Determining the Optimal Premium for ADR Implementation Insurance in Construction Dispute Resolution

Xinyi Song[1]; Feniosky Peña-Mora[2]; Carol C. Menassa[3]; and Carlos A. Arboleda[4]

Abstract: In most of today's construction projects, disputes are almost inevitable, and the implementation costs associated with dispute resolution are becoming increasingly expensive. One approach to deal with the risk of dispute-related cost overruns is by pooling the risk using alternative dispute resolution (ADR) implementation insurance. This innovative insurance product is designed to allow the insurance company to compensate any ADR implementation cost that project participants incur during the construction phase. In return, the insurance company will receive a premium for bearing the risk of excessive ADR implementation costs. Similar to commercial medical and auto insurance, the ADR insurance policy specifies a deductible limit (DL) and a maximum payment limit (MPL) on project participants to prevent both moral and morale hazards. In this case, project participants must bear part of the future ADR implementation costs before their insurance is activated. Based on the basic framework of ADR implementation insurance previously developed by the writers, this paper proposes an advanced model with the two additional insurance limits to help determine the optimal point on the project participants' subjective loss curve. The objective is to provide a mutually advantageous insurance policy and minimize project participants' total expected subjective loss. An example is provided to illustrate the benefits of the proposed methodology. The results show that project participants' subjective loss function (SLF), DL, MPL, and the expense loading factor α together play important roles in determining the optimal premium for the ADR implementation insurance. **DOI: 10.1061/(ASCE)ME.1943-5479.0000188.**

Author keywords: Construction disputes; ADR; Insurance; Subjective loss; Optimal premium.

Introduction

Completing a construction project without incurring any disputes is an elusive goal for most project participants since conflict has become an inherent characteristic of this industry (Peña-Mora et al. 2003). In response to financially expensive and emotionally draining litigation, many systems and procedures have been developed to address disputes within the construction industry (Gebken and Gibson 2006). A good example is the adoption of ADR techniques, such as negotiation, dispute review board (DRB), mediation, and arbitration (Barrett 2004). Generally, ADR refers to a contractual means to resolve disputes without going into the classic courtroom setting (Kovach 2004). It encompasses all legally permitted processes of dispute resolution other than litigation (Ware 2001). While a considerable amount of research has been conducted on various alternative dispute resolution (ADR) techniques (Zack 1997; Rubin et al. 1999; Harmon 2003; Peña-Mora et al. 2003; Chan et al. 2006; Cheung et al. 2006; El-adaway and Kandil 2010), few studies have focused on how to reduce the negative impact of high ADR implementation costs associated with dispute resolution (Diekmann and Nelson 1985; Adrian 1988; Gebken and Gibson 2006). In this study, implementation costs were not considered as the settlement amount of a dispute; rather, they refer specifically to the cost of implementing ADR techniques during the dispute resolution process, including fees and expenses paid to the owner's/contractor's employees, lawyers, claims consultants, third-party neutrals, and other experts associated with the resolution process (Gebken and Gibson 2006; Menassa et al. 2009). According to Gebken and Gibson (2006), direct costs incurred during the dispute resolution process alone can equate to almost 2% of the entire contract amount before any consideration of indirect or hidden costs, such as injured business relationships or loss of productivity. From the perspective of risk management, one approach to mitigate this negative impact on the project budget, which is likely already financially stressed, is to price ADR implementation costs as an insurance product. Insurance, as a risk financing tool, transfers the risk of unexpected high ADR implementation costs from project participants to the insurance company. In return, the insurance company receives a premium that covers the company's underwriting expenses and targeted profit.

The previous research by the writers proposed a basic framework for the ADR implementation insurance model, but two additional policies should be applied to prevent moral and morale hazards (Pritchett et al. 1996). In insurance analysis, the term "moral hazards" refers to a condition that "increases the likelihood that a person will intentionally cause or exaggerate a loss" (Myhr and Markham 2003). It often involves bad faith on the part of the insured. For example, faking the theft of a laptop in an effort to obtain a new one is a moral hazard. Morale hazards are "attitudes of carelessness and lack of concern that increase the chance of a loss occurring or increase the size of losses that do occur" (Pritchett et al. 1996). Reckless driving is a typical example of a morale

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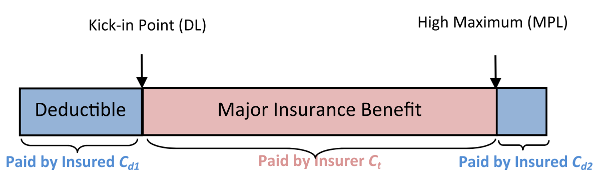
hazard in auto insurance. Both moral and morale hazards describe different behaviors of the insured when protected from risk and when fully exposed to risk. The difference is that the former is considered malicious, while the latter is mainly due to indifference. Similarly, project participants who deliberately prolong a dispute resolution process are suspected of creating a moral hazard. On the other hand, a poor communication system that prevents efficient dispute resolution is an example of a morale hazard. To address the potential risk of these two types of hazards, the ADR implementation insurance policy will include a deductible limit (DL) and a maximum payment limit (MPL) on project participants. Fig. 1 shows the insurance structure. Project participants will bear the first part of any ADR implementation costs that are incurred up to the DL as well as any costs that exceed the MPL. Together, these two limits play an important role in determining the insurance premium.

This paper introduces an insurance model that incorporates uncertainties in potential ADR implementation costs and calculates the optimal premium for the insured based on the expected total loss and expected total subjective loss. Note that because of DL and MPL, project participants must be responsible for part of the future ADR implementation costs instead of completely relying on the insurance company to take the risk. As a result, their expected total loss and expected total subjective loss will increase and further affect the terms of the insurance policy. The intent of this study is to provide a mutually advantageous insurance policy for both the insured and the insurer, thus providing project participants with a certain degree of confidence against possible dispute-related cost overruns.

Problem Statement

Before proceeding to the insurance model, the condition of a maximum acceptable premium is stated to help project participants understand and accept the merit of ADR implementation insurance in the light of financial loss implications. Assume that C is the total ADR implementation costs for a certain construction project.



$C_d = C_{d1} + C_{d2}$: Retained loss of project participants
Ct: Loss transferred to the insurance company

Fig. 1. Structure of ADR implementation insurance

Insurance will cover the loss in the range between DL and MPL, as shown in Fig. 1 (Hoshiya et al. 2004). Thus, the total loss incurred can be expressed as

$$C = C_d + C_t \tag{1}$$

where Cd = retained loss of project participants; and Ct = part that is transferred to the insurance company. From the perspective of project participants, the maximum acceptable gross premium (GP) is determined as shown (Hoshiya et al. 2004; Song et al. 2012)

$$E[u(C)] = E[u(C_d)] + E(C_t) + \alpha \tag{2}$$

$$\text{GP} = E(C_t) + \alpha \tag{3}$$

where $E[u(C)]$ = total expected subjective loss; $E[u(C_d)]$ = expected subjective loss for project participants under insurance coverage; $E(C_t)$ = expected loss for the insurance company; α = expense loading factor; and GP = gross premium as charged by the insurance company.

The left-hand side of Eq. (2) represents the situation in which the project does not carry ADR implementation insurance. As a result, project participants must bear all potential future loss C. The right-hand side of Eq. (2) is the case with insurance, in which project participants can choose to pay a certain amount of premium GP plus an uncertain amount of retained loss below the DL and above the MPL, as shown in Fig. 1, where α is the expense loading factor included in GP to cover the insurance company's underwriting expenses and targeted profit. In both cases, project participants view the undesirable financial outlay of possible uncertain loss subjectively with a subjective loss function (SLF) u, which quantifies project participants' risk-averse attitude toward a future risk in monetary terms (Song et al. 2012).

According to Bowers et al. (1997) and Song et al. (2012), project participants with SLF $u(c)$ are risk averse if, and only if, $u''(c) > 0$. This means that the SLF for risk-averse project participants is a strictly convex upward function. The relationship between GP and $E[u(C)]$ is illustrated schematically in Fig. 2. The left graph shows the situation in which insurance is attractive for project participants, while the right graph shows the opposite for much less risk-averse project participants.

ADR Implementation Insurance Model

The flowchart developed by Song et al. (2012) serves as the first step in the model to determine whether an insurance policy formulated by the insurance company is beneficial for a specific project. The model proposed in this paper (Fig. 3) is an advanced version

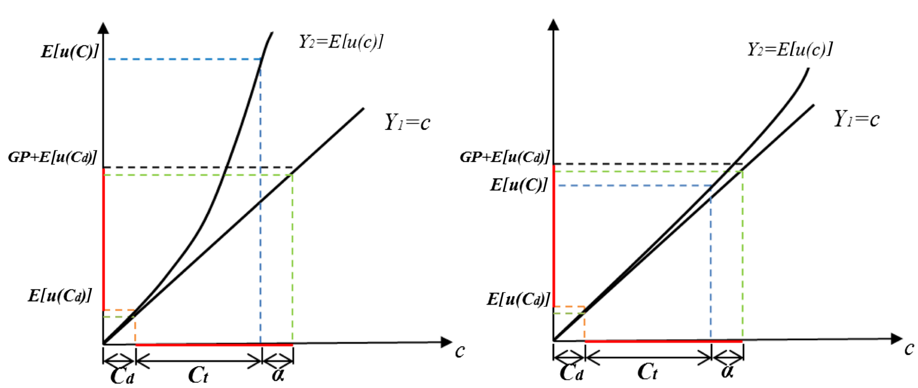


Fig. 2. Schematic illustration of the relationship between GP and $E[u(C)]$

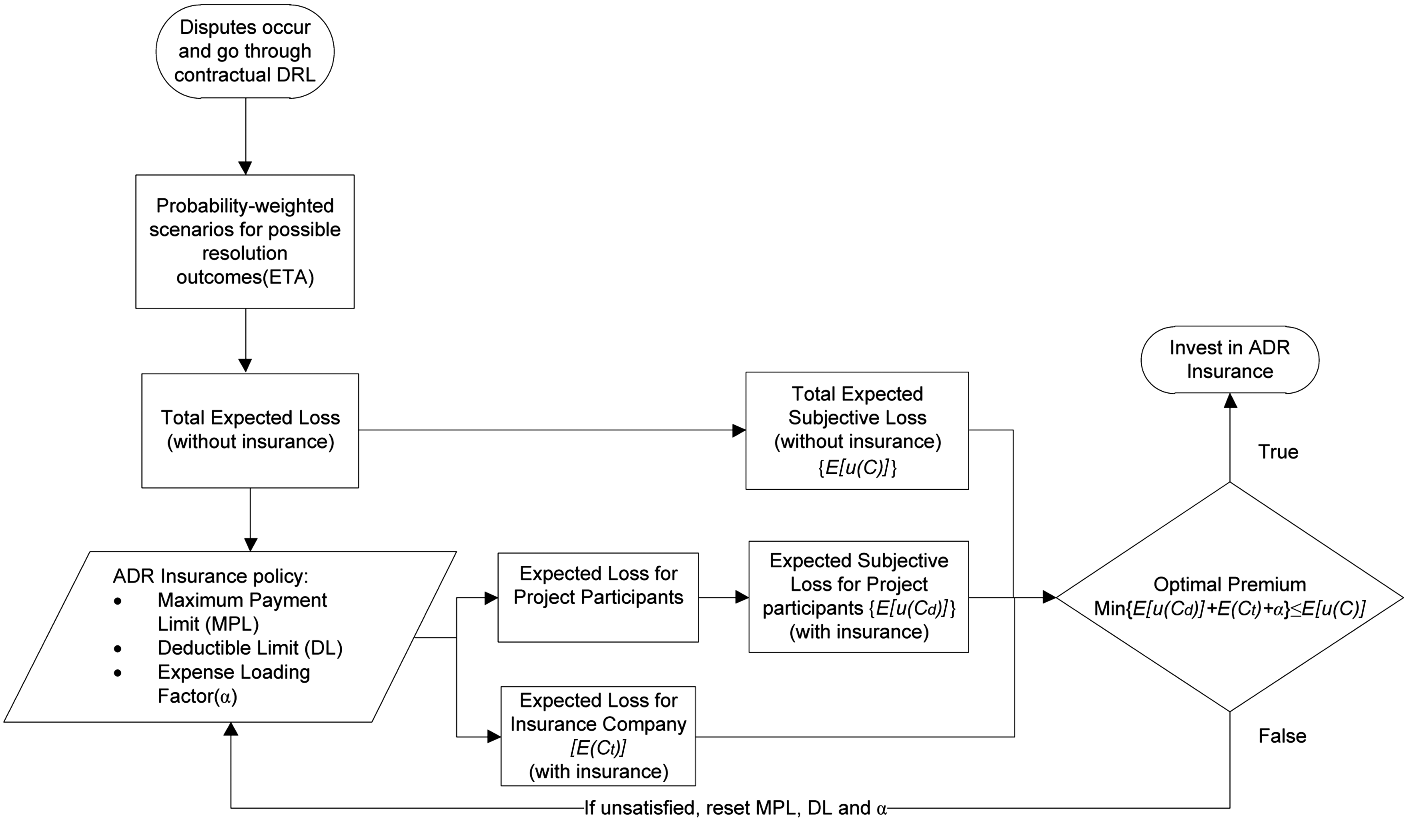


Fig. 3. ADR insurance model for determining the optimal premium

with deductible limit (DL) and maximum payment limit (MPL) added to the policy. First, it assumes that disputes occur and go through the contractual dispute resolution ladder (DRL), which is a predetermined procedure for dispute resolution that involves multiple ADR techniques (USACE 1989; Caltrans 2000; Peña-Mora et al. 2003). Disputes escalate from the lower stage to the higher stage if no satisfactory settlement is achieved within the maximum allowable time on each stage. Then, event tree analysis (ETA) is applied to determine the total expected loss $E(C)$ for a certain project and to determine the total expected subjective loss $E[u(C)]$ for project participants, taking their subjective loss function into consideration. If the simulation results indicate that a mutually acceptable insurance policy exists between project participants and the insurance company, then the expected subjective loss $E[u(C_d)]$ for project participants under insurance coverage and the expected loss $E(C_t)$ for the insurance company are calculated. Based on this, the model gives the optimal premium among different combinations of MPL, DL, and α.

Fig. 4 shows the structure of the event tree analysis (ETA). It first sets up the event of dispute occurrence as a specified condition. Then, the dispute goes through the contractual dispute resolution ladder (DRL), which has m stages of ADR_1, $\text{ADR}_2, \ldots,$ and ADR_m until final settlement. For the jth stage, assume that the effectiveness of ADR_j is kj, which is based on historical data and is used to determine the conditional probability of a certain dispute being resolved with ADR_i. Furthermore, assume that the cost ci for successfully resolving a dispute with ADR_i has a normal distribution with mean μi and standard deviation σi, and is left truncated

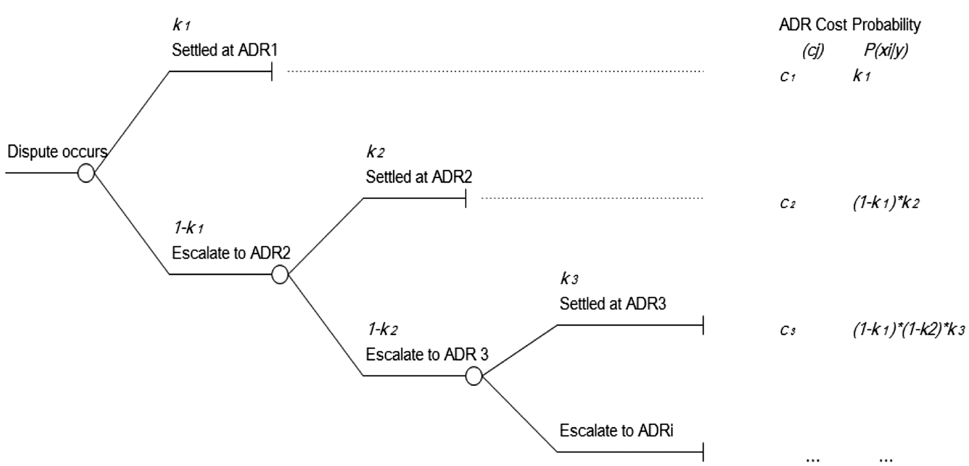


Fig. 4. Event tree analysis (ETA)

at 0 (Touran 2003). The value of the parameters is based on the research results of Zuckerman (2011), which will be described later. Project participants could use a distribution regressed from their own historical data of dispute resolution costs to achieve greater accuracy. Finally, ETA generates probability-weighted scenarios for possible resolution outcomes of all disputes that occurred during the project. Note that each dispute resolution process is assumed to be independent.

The next step in the model is to determine the total expected loss $E(C)$ and the total expected subjective loss $E[u(C)]$ for project participants with a set of insurance policies. According to Song et al. (2012), the total expected ADR cost can be calculated as

$$\begin{aligned} E(C) &= \sum_{n=N_1}^{N_k} q_n \sum_{r=1}^{R} \binom{n}{x_1,\ldots,x_j,\ldots,x_m} C_r P_r \\ &= \sum_{n=N_1}^{N_k} q_n \sum_{r=1}^{R} \binom{n}{x_1,\ldots,x_j,\ldots,x_m} \sum_{j=1}^{m} c_j x_j \prod_{j=1}^{m} p_j^{x_j} \\ &= \sum_{n=N_1}^{N_k} q_n \sum_{j=1}^{m} c_j \left[\sum_{r=1}^{R} \binom{n}{x_1,\ldots,x_j,\ldots,x_m} \prod_{j=1}^{m} p_j^{x_j}\right] x_j \\ &= \sum_{n=N_1}^{N_k} q_n \sum_{j=1}^{m} c_j (n p_j) = \sum_{n=N_1}^{N_k} n q_n \sum_{j=1}^{m} c_j p_j \end{aligned} \tag{4}$$

where n = total number of disputes; and $n = N_1, N_2, \ldots, N_k$ with probabilities $q_1, q_2, \ldots, q_k$ respectively, where N_1 is the minimum possible number of disputes ($N_1 \geq 0$), and N_k is the maximum number of possible disputes. According to Touran (2003), dispute occurrence in a construction project can be modeled as a Poisson process. Thus, if (λ) represents the average number of disputes occurring per month in a given construction project whose duration from notice to proceed to project completion consists of (t) month, then the probability that (n) disputes will occur during the project construction phase is given by

$$P(n) = \frac{(\lambda t)^n}{n!} e^{-\lambda t}$$

This parameter can be obtained from historical projects having similar characteristics to the project being analyzed by looking at the trend in the average number of disputes occurring.

c_j = the average amount of ADR implementation costs for each dispute resolution process, where $j = 1, 2, \ldots, m$ represents the jth stage on the contractual DRL. Then, for each dispute, its resolution process bears m possible outcomes: resolved at ADR_1 and cost c_1, resolved at ADR_2 and cost c_2, $\ldots$, resolved at ADR_m and cost c_m, with probability p_1, p_2, and p_m, respectively, in which $\sum_{j=1}^{m} p_j = 1$. p_j could be obtained following Fig. 4.

xj = the number of disputes resolved with ADR_j for each outcome. For the ith dispute ($i = 1, 2, \ldots, n$), $x_{ij} = 1$ denotes that the ith dispute is resolved in the jth stage; otherwise, $x_{ij} = 0$. Thus, $x_j = \sum_{i=1}^{n} x_{ij}$ represents the total number of disputes that are resolved in the jth stage and follows a multinomial distribution M (n; $p_1, p_2, \ldots, p_m$), with the expected value $E(x_j) = np_j$, in which $j = 1, 2, \ldots, m$. Specifically, when $m = 2$, then x_j follows binomial distribution $B(n, p_1, p_2)$. $E(x_j)$ = expected number of disputes that are resolved in the jth stage.

R = the total number of different possible outcomes among all n disputes. For each outcome, there could be x_j disputes resolved with ADR_j. Consequently, the total ADR-implementation cost throughout the time horizon for the rth outcome is $C_r = \sum_{j=1}^{m} c_j x_j$, with a probability of $P_r = \prod_{j=1}^{m} p_j^{xj}$, given a total of n disputes. The number of outcome that bears the same total cost and probability is $\binom{n}{x_1 \ldots x_j \ldots x_m}$.

Following Eq. (4), the total expected subjective loss could be expressed as (Song et al. 2012)

$$E[u(C)] = \sum_{n=N_1}^{N_k} p_n \mathrm{SL}_n \tag{5}$$

where SL_n = total subjective loss when the total number of disputes is n and is determined by Eq. (5) (Song et al. 2012)

$$\mathrm{SL}_n = \sum_{r=1}^{R} \left\{ \binom{n}{x_1 \;\cdots\; x_j \;\cdots\; x_m} \prod_{j=1}^{m} p_j^{x_j} \left[\sum_{j=1}^{m} x_j u(c_j)\right] \right\} \tag{6}$$

Illustrative Example

The standard dispute resolution process for government construction contracts in Hong Kong usually includes a three-step DRL (Peña-Mora et al. 2003). In this DRL, the design professional who serves as a third party to the owner and the contractor is responsible for the first determination concerning any disputes that arise. Then project participants have 28 days to refer the matter to mediation if no satisfactory settlement can be achieved. On the non-mandatory mediation level, 42 days are allowed to resolve disputes before they escalate to arbitration. Finally, the arbitrator has 28 days to issue a final binding determination for settlement, subject to the

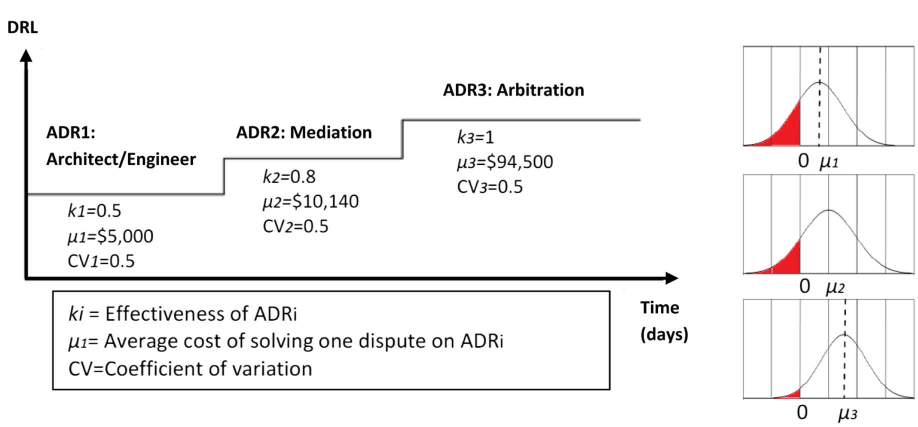


Fig. 5. Project DRL and distribution of resolution costs of each

completion of the work. This paper presents a similar DRL as an example to demonstrate the proposed ADR insurance model. The effectiveness of each ADR (kj) can be determined by statistical data from the project participants' past experience. Assume that the cost of solving a dispute with a specific ADR has normal distribution truncated at zero. The mean value is determined from the average hourly or daily rate of mediators or arbitrators from the American Arbitration Association from different parts of the United States. According to Zuckerman (2011), an arbitrator's compensation is estimated to be \$2,200 at the per diem rate and the mediator's compensation to be \$310 at the hourly rate. Based on these rates, Zuckerman estimated that the average cost of arbitration for a hypothetical, two-party construction dispute is \$94,500, while the outlay for mediation is \$10,140. Because ADR implementation costs are subject to wide variation based on the degree of complexity of the dispute, assume the coefficient of variation to be 0.5 for all three

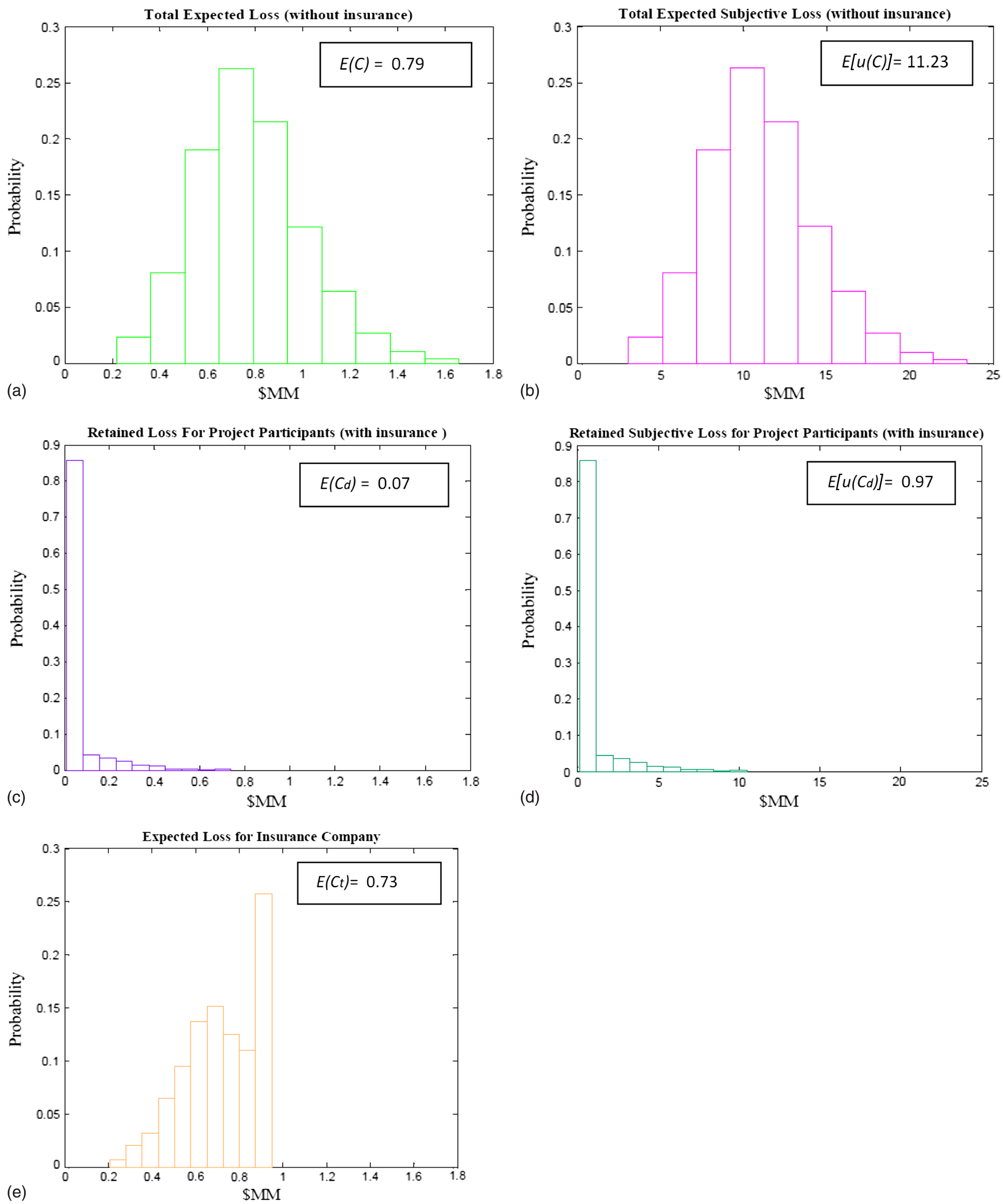


Fig. 6. Different scenarios of probability mass functions for project participants and insurance company

distributions. Again, this value should be based on the past experience of project participants. The stepwise approach is shown graphically in Fig. 5.

Assume for a highway bridge project that the estimated duration is $T = 24$ months. Since construction disputes occur randomly over time, the arrival of disputes can be approximated with a Poisson process (Touran 2003). Assume the occurrence rate $\lambda = 2$. The following SLF was used:

$$u(x) = x + 1,880[\exp(0.007x) - 1] \tag{7}$$

The function was calculated based on 96 samples taken from insurance purchasing owners in a financial survey (Hoshiya et al 2004). The reason for adopting this particular SLF is because first, it bears the properties necessary to represent a risk-averse attitude, as we can easily obtain that $u'(c) = 1 + 13.16 \times \exp(0.007x) > 0$ and $u''(c) = 0.09212 \times \exp(0.007x) > 0$. Second, it is the closest function form that can be used to estimate our pilot data. Last but not the least, exponential function is one of the fundamental functions and is easy to comprehend and calculate.

In the simulation, the probability mass functions for project participants and the insurance company were evaluated with a DL of 5% of the total expected loss and an MPL of \$1 million. The gross premium was calculated with a 25% expense loading factor. Fig. 6 is based on the results of 1,000 simulation runs. The values of C_t and C_d are determined from C using the specified DL and MPL for each run, and $u(C_d)$ is determined as the mean value of C_t of 1,000 runs. Similarly, $E[u(C_d)]$ is determined by the mean value of $u(C_d)$ of 1,000 runs.

Recalling Eq. (2), a gross premium GP is acceptable for project participants if, and only if

$$E[u(C)] \geq E[u(C_d)] + \text{GP}$$

$$\text{GP} = E(C_t) + \alpha$$

In this case

$$E[u(C)] = \$11.23 \text{ MM}$$

$$\text{GP} = E(C_t) + \alpha = 0.73 \times 1.25 = \$0.91 \text{ MM}$$

$$E[u(C_d)] + \text{GP} = 0.97 + 0.91 = \$1.88 \text{ MM}$$

which satisfies the condition described in Eq. (2). This means that project participants are willing to pay a gross premium of \$0.91 MM to avoid the possibility of uncertain ADR implementation costs, which are distributed in a wide range of up to \$1.88 million dollars under the specified insurance policy.

Analysis of Results

While fixing α at 25%, the optimal premium was investigated by varying two parameters, DL and MPL, which impact both the insured and the insurer. According to Eq. (2), the optimal premium is achieved when the right-hand side of the equation reaches its lowest point. Fig. 7 shows the impact of different MPL and DL values on expected subjective loss, expected retained subjective loss, and the gross premium.

In Fig. 7(a), the MPL varies from 40 to 160% of the expected total loss, while the DL and α are set at 5 and 25%, respectively. The minimum point of curve $E[u(C_d)] + \text{GP}$ is reached when the MPL is 130% of the expected total loss. With the MPL at 130% and α at 25%, the DL varies from 0 to 14%. These results show that the optimal premium is obtained when the DL is 0. However, as mentioned before, an insurance policy should include the DL to avoid moral and morale hazards. Thus, despite the results, a 5% DL, which is commonly used in the insurance industry, was adopted in the model.

Of course, the optimal combination of MPL and DL will differ with different subjective loss functions. An acceptable insurance policy depends largely on the project participants' degree of risk aversion. In addition to the exponential function used in the model, several elementary functions are commonly used to illustrate the properties of subjective loss functions, such as fraction power functions, quadratic functions, and logarithmic functions (Bowers et al. 1997).

Fig. 8(a) shows an example of risk-neutral project participants whose subjective loss function is $u(c) = c$. In this case, because of the expense loading factor α, purchasing insurance will not be a favorable choice for project participants, which is obvious since $E[u(C_d)] + \text{GP}$ is always larger than $E[u(C)]$. Fig. 8(b)

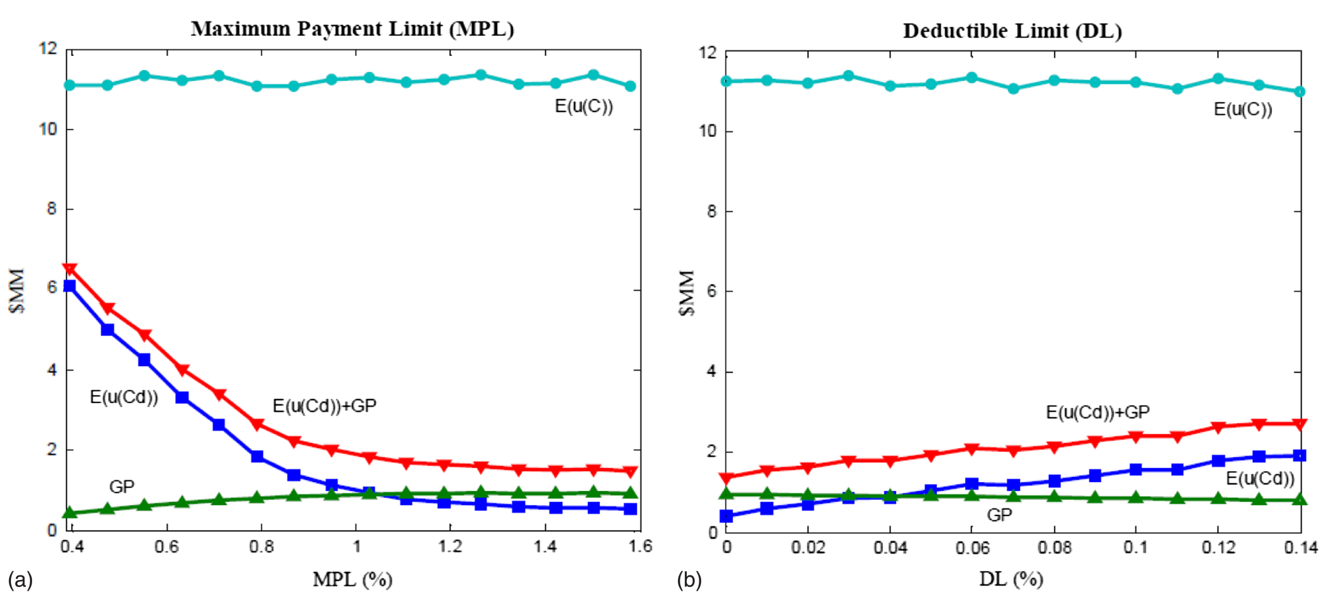


Fig. 7. Impacts of MPL and DL: (a) maximum payment limit (MPL); (b) deductible limit (DL)

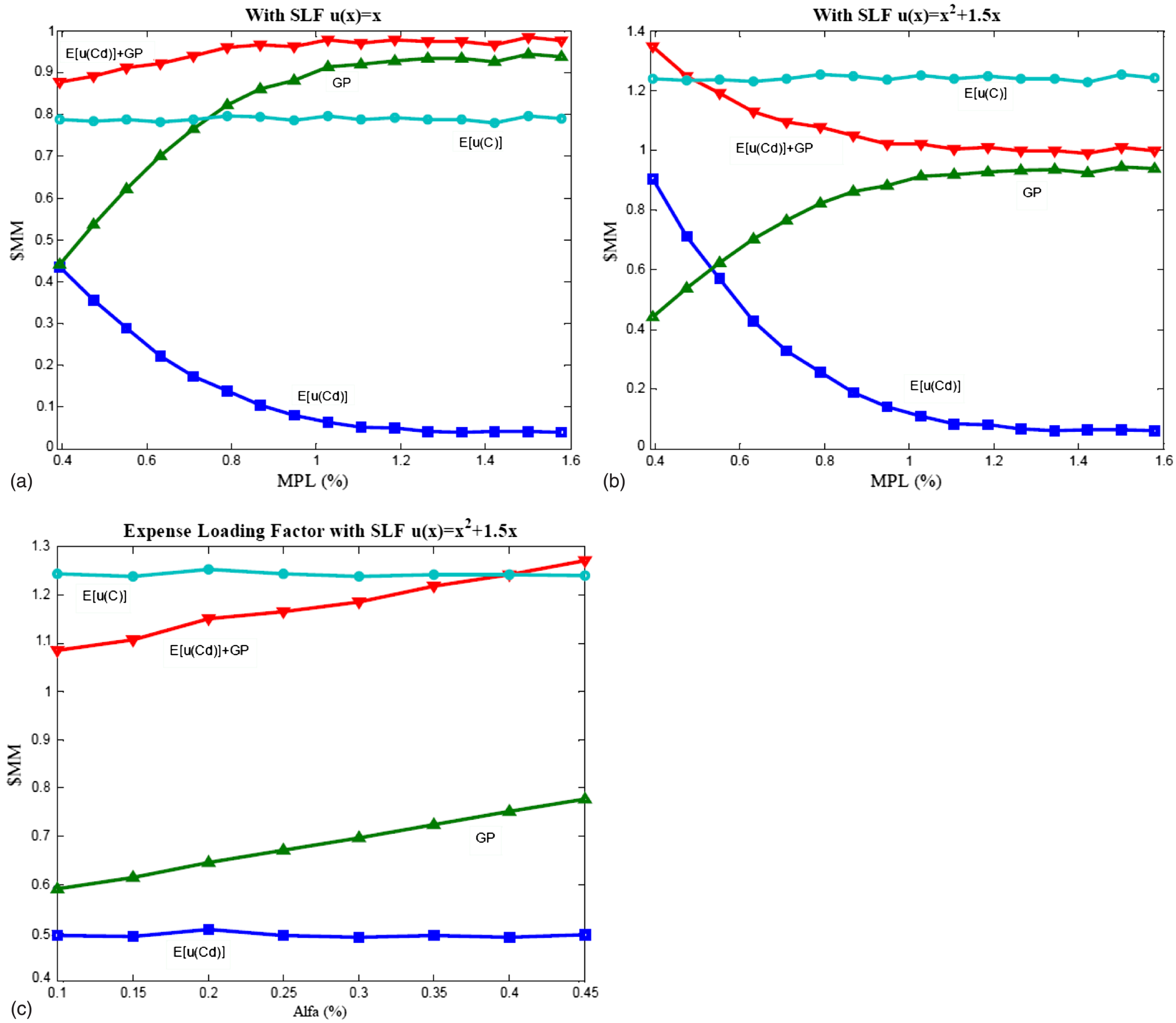


Fig. 8. Simulation with different subjective loss functions (a) with SLF $u(x) = x$; (b) with SLF $u(x) = x^2 + 1.5x$; (c) expense loading factor with SLF $u(x) = x^2 + 1.5x$

presents the case of a quadratic subjective loss function $u(c) = c^2 + 1.5c$. It represents risk-averse project participants because it satisfies $u'(c) > 0$ and $u''(c) > 0$. Fig. 8(b) suggests that, with 5% DL and 25% α, purchasing insurance is not feasible if the MPL is less than 50%. The optimal point is reached at 110% MPL. For an insurance policy to be acceptable to project participants with 50% MPL and 5% DL, the expense loading factor α should not exceed 40%, as shown in Fig. 8(c).

Conclusions

This paper describes the development of a model to evaluate the economic feasibility of investing ADR implementation insurance by drawing analogies from utility theory and insurance-pricing theory. The model takes into account the characteristics of construction projects, the properties of different ADR techniques, and the project participants' SLF. Note that the ADR model could be easily extended to cover litigation cost as well, provided that project participants have estimation on the average cost of litigation based on past experience. The major hypotheses of the model are:

- The cumulative amount of ADR costs that occur in a construction project in which a project-specific DRL is used is a function of characteristics of the project and the properties of the ADR.
- In a given project, disputes occur according to a Poisson process.
- It is assumed that each dispute resolution process is independent.
- Project participants seek to minimize the negative utility of uncertain ADR implementation costs.

By revealing the key structure of ADR insurance, this paper contributes to bridging the gap between existing insurance packages and nonreimbursed expenses incurred during the dispute-resolution process. In previous research, Song et al. (2012) developed a mathematical model that captured the risk attitudes of project participants using utility theory, thus providing a solid explanation for the validity of third-party insurance in construction-dispute resolution. Building on that model, this paper considered two additional insurance limits, a deductible limit (DL) and a maximum payment limit (MPL), to screen out moral and morale hazards, which are the two most common risks that prevent effective use of insurance. A comprehensive framework that incorporates uncertainties in potential ADR implementation costs was developed to answer two questions, (1) "Is an insurance policy beneficial for a certain project?" and (2) "If a policy is beneficial, what is the optimal premium for project participants?" The framework allows the calculation of the insurance premium and the comparison of the premium with project participants' subjective loss, thus serving as a decision-making support system to determine whether an ADR implementation insurance policy is attractive for a certain project. By establishing a mutually advantageous insurance policy and a rational premium that is acceptable to both project participants and the insurance company, ADR implementation insurance becomes a powerful risk management tool for construction projects. The results of the study led to the following conclusions:

1. The development of an innovative insurance product has significant implications for the construction and insurance industries. For the former, such an insurance product provides a valid approach for transferring the risk of unexpected ADR costs. This is especially true for the owner, general contractor, and subcontractors, who contribute approximately 96% of the total cost for dispute resolution (Gebken and Gibson 2006). For the latter, offering such an insurance product could create a unique business opportunity to differentiate an insurance company from its competitors, which is important for the success of insurance companies in today's competitive market.
2. From the project participants' perspectives, future uncertain ADR implementation cost is measured using a subjective loss function. An optimal premium is achieved when the right-hand side of Eq. (2) has its minimum value. Simulation results suggested that the DL is normally a fixed value as used by the insurance industry. The MPL and the expense loading factor, α, which are proportional to the expected total loss, are two important variables in the optimization process. Depending on the different risk attitudes of the project's participants, different values of MPL and α are required to make insurance acceptable.
3. This model has certain shortcomings that must be taken into account. The three major limitations related to the modeling assumptions and industrial applications are discussed below:
   - The SLF used in the numerical examples was taken directly from the research results of Hoshiya et al. (2004). As illustrated before, a subjective loss function (SLF) was used to quantify a decision-maker's risk-averse attitude toward future risk in monetary terms. Although this paper presents a detailed discussion of the properties of the SLF and the rationale for choosing this simulation, a SLF should be obtained for each individual project to determine the project participants' risk attitudes accurately in a real-world application.
   - To simplify the model, it was assumed that disputes were independent of each other. As a result, the Poisson process, with its mathematical property of memorylessness (Willkomm et al. 2009), was used to simulate the occurrence of disputes. This means that the number of disputes that occur in any bounded interval after time t is independent from the number of arrivals that occur before time t (Cannizzaro 1978). Touran's (2003) research on a probabilistic model for cost contingency provided strong theoretical support for using the Poisson process to simulate the number of disputes occurred in a given time interval. However, a real situation could be more complicated, and the assumption that disputes are independent of each other may be unrealistic. Overlapping dispute resolution processes could have a negative impact on each other because the project has limited resources available to allocate to different disputes. Conversely, the occurrence of one dispute could be the prelusion of additional disputes. For these two reasons, among others, the correlation between disputes should be investigated further.
   - While feedback from the construction industry generally suggests interest and support for the design of such an ADR implementation insurance, future research is necessary to determine how to apply such a design in real projects. In future work, an experiment will be conducted to study the projects of our cooperating construction company with the aim of validating the model that was developed in this research. The construction industry is also looking for a new insurance product, in addition to ADR implementation insurance, that covers ADR implementation as well as any legal expenses that are not covered by standard insurance. To meet such a need, this research must be extended to explore the possibility of developing nonreimbursed expense insurance.

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