definition of preventive premium P_y:

$$U'\left[W - P_y(W, y)\right] = E[U'(W + y)] \quad (3.4)$$
$$P_y \geq 0$$

Among them, $U'$is the marginal utility, and the preventive premium P_y can be regarded as:

$$P_y \cong -\frac{U'''}{U''} \cdot \frac{\sigma^2}{2}$$

Kimball defines $-\frac{U'''}{U''}$ in the formula as absolute prudence[8].

In the optimal premium model with country risk conditions, the concept of prudence represents the willingness and demand to purchase insurance in order to prevent and respond to risks when there are country risks.When absolute prudence is positive and the level of wealth is affected and decreased, the existence of country risk will increase the insured's demand for insurance against other risks (Eeckhoudt, 1992).

Introduce EU_y:

$$EU_y = EU(W + y) \quad (3.5)$$
$$E(y) = 0$$
$$P(W, y) > 0$$

Take the derivative of W in formula (3.5) and combine it with formula (3.4) to get:

$$EU_y' = EU'(W + y) = U'(W - P_y) \quad (3.6)$$

Take the derivative of W in formula (3.6) again to get:

$$EU_y'' = U''(W - P_y) \cdot (1 - \frac{\partial P_y}{\partial W}) \quad (3.7)$$

After finishing formula (3.6) and formula (3.7), we can get:

$$-\frac{EU_y''}{EU_y'} = (1 - \frac{\partial P_y}{\partial W}) \cdot \left[-\frac{U''(W-P_y)}{U'(W-P_y)}\right] \quad (3.8)$$

According to the study of Kimball (1990), under the monotonic and concave conditions of the utility function, reducing absolute risk aversion and reducing absolute prudence are sufficient and

[7] Absolute risk aversion indicates the degree of aversion of the decision makers to uncertainty and the price they are willing to pay for getting rid of uncertainty. According to Kimball (1990), the concept of absolute risk aversion is not suitable for studying the impact of risk on marginal utility.
[8] Kimball (1990) provides an economic explanation for absolute caution: the term "prudence" is the opposite of "risk aversion", which aims at the tendency of decision makers to prepare and prevent when faced with uncertain events.

necessary conditions for meeting standard risk aversion.Therefore, the consumer's utility function exhibits absolute uncertainty avoidance diminishing and absolute cautious diminishing. This condition is expressed in this model as:

$$\frac{\partial P_y}{\partial W} < 0 \qquad (3.9)$$

Substituting the conditions of formula (3.9) into (3.8), we get:

$$-\frac{EU_y''}{EU_y'} \geq -\frac{U''(W-P_y)}{U'(W-P_y)} \qquad (3.10)$$

Substituting the condition that the premium payment is positive $P_y > 0$ into the formula (3.10), we get:

$$-\frac{EU_y''}{EU_y'} \geq -\frac{U''(W)}{U'(W)} \qquad (3.11)$$

It can be seen from the formula (3.11) that when considering the introduction of country risk, the change in wealth level is y, and its expected utility function is more prone to risk aversion than when there is no country risk state.

Therefore, when there is a country risk, the insured will choose to increase the premium payment for the insurable risk to withstand the possible impact of the country risk, namely:

$$P_y > P$$

At the same time, country risk may change under different loss conditions, which leads to an increase in the role of insurance in preventing future expected losses. Even if they cannot directly hedge country risks through insurance, consumers can adjust their wealth levels under different loss states to better cope with country risks, or increase premiums for insurable risks.

CONCLUSION

Based on the theoretical model of consumer expected utility, this chapter first derives the theoretical model of the insured's optimal premium expenditure under the condition of no country risk, and on this basis introduces the country risk, and derives the insured under the condition of country risk. The theoretical model of the insurer's optimal premium expenditures. After deriving the model, it is concluded that under the state of country risk, the insured will increase the premium expenditures for the insurable risk part to withstand the impact of changes in national risks.

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