

# **Default Risk Tolerance and Its Determinants: A Comparison between Cancer Insurance and Optional Third Party Liability Coverage**

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## **Abstract**

In this study the policyholder's default risk tolerance is measured by the percentage of insurance premium reduction necessary to compensate the policyholder for buying the relevant insurance, given a specific default probability. Based on the literature, concern about default risk, risk aversion, income, and number of contracts purchased are selected as the determinants of default risk tolerance. Cancer insurance and optional third party liability coverage are chosen as the study targets for comparison. Our results show: (1) the level of potential policyholders' default risk tolerance for optional third party liability coverage is significantly higher than for cancer insurance; (2) the level of potential policyholders' concern about the default risk of optional third party liability coverage is significantly higher than for cancer insurance; (3) the means of risk aversion across two groups are invariant, implying that the scale used to measure risk aversion is generally applicable; and (4) the regression weights of the structural model are significantly variant across the two groups. The purchase decision for optional third party liability coverage is less likely to be influenced by affective variables, while the purchase decision for cancer insurance is more likely to be influenced by affective variables.

**JEL classification numbers:** D81, G02, G22

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## 1 Introduction

In recent years, a foreign life insurance company in Taiwan advertised its special offering of guaranteed acceptance policies. These policies are usually life insurance associated with riders for personal accident and catastrophic disease payment. The policyholder needs no physical checkup and no health declaration. There are 1.2 million individuals aged over 50 in Taiwan. Since they generally do not insure themselves because they cannot meet the health criterion or the insurance premiums are too expensive, policies with acceptance guarantees are very attractive.

However, a provision of these policies stipulates that the beneficiary receives 100% of indemnity only if death occurs two years after the policy has been accepted. Thus, the beneficiary can only receive the paid insurance premium and the policyholder claim will be rejected, if death occurs within two years of policy acceptance. Consumers are often not well informed about this provision. Consumers instead believe that the settlement of the claim is certain, if their insurance policies have been accepted with guarantee. Since they normally ignore the aforementioned provision, the result is often claim disputation.

If consumers take note of the possibility of claim disputation, will they still purchase life insurance policies with acceptance guarantees? The question can thus be formulated more generally: if there is a small probability that settlement of a claim fails, will consumers still purchase an insurance policy? The most likely answer is that some consumers will still purchase insurance policies despite the possibility of claim failure, while others will not. Clearly, different consumers exhibit different tolerances for the risk of claim failure. This question is thus related to consumer purchase decisions when facing risk of claim failure.

Claim failure risk can be viewed as a type of insurance default risk [1]. In addition to claim rejection, another reason for insurance default risk is the insurer's insolvency. According to expected utility theory, investors are compensated for bearing risk and thus receive a risk premium. In the current study, the insurance default risk premium is defined as the percentage of reduction in premium offered by the insurer to compensate consumers for bearing insurance default risk. The required reduction in insurance premium can be used to measure consumers' default risk tolerance. In other words, default risk tolerance can be measured by answering the following question: what is the percentage reduction in insurance premium that motivates consumers to purchase insurance with default risk, if the probability of insurance default risk can be estimated and made known to consumers? For a given probability of insurance default, the higher the discount a consumer requires, the lower the default risk tolerance of the consumer.

There are several other related issues. First, which factors determine consumers' default risk tolerance? Second, how do these determinants affect consumers' default risk tolerance? Third, do the relationships between these factors and consumers' default risk tolerance changes when consumers purchase different types of insurance? Finally, do consumers have different levels of default risk tolerance for different types of insurance?

Since an insurance contract is a financial instrument, consumer purchase decisions may be affected by consumer risk aversion. Risk aversion may thus be a determinant of the potential policyholder's default risk tolerance. According to Zimmer, Schade, and Gruendl [1], concern about default risk is another possible determinant. Other possible determinants of default risk tolerance will be selected based on consumer behavior theory. Cancer insurance and optional third party liability coverage are compared in this study. The scope of indemnity and premium of these two insurances are very different from each

other.

The aims of the current study can be listed as follows. First, a conceptual model of the effects of consumer risk aversion, concern about default risk, and other determinants on consumer default risk tolerance will be developed and empirically tested. Second, whether different insurance contracts lead to differences in the proposed relationships between variables is explored. Third, whether consumers have different levels of risk aversion, concerns about default risk, and default risk tolerances when purchasing different types of insurance is also investigated.

The remainder of this paper is organized as follows. Section 2 provides a literature review of the definition and sources of insurance default risk and suggests some possible determinants of policyholders' purchase decisions subject to uncertainty based on expected utility theory. The purchasing decisions of policyholders follow the general model of consumer buying behavior, which is used to propose other possible determinants of policyholders' purchasing decisions. The difference in scope of indemnity and other differences between cancer insurance and optional third party liability coverage is also described. In section 3, the hypotheses and the corresponding causal relationships within the conceptual model are developed. Questionnaire design and data collection of this study are also described. In section 4, tests for the factorial validity of scores from measuring instruments, tests for the validity of the structural model, tests for the equivalence of latent mean structures, and tests for the equivalence of the structural model are illustrated. Section 5 concludes the study and offers the theoretical implications of our findings and a discussion of limitations and future research.

## **2 Literature Review**

### **2.1 Insurance Default Risk and Related Concerns**

Economic individuals purchase insurance to protect themselves from potential losses. However, the insurance policy itself has a default risk [1]. In a narrow sense, the default risk of the insurance policy is defined as the risk of the policyholder failing to receive full reimbursement in case of loss because of the insurer's inability to meet its financial obligation. However, the insurer's insolvency is not the only reason for a total or partial default in paying claims. Whatever the reason, the result is the same for the policyholder.

Sometimes the policyholder is not aware of the reasons. For example, many victims of Hurricane Katrina were not aware that a standard homeowner policy in the US does not cover losses from rising water due to floods and hurricanes. These homeowner policyholders did not expect that the indemnity payments they received were too low to rebuild or repair their damaged houses)[2]. From the policyholder standpoint, unexpected partial or total nonpayment of claims can be viewed as a default risk.

Another source of default risk is nonpayment due to the insurer's claim settlement practices [1]. The policyholders may be angrier about a default based on the insurer's unwillingness to meet its financial obligation, than about nonpayment due to insolvency. They may believe that claim settlement practices are under the insurer's control, while insolvency is not [3].

The default on an insurance contract is an event involving uncertainty. How economic individuals make their decisions under uncertainty is explained by expected utility theory. According to expected utility theory, there are three utility functions with positive

marginal utility: risk lover, risk neutral, and risk averter. Suppose the economic individual has two alternatives: the actuarial value of the gamble with certainty and the gamble itself. A risk averter will prefer the actuarial value of the gamble with certainty, a risk neutral individual is indifferent to these two alternatives, and a risk lover will prefer the gamble itself. In other words, for a risk averter, the utility of expected wealth is greater than the expected utility of wealth, for a risk neutral individual, the utility of expected wealth is equal to the expected utility of wealth, and for an averter, the utility of expected wealth is smaller than the expected utility of wealth. The risk premium is defined as the difference between an individual's expected wealth, given the gamble, and the certain equivalent wealth that is the level of wealth that individual would accept with certainty if the gamble were removed [4, 5]. Individual risk attitude can be measured by the risk premium the individual would be willing to give up to avoid the gamble, or by the risk premium the individual would be willing to accept for a given amount of risk. For the default risk of insurance contracts, consumer risk attitude is measured via risk premium.

According to expected utility theory, individuals are able to use full information to achieve optimal decision making. However, an abundant literature shows that individual decisions are affected by environments [6], and may be suboptimal. The existence of non-optimal decisions is based on the trade-off between decision cost and outcome benefit. The costs of decision making to the individual are determined by his or her limited processing capability, the choice complexity, time pressure, and other determinants [7, 8, 9], this research stream has demonstrated that the cost and benefit approach helps explain contingent decision-making behavior. Therefore, the current study will not develop a trade-off relationship between default probability and risk premium that is based on the expected utility theory.

Additionally, one basic assumption of expected utility theory that the individual assigns subjective possibilities to possible incomes when making decisions under uncertainty has been questioned. Huber, Wider, and Huber [10] demonstrated that many individuals do not use subjective numeric probability at all when they decide whether to purchase insurance. Furthermore, it has been found that most policyholders base their insurance purchase decision on affective factors that are typically overlooked in normative analysis, rather than on the risk-return analysis implied by the expected utility theory [11]. Li et al. [12] showed that risk aversion and regret aversion affect intention to gamble negatively, and that which determinant plays the greater role is dependent on the type of gambling involved.

Different insurance contracts can be viewed as different types of gambling, for they are different in scope of indemnity, premium, and other provisions. The literature provides two suggestions for the current study. First, Li et al. (2010)[12] imply that the effects of determinants on the purchase decision may be varied when different insurance contracts are involved. Second, when investigating which determinants affect the individual's insurance purchase decision, affective determinants should be taken into account. The current study proposes concern about default risk, which is assumed to be a latent variable including four indicators: general interest in the underlying decision object, awareness of and importance of default risk, and worry about default risk. This is discussed in detail in the next section.

## **2.2 Policyholder's Purchase Behavior and Consumer Behavior**

The policyholders' purchase behavior should follow the general model of consumer buying behavior, which describes how marketing and environmental stimuli enter the buyer's consciousness and how the buyer's characteristics and decision processes lead to the purchase decision [13, 14].

Purchase decision consists of five sub-decisions: brand, dealer, quantity, timing, and payment method [14]. The current study focuses on the purchase decision involving quantity, and more specifically, on whether consumers purchase the investigated insurance contract. This decision has only two outcomes: buy or not buy. According to expected utility theory, the insurance purchase decision of consumers across a range of different premium reduction percentages can be used to measure their default risk tolerance, when a specific default probability is given.

A buyer's decision is also influenced by cultural, social, and personal factors [14]. Personal factors include age and stage in the life cycle, occupation and economic circumstances, personality and self-concept, and life style and values [14]. According to expected utility theory, income, which is a significant dimension of economic circumstances, and risk aversion, a dimension of personality, may have significant effects on the purchase decisions of potential policyholders [13].

Psychological processes including motivation, perception, learning and memory, combine with cultural, social, and personal factors to form purchase decisions. How a motivated person acts and responds to stimuli is influenced by his perception of the situation. Perceptions can vary widely among individuals facing the same physical stimuli and reality. This implies that perceptions will affect consumer's behavior rather than reality [14]. The current study proposes general interest in the underlying decision object, awareness of and importance of default risk, and worry about default risk as perceptions that may have significant impacts on the potential policyholder's purchase decisions [1].

Hsee and Kunreuther [15] found that consumers are more willing to purchase insurance policy for object when they have greater affection for the object, holding the amount of reimbursement constant. In the current study, this phenomenon is referred to as "general interest in the underlying decision object". The default risk of an insurance policy is the uncertainty involved. We thus assume that the importance attached to uncertainty by potential policyholders affects their buying behavior. Awareness of the default risk can also influence the policyholder's purchase decision [1, 16, 17]. Analogically, we assume that the importance attached to uncertainty by the potential policyholders has impact on their buying behavior. The default risk of insurance policy is the uncertainty involved. Therefore the importance attributed to the default risk influences consumers' purchase decision. The awareness of default risk can also influence the policyholder's purchase decision [1, 16, 17]. The insurer's settlement of claim practices and its ability to meet reimbursement obligation may be the most important determinants of insurance default risk. Consumer perception of these risks and their worry about them can affect their insurance purchase decision. Baron, Hershey, and Kunreuther [18] show empirically that individual differences in mean desire for action are significantly affected by worry, which in turn is strongly affected by probability judgments. The above mentioned four variables, i.e. general interest in the underlying decision object, awareness of and importance of default risk, and worry about default risk, are considered to be indicators of a latent variable, which is referred to as concern about default risk.

Learning involves changes in consumer buying behavior arising from experience [14].

For example, homeowners are more willing to buy earthquake insurance after a devastating earthquake occurs. Changes in the potential policyholders' buying behavior could also result from their purchase experience. Frequent travelers, who have purchased flight insurance several times, are less likely to purchase coverage than those who fly occasionally [19].

### **2.3 Cancer Insurance and Optional Third Party Liability Coverage**

Li et al.[12] indicate that the impacts of determinants on the intention to gamble are dependent on the type of gamble. This implies that the effects of determinants on consumer purchase decisions may vary because of the different insurance contracts involved. Cancer insurance and optional third party liability coverage are chosen for comparison in the current study, in order to illustrate whether purchase decisions about different types of insurance lead to changes in the hypothesized relationships in our conceptual model. For policyholders, the scope of indemnity and importance of these two types of insurance are different from each other.

A cancer insurance policy can provide policyholders with cash benefits during covered cancer treatments. A supplementary cancer insurance policy can protect policyholders' income and savings from expenses that are not covered by their major medical coverage. Optional third party liability coverage provides additional coverage of bodily injury or death in excess of the compulsory liability coverage and the property damage at the insured's option [20].

Cancer insurance is a long term contract. Basically, policyholders of cancer insurance are concerned about uncertain events that may happen in the long term. It is assumed that a policyholder may have paid premium for a long time, when the cancer occurs. He or she will thus suffer substantial loss, if the insurer fails. By contrast, optional third party liability coverage is a short term contract. Each year, the policyholder considers whether to contract again. For this reason, the policyholder has paid a premium only for the current year, when insurance default occurs, incurring a relatively small loss in the event of a default. In the current study, the premium for cancer insurance is assumed to be 50000TWD annually. If the insurance default happens 10 years after policyholder has purchased insurance, the total amount paid is 500000 TWD. For potential policyholders of optional third party liability coverage surveyed in the current study, the premium is assumed to be 2000 TWD. If insurance default occurs, the total amount paid is merely 2000 TWD. However, the amount of indemnity for these two types of insurance contract can be similar.

The policyholders buy cancer insurance to protect themselves from risky events across a long time period. Compared to optional third party liability coverage, cancer insurance has a high premium, and many payments. Policyholders buy optional third party liability coverage to protect themselves from risky events across a short time period. Optional third party liability coverage has a low premium, and only one payment. However, the size of the indemnity for these two types insurance may be similar. By setting the indemnity to be equal, cancer insurance and optional third party liability coverage can be used as two different types of insurance to explore whether potential policyholders exhibit different levels of risk aversion, concern about default risk, and default risk tolerance, when they make purchase decisions for different types of insurance, and whether different insurance contracts result in changes in the proposed relationships between these variables.

### 3 Methodology

#### 3.1 Conceptual Framework and Hypotheses

Based on expected utility theory, the default risk tolerance can be measured by the required discount of insurance premium, for a given probability of default. Therefore, the required discount is used as the proxy of the default risk tolerance. However, the relationship between the required discount and default risk tolerance is negative.

The conceptual framework consists of the relationships between default risk tolerance and its determinants as illustrated in Figure 1. Concern about default risk is a psychological determinant of the insurance purchase decision, and is assumed to be a latent variable. It consists of four indicators: general interest in the underlying decision object, awareness and importance of default risk, and worry about default risk. It is therefore hypothesized that concern about default risk affects default risk tolerance.

Purchase behavior may be changed by a potential policyholder's purchase experience [19]. In the current study, purchase experience is represented by the number of the life insurance policies potential policyholders have purchased. Risk aversion significantly affects investor purchase decision of financial instruments that include insurance [13]. The current study proposes that risk aversion affects the required premium discount and thus the default risk tolerance, when potential policyholders decide whether to purchase insurance contracts. Since income may affect risk aversion [21], and subsequently the insurance purchase decision (Hsu, 2011[13]), it is treated as a determinant of the default risk tolerance. Concern about default risk and risk aversion act as mediators, and mediate the impact of purchase experience on default risk tolerance, and the impact of income on default risk tolerance, respectively. The conceptual framework is described by the following three groups of hypotheses.

The first group includes H1 and H2. They describe the impact of purchase experience on concern about default risk and the impact of income on risk aversion respectively. These hypotheses address only direct effects of the antecedent variable on the response variable.

H1: Purchase experience has no effect on potential policyholder's concern about the default risk of the insurer.

H2: Income has no effect on the potential policyholder's risk aversion.

The second group consists of H3 and H4. They hypothesize the impact of concern about default risk on the required premium discount (default risk tolerance) and the impact of risk aversion on required premium discount (default risk tolerance). These address only the direct effects of the antecedent variable on the consequent variable.

H3: Concern about default risk is not significantly related to the potential policyholder's required premium discount (default risk tolerance).

H4: Risk aversion is not significantly related to the potential policyholder's required premium discount (default risk tolerance).

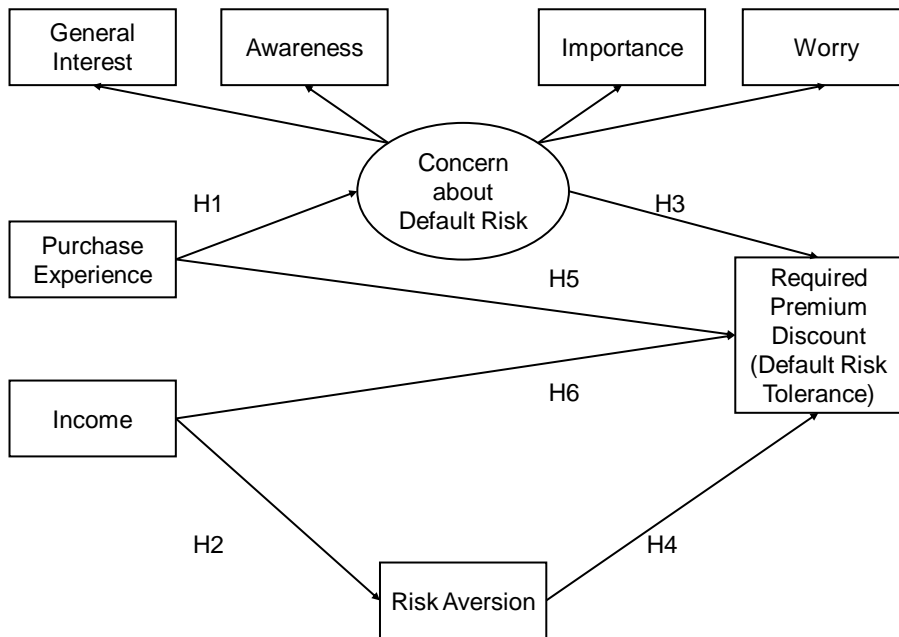


Figure 1: Conceptual framework

The third group comprises H5 and H6. They describe the effects of purchase experience and income on required premium discount (default risk tolerance), respectively. Both the direct and indirect effects of the antecedent variable on the consequent variable are taken into consideration.

H5: Purchase experience does not significantly affect the potential policyholder's required premium discount (default risk tolerance).

H6: Income does not significantly affect the potential policyholder's required premium discount (default risk tolerance).

Cancer insurance and optional third party liability coverage are chosen to test whether the proportion of potential policyholders who are willing to accept a premium discount and to purchase an insurance policy are identical for the two different insurance contracts, given the probability of default risk. We will also test whether potential policyholders of these two insurance contracts will accept the same premium discount, and whether the potential policyholders of these two insurance contracts perceive the same level of concern about default risk, and have the same level of risk aversion.

H7: The proportion of potential policyholders who are willing to accept a premium discount and to purchase an insurance policy for cancer insurance and for optional third party liability coverage are equivalent.

H8: The two groups of potential policyholders are willing to accept the same level of premium discount, and thus have the same level of default risk tolerance.

H9: The mean of concern about default risk is invariant across the two groups of potential



policyholders.

H10: The two groups of potential policyholders have the same level of risk aversion.

Li et al. [12] found that the relationship between the intention to gamble and its antecedents varies for different types of gambling. An insurance contract can be viewed as a gamble and the insurance purchase decision as a decision about whether to gamble. Thus, the relationships between the insurance purchase decision and its antecedents may vary across different types of insurance contracts. To test whether the relationships between default risk tolerance and its determinants vary across different types of insurance contracts, the following hypothesis is proposed:

H11: The causal structures for the two scenarios regarding cancer insurance and optional third party liability coverage are equivalent.

### **3.2 Questionnaire Design**

Two questionnaires are designed based on real contracts of cancer insurance and optional third party liability coverage, respectively. The indemnity of the cancer insurance is assumed to be 1,000,000TWD, and the premium is assumed to 50,000TWD yearly. The indemnity of the optional third party liability coverage is assumed to be 1,000,000 TWD, and the premium is assumed to be 2,000 TWD. The assumptions about indemnity and premium are based on real insurance contracts. To compare the two scenarios on the same basis, the indemnity is the same. The insured of the two insurance contracts are assumed to have the same characteristics.

A composite questionnaire is created for the current study. It is composed of four divisions. Division one captures respondents' default risk tolerance. Division two captures participants' risk aversion. In division three, concern about default risk, which includes four indicators, is measured. Demographic questions are included in division four. To improve readability and understanding, the questionnaire was pre-tested and subsequently revised.

The method used to measured default risk tolerance was borrowed from Zimmer, Schade, and Gruendl [1], and is illustrated in Table 1. A description of the decision situation is presented in Appendix 1. Insurer A served as the reference insurer. For each combination of premiums, respondents were asked to decide from which insurer they would prefer to purchase insurance policy, Insurer A or B (Step 1). If the respondents decided to contract with Insurer A for all listed combinations, they were further asked to specify the maximum premium that can induce them to buy insurance from Insurer B. A final option was also given, which indicates that the respondent would never purchase insurance from Insurer B (Step 2). The default risk tolerance regarding cancer insurance and that of optional third party liability coverage were measured by the two different questionnaires, respectively.

Table 1: Default risk tolerance measurement

Premium of Insurer A default probability 0%	Premium of Insurer B default probability 10%
Step 1	
50,000TWD (2,000TWD)	50,000TWD (2,000TWD)
50,000TWD (2,000TWD)	45,000 TWD (1,800TWD)
50,000TWD (2,000TWD)	40,000 TWD (1,600TWD)
50,000TWD (2,000TWD)	35,000 TWD (1,400TWD)
50,000TWD (2,000TWD)	30,000 TWD (1,200TWD)

## Step 2

Premium of Insurer B should not exceed \_\_\_TWD in order to induce me to buy the policy from Insurer B.

I would never purchase cancer insurance (optional third party liability coverage ) from Insurer B.

Source: Cf. Zimmer, Schade, and Gruendl [1]

Note: The values in the parentheses are referred to the scenario regarding optional third party liability coverage.

The respondent's risk aversion is measured by the following question: "Suppose you invest money in a portfolio and face two possible scenarios with same probability, which of the following portfolios would you prefer?"

	A	B	C	D	E
Prosperity	5%	20%	45%	80%	120%
Recession	-2%	-10%	-25%	-50%	-80%

Responses are on five-point Likert scales anchored at 5 = A and 1 = E. The respondents who choose A have the highest level of risk aversion, while those who choose E have the lowest level of risk aversion.

Four items were borrowed and modified from Zimmer, Schade, and Gruendl [1] to measure the participants' concern about default risk. The item measuring general interest in the underlying decision object states: "I find that the ownership of cancer insurance (optional third party liability coverage) is important for me." The item measuring default risk awareness states: "I have thought about the risk of default with insurance purchase before I participated in this experiment." The item measuring importance of default risk states: "I find that the quality of claim settlement practices/financial situation of the insurer when purchasing cancer insurance (optional third party liability coverage) is important." The item measuring worry about default risk states: "I worry that the insurer will not pay its valid claims." Responses to these were along five-point Likert scales anchored at 1 = "strongly disagree" and 5 = "strongly agree".

The participants' annual income is measured on an ordinal scale, 1 meaning annual income under 2 hundred thousand TWD, 2 = 200000-290000 TWD, 3 = 300000-390000 TWD, and so on up to 14 = more than 3000000 TWD. Number of purchased policies is measured on an ordinal scale: 0 means no policy purchased, 1 means number of purchased policies is 1, 2 means 2 purchased policies, and so to 7, which represents that the number of purchased policies exceeds 7.

The participants are policyholders of life insurance companies in Taiwan, who have not

purchased cancer insurance and optional third party liability coverage. If some participants have purchased cancer insurance or optional third party liability coverage and also have experienced successful settlement of claim, they may have lower level of concerns about default risk or a higher level of default risk tolerance than participants who have no purchase experience of these two insurance contracts.

Two different types of questionnaires were randomly assigned to the participants. A total of 800 survey instruments were distributed, 400 addressing cancer insurance and 400 addressing optional third party liability coverage. The questionnaires were distributed by research assistants themselves. The research assistants also helped the participants complete the questionnaires. For this reason, there are no uncompleted questionnaires or questionnaires with missing data. Roughly half of the participants are female (53.4%). The average age was 39.36, and the range of ages was between 22 and 90. The sample was weighted towards the lower to middle income level with 53.8% of the sample earning less than 490,000 TWD annually. The majority of the sample (56.25%) held graduate or postgraduate degrees. The statistical analysis was performed using SPSS 18 and AMOS 16.

## 4 Results

### 4.1 Measurement Model

The Cronbach's  $\alpha$  of the only latent variable, concern about default risk, is 0.874, higher than the 0.7 recommended by Nunnally and Bernstein [22], demonstrating adequate internal consistency. Its composite reliability (CR) index is 0.88, above the 0.6 threshold suggested by Bagozzi and Yi [23] and Fornell and Larcker [24], indicating a favorable level of construct reliability. The value of average variance extracted (AVE) is 0.6517, above the 0.5 benchmark recommended by Fornell and Larcker [24]. All estimated regression weights of items are significant at the 0.001 level and above 0.7 threshold [23, 24], as reported in Table 2. The measurement scales show strong convergent validity.

Table 2: Construct measure reliability and validity

Construct	Indicator	Standardized	Regression weight	SE	P	Cronbach's A	CR	AVE
Concern about default risk	Awareness	0.664	1.000			0.874	0.88	0.6517
	Importance	0.955	1.913	0.086	<0.001			
	Worry	0.716	1.198	0.065	<0.001			
	General Interest	0.861	1.496	0.070	<0.001			
Model fit indexes	X2(2)=3.371; P=0.185; X2/DF =1.686; CFI =0.999; SRMR =0.0087; RMSEA =0.029							

A set of fit indexes suggested by Kline [25] is used to evaluate model fit. The value of the model chi-square ( $X^2$ ) is 3.371 and is not statistically significant. The value of the normed chi-square ( $X^2/DF$ ) is 1.686, less than the threshold of 5, indicating reasonable fit [26]. The value of the Bentler comparative fit index (CFI) is 0.999, higher than the 0.9 threshold, indicating reasonable fit [27]. The value of RMSEA is 0.029, less than 0.1, indicating favorable model fit [25]. The value of SRMR is 0.0087, less than 0.05, indicating good fit. As reported in Table 2, the values of all selected fit indices indicate

favorable model fit for concern about default risk.

#### 4.2 Invariance of Means

When facing a 10% default probability, only 40% of the participants are willing to accept a premium discount and purchase cancer insurance. By contrast, 67% of the participants are willing to accept a premium discount and purchase optional third party liability coverage. The results of one way ANOVA show that the t value is -8.099, and the p value is 0.000, rejecting H7. For cancer insurance, fewer potential policyholders are willing to accept a premium discount and purchase insurance policy. For cancer insurance, the average required premium discount to induce the participants to buy insurance policy is 85.28%, while for optional third party liability coverage it is 74.95%. The results of one way ANOVA show that the t value is 6.043, and the p value is 0.000, rejecting H8. The average required premium discount for cancer insurance is higher than for optional third party liability coverage. These two results imply that the potential policyholder's tolerance of the default risk of cancer insurance is lower than that of optional third party liability coverage.

We then proceed to test the differences in the latent mean of concern about default risk across the two groups of potential policyholders. Participants in the cancer insurance survey are chosen as the reference group in this step. The latent mean difference between the two groups is 1.952 with a p value of less than 0.001, rejecting H9. This indicates that the latent mean of concern about default risk of the cancer insurance group is lower than that of the optional third party liability coverage group.

The invariance of means related to risk aversion across the two groups of potential policyholders then tested by one way ANOVA. The t value is 0.524, and the p value is 0.600, supporting H10. There is no significant difference in risk aversion perceived by the potential policyholders of the cancer insurance and those of optional third party liability coverage. These results show the general applicability of the scale used to measure risk aversion. This result is also consistent with the implication of expected utility theory, where different types of financial instruments with same level of return, risk and cash flows are deemed identical.

In sum, the level of default risk tolerance and the level of concern about default risk are different across the two groups of potential policyholders, while the level of risk aversion is invariant across them.

#### 4.3 Structural Model and Results of Multiple Group Analysis

Whether the regression weights within the conceptual framework are invariant across cancer insurance and optional third party liability coverage was tested by a multiple group analysis. The first step is creating a baseline model based on the conceptual framework. Its values for the selected fit indexes are as follows:  $\chi^2(17) = 33.334$ ,  $\chi^2/DF = 1.961$ ,  $p = 0.010$ ,  $GFI = 0.990$ ,  $SRMR = 0.0285$  and  $RMSEA = 0.035$ . The values of all selected fit indices indicate favorable model fit. The model being tested is commonly termed the configural model. It incorporates the baseline models for cancer insurance and optional third party liability coverage within the same file and can be considered a multiple group representation of the baseline models [28]. The next step is to impose the equality constraints in the configural model, i.e. the constrained model. The fit of the configural model without equality constraints (unconstrained model) provides the baseline values

against which the constrained model is compared. Evidence of noninvariance is found when the  $X^2$  difference value, which represents the difference between the  $X^2$  values for the unconstrained model and the constrained model, is significant [28]. The  $X^2$  difference is 22.592, with a p value of 0.000, indicating statistical significance and rejecting H11. Therefore, the regression weights within the conceptual framework are significantly different across the two groups. The results of the structural models of the two scenarios are reported in Table 3 and 4, and depicted in Figure 2 and 3 respectively.

The results of the structural model analysis for cancer insurance group are illustrated in Table 3 and Figure 2. The influence of purchase experience on concern about default risk is not significant and the p value is 0.271, supporting H1. The value of the standardized direct effect of income on risk aversion is -0.173 and the p value is 0.004, significantly negative and rejecting H2. The potential cancer insurance policyholder's income has a significant negative influence on his or her risk aversion. The value of standardized effect of concern about default risk on required premium discount (default risk tolerance) is 0.394 and the p value is 0.002, significantly positive and rejecting H3. This result implies that the higher the level of concern about default risk, the higher the premium discount required by the potential cancer insurance policyholders and the lower their level of default risk tolerance. The effect of risk aversion on required premium discount (default risk tolerance), and thus on default risk tolerance, is not significant, supporting H4. The effects of purchase experience and income on required premium discount (default risk tolerance) are decomposed into direct effects and indirect effects. The relationship between purchase experience and required premium discount (default risk tolerance) is mediated by concern about default risk, while the relationship between income and required premium discount (default risk tolerance) is mediated by risk aversion. The method of bootstrapping was used to estimate the two-tailed significance for total effects, total indirect effects, and direct effects [29]. The number of bootstrap samples was set at 1000.

The direct effect of purchase experience on required premium discount (default risk tolerance) is significant. Its standardized value is -0.223, while the indirect effect via concern about default risk is not significant. The mediating effect of concern about default risk on the relationship between purchase experience and required premium effect (default risk tolerance) is thus not significant. Purchase experience has a direct effect only on the potential policyholder's required premium discount (default risk tolerance). This result rejects H5 and implies that the more often the potential cancer insurance policyholders have purchased insurance policies, the lower the premium discount they require, indicating a higher level of default risk tolerance. Both the direct and indirect effects of income on required premium discount (default risk tolerance), and in turn on default risk tolerance are not significant, supporting H6.

Table 3: Effect decomposition for the cancer insurance group

	Unstandardize d	Standardized	Unstandardize d	Standardize d	Unstandardize d	Standardized
	Direct effects		Indirect effects		Total effects	
Purchase experience->Concern about default risk	-0.009(0.251) -0.029~0.008	-0.064(0.271) -0.188~0.054				
Income->Risk aversion	-0.083(0.004) -0.125~-0.034	-0.173(0.004) -0.271~-0.068				
Concern about default risk ->Required premium discount	0.354(0.001) 0.234~0.618	0.394(0.002) 0.251~0.527				
Risk aversion -> Required premium discount	0.005(0.373) -0.007~0.020	0.033(0.390) -0.049~0.123				
Purchase experience -> Required premium discount	-0.027(0.002) -0.043~0.013	-0.223(0.001) -0.339~-0.116	-0.003(0.257) -0.010~0.002	-0.025(0.263) -0.085~0.020	-0.031(0.002) -0.046~-0.017	-0.249(0.002) -0.364~-0.138
Income -> Required premium discount	0.006(0.169) -0.002~0.014	0.085(0.182) -0.027~0.183	0.000(0.322) -0.002~0.001	0.008(0.330) -0.025~0.008	0.006(0.182) -0.002~0.013	0.080(0.187) -0.031~0.172

Note: P values are presented in parentheses. 95% confidence intervals are presented below coefficients.

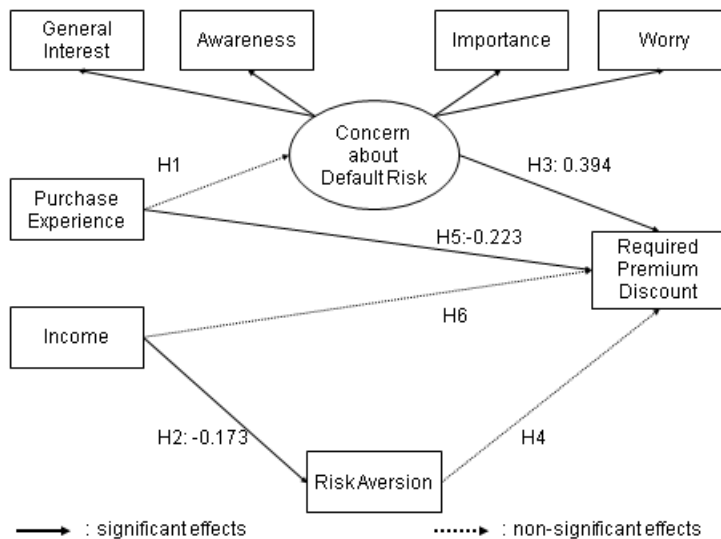


Figure 2: Results of the cancer insurance group

Table 4: Effect decomposition for the optional third party liability coverage group

	Unstandardized	Standardized	Unstandardized	Standardized	Unstandardized	Standardized
	Direct effects		Indirect effects		Total effects	
Purchase experience->Concern about default risk	-0.034(0.122) -0.091~0.008	-0.116(0.138) -0.272~0.033				
Income->Risk aversion	0.020(0.186) -0.013~0.054	0.058(0.191) -0.041~0.151				
Concern about default risk ->Required premium discount	0.019(0.493) -0.035~0.088	0.043(0.490) -0.085~0.172				
Risk aversion -> Required premium discount	0.021(0.035) 0.002~0.043	0.101(0.034) 0.010~0.201				
Purchase experience -> Required premium discount	-0.011(0.158) -0.026~0.005	-0.086(0.143) -0.204~0.033	-0.001(0.301) -0.005~0.001	-0.005(0.304) -0.038~0.006	-0.012(0.104) -0.026~0.003	-0.091(0.107) -0.202~0.025
Income -> Required premium discount	0.011(0.018) 0.002~0.019	0.145(0.019) 0.023~0.254	0.000(0.131) 0.000~0.002	0.006(0.126) -0.002~0.027	0.011(0.010) 0.002~0.020	0.151(0.010) 0.028~0.257

Note: P values are presented in parentheses. The 95% confidence intervals are presented below coefficients.

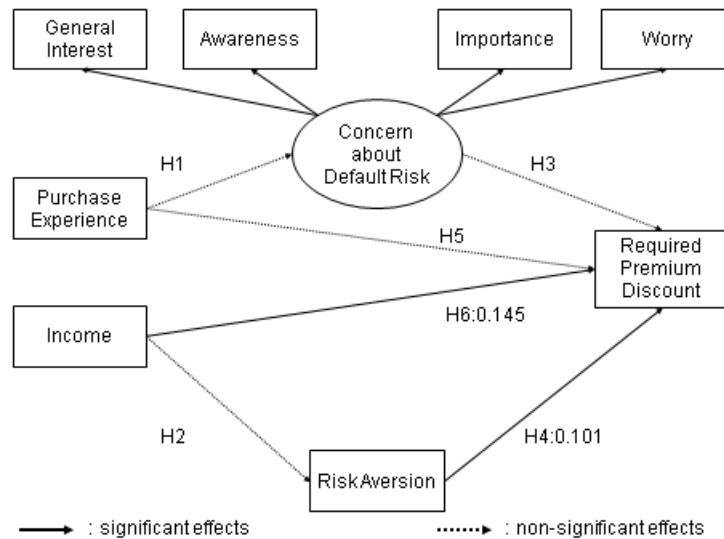


Figure 3: Results of the optional third party liability coverage group

The results of structural model analysis for optional third party liability coverage group are illustrated in Table 4 and Figure 3. The influence of purchase experience on concern about default risk is not significant and the p value is 0.138, supporting H1. The influence of income on risk aversion is not significant and the p value is 0.191, supporting H2. The impact of concern about default risk on required premium discount (default risk tolerance) is not significant and the p value is 0.490, supporting H3. The value of standardized effect of risk aversion on required premium discount (default risk tolerance) is 0.101 and the p value is 0.034, significant and rejecting H4. This result implies that the higher the level of risk aversion, the higher premium discount required by the potential policyholders and the lower their level of default risk tolerance. This result is not consistent with that of the cancer insurance group. For the cancer insurance group, the impacts of purchase experience and income on default risk tolerance (default risk tolerance) are decomposed into direct effects and indirect effects for the optional third party liability coverage group.

Both the direct and indirect effects of purchase experience on required premium discount (default risk tolerance) are not significant, supporting H5. The direct effect of income on required premium discount (default risk tolerance) is significant, whose standardized value is 0.145, while the indirect effect via risk aversion is not significant. Income has a direct effect only on the potential policyholder's required premium discount (default risk tolerance). This result rejects H6 and implies that the higher the income of potential policyholders, the higher the premium discount they require, and the lower their level of default risk tolerance.

## 5 Discussion and Conclusion

Zimmer, Schade, and Gruendl [1] have found that a substantial portion of consumers completely refuse to accept any insurance default risk while others ask for considerable premium discount. Their findings are largely consistent with ours, and are more similar to the results of cancer insurance group. Under a given default risk probability, 40% of the participants of the cancer insurance and 67% of the participants of optional third party liability coverage group are willing to accept default risk. For both groups, the average required premium discounts are all substantial. Zimmer, Schade, and Gruendl [1] argued that their results were robust against several variations of the setup. However, these variations of the setup do not include different types of insurance contract. The current study fills this gap. By comparing the results from different types of insurance contracts, several new findings are revealed. Given a specific probability of default risk, the percentage of potential policyholders of cancer insurance who are willing to accept premium is less than that of optional third party liability coverage, and the average premium discount required for the default risk of cancer insurance is higher than for optional third party liability coverage. These results show that the potential policyholder's tolerance for the default risk of cancer insurance is lower than for optional third party liability coverage. These results could be explained by the following facts. The individual places more importance on the loss resulting from cancer than from compensating the victim because of a traffic accident. The former is directly related to the individuals themselves, while the latter is only indirectly related to them. In addition, cancer insurance is a long-term contract, while optional third party liability coverage is a short-term contract. If insurance default occurs, cancer insurance policyholders will face an enormous loss, for they may have paid cancer insurance premiums for many years. For optional third party liability coverage group the situation is very different. If insurance default occurs, policyholders have paid an insurance premium only for the current year. As mentioned, in this study, the cancer insurance premium is assumed to be 50,000TWD annually, while the premium for optional third party liability coverage is assumed to be 2,000 TWD annually.

In addition, the latent mean of concern about default risk perceived by the potential policyholders of cancer insurance is lower than that of optional third party liability coverage. The decision about whether the insured suffers from cancer is made by a doctor, and therefore seldom controversial. Policyholders' expectations about whether the settlement of a claim will be successful is often consistent with what actually occurs. By contrast, the insurance company's decision on optional third party liability coverage may be controversial. For this reason, policyholders often perceive discrepancies between the expected claim settlement process and the actual process. These discrepancies may lead to



a higher level of concern about default risk for optional third party liability coverage group.

The means of risk aversion across the two groups are invariant. This result implies that the scale used to measure risk aversion is generally applicable. The regression weights of the structural model are significantly variant across two groups. Being consistent with that of Li et al. [12], this result implies that the relationships between insurance purchase decision and its determinants may be varied because of different insurance contracts involved.

For both groups, the policyholders' purchase experience has no significant effect on the level of their concern about default risk, supporting H1. This result is valid across the two groups.

For the cancer insurance group, income has a negative but minor impact on risk aversion, rejecting H2. Income may not be an important determinant for risk aversion. For optional third party liability coverage group, income has no significant impact on risk aversion. This result further confirms the minor role of income as a determinant for risk aversion.

For the cancer insurance group, concern about default risk has a positive (negative) impact on required premium discount (default risk tolerance), while for the optional third party liability coverage group concern about default risk has no significant impact on required premium discount (default risk tolerance). When making the decision to purchase cancer insurance, potential policyholders are more likely to be influenced by affective variables such as concern about default risk, since the consequences of purchase decision are more directly related to themselves. By contrast, the consequences of purchase decision about optional third party liability coverage are indirectly related to the potential policyholders. For this reason, their purchase decision about optional third party liability coverage is less likely to be influenced by affective variables, and more like the purchase decision about a stock or bond.

For the potential policyholders of cancer insurance, risk aversion has no significant impact on required premium discount, and thus on default risk tolerance. By contrast, for the potential policyholders of optional third party liability coverage, risk aversion has a positive impact on required premium discount and thus a negative impact on default risk tolerance. As mentioned above, the decision to purchase optional third party liability coverage is not influenced by affective variables. The required premium discount is considered to be a part of the total risk premium and thus influenced by risk aversion.

For cancer insurance group, purchase experience has a negative (positive) direct effect on required premium discount (default risk tolerance). In the current study, the surrogate of purchase experience is the number of the life insurance policies the participant has purchased. Since cancer insurance is a type of life insurance contract, other types of life insurance that the policyholder has purchased can offset the loss resulting from the default of cancer insurance.

The greater the number of life insurance contracts potential policyholders have purchased, and the more often they have purchased life insurance contracts, the higher their level of default risk tolerance. By contrast, for the optional third party liability coverage group, both direct effect and indirect effects of purchase experience on required premium discount (default risk tolerance) are not significant. This coverage is a non-life insurance, and "covers the insured's legal liability against the third party in respect to bodily injury/death or property damage arising out of an accident involving the insured's vehicle when it is used by the insured or any permitted driver [20]." If insurance default occurs, a life insurance contract may not be able to cover the loss. Therefore, for the potential

policyholders of optional third party liability coverage, the number of life insurance policies they have purchased has no significant impact on the required premium discount (default risk tolerance).

For the cancer insurance group, income has no significant effect on required premium discount (default risk tolerance); while for optional third party liability coverage group, income has a significant positive (negative) direct effect on required premium discount (default risk tolerance). As mentioned, cancer insurance is a long-term contract, while optional third party liability coverage is a short-term contract. For the long-term insurance contract, the determinant of its purchase decision may be wealth or future income rather than current income. However, current income influences the purchase decision for the short-term insurance contract.

For the cancer insurance group, the significant determinants of potential policyholders' default risk tolerance (required premium discount) are concern about default risk and purchase experience (number of the life insurance policies bought). The effect of the former is greater than that of the latter. For optional third party liability coverage group, the significant determinants of potential policyholders' default risk tolerance (required premium discount) are risk aversion and income. The effect of the former is lower than that of the latter. As implied by Li et al. [12], which determinant of insurance purchase decision plays a greater role is dependent on the type of insurance contract involved. The current study illustrates how the proposed determinants affect the potential policyholder's purchase decision differently for the two types of insurance contract examined.

There are two major contributions of the current study. First, we propose an approach employing the individuals' insurance purchase decision to measure their default risk tolerance. The required premium discount and thus, the default risk tolerance can be derived from the participant's purchase decision across different scenarios. Second, the conceptual model for the current study is based on the general model of consumer buying behavior, since the potential policyholder's purchase decision should follow it. Based on the general model of consumer buying behavior, we propose several determinants of insurance purchase decision. The roles of affective variables and risk aversion in insurance decisions are investigated. Our analysis is thus related to three major strands of research, customer analysis, affect in insurance decisions, and expected utility theory.

For simplicity, the default risk resulting from the discrepancy between the expected reimbursement and the actual reimbursement is not taken into account in the current study. In addition, the participants in the current study had no purchase experience about cancer insurance and optional third party liability coverage, in order to prevent experience with claim settlement from affecting their default risk tolerance. How the policyholders' experience of claim settlement affects their default risk tolerance may be explored in future studies.

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## **Appendix**

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### **Description of Decision Situation**

Imagine that you decide on purchasing cancer insurance (optional third party liability coverage) to protect you from cash outflows that would cover losses up to 1,000,000TWD. You have gathered information on cancer insurance (optional third party liability coverage) and received quotes from two insurers, which are identical in the scope of indemnity. Insurer A offers its cancer insurance (optional third party liability coverage) for a premium of 50,000TWD (2,000TWD) per year, whereas Insurer B has not yet specified the amount of its premium.

Source: Cf. Zimmer, Schade, and Gruendl [1]

Note: The values in the parentheses refer to the optional third party liability coverage scenario.