The Impact of hedonic and utilitarian motivations on the hotel customers' risk perception

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Abstract. The study proposes that deal seeking travelers’ perception of risk may have a dual and contradicting impact on Expected Utility and, consequently, on their propensity to search for a better deal and book the travel product. According to a traditionally utilitarian motivation, a high level of risk and the prospect of negative results reduce Expected Utility, and they are therefore likely to reduce search activities and increase booking. This study argues that, due to hedonic motivations, consumers may enjoy the risk elements of their search for a better deal and, consequently, may respond to higher levels of induced risk perception by increasing search activities and reducing booking. The study explains how this finding impacts the way revenue-managing hotels, which seek to impact their customers’ behavior by inducing risk perceptions, should adapt their strategies.

Key Words: Advanced Booking, Hotel Revenue Management
INTRODUCTION

The critical role consumer behavior plays in determining the effectiveness of revenue management policies has received increased attention in recent years (Cross, Higbie, & Cross, 2009). This centrality of consumer behavior considerations has evolved in conjunction with notable changes in the structure and dynamics of the market. Examples of these changes include the Internet’s rising predominance as a medium for booking travel products and services (Dennis, 2009), modifications of online travel distribution channels’ membership (Buhalis, 2000; Myung, Li, & Bai, 2009), the struggle for dominance among third-party sites and travel service providers (Schaal, 2006), and, of course, the remarkable technological advances that continue to reshape the way business is conducted in the travel industry (Tinnila, 2002). These are especially challenging times for revenue management policies. From one perspective, revenue policies continue to improve because technological advancements offer access to more sophisticated information processing and decision making tools, and to rich content (Blank, 2000; Chase, 2007; Higley, 2005; Kimes, 2008; Winkler, 2008). Conversely, these changes in the environment and the proliferation of revenue management practices have implications for consumer behavior, because they impact consumer expectations and behaviors, often in unanticipated ways. Several of these effects have been focused on in recent research. For example, the impact of overbooking on consumer satisfaction, behavior, and repeat purchase was recently studied by Lindenmeier and Tscheulin (2008) and Wangenheim and Bayón (2007). The impact of price discrimination on consumers’ fairness perception and intention to book was examined by Beldona and Narnasivayarn (2006), and the effect of hotel room rate price presentation strategies on customers’ willingness to book was explored by Noone and Mattila (2009). An important development in the area of revenue management and consumer behavior is that, for various
reasons, the Internet has emerged not only as the major venue for price-conscious consumers to search for the best available travel deals, but, with the active support of travel service providers, it has promoted deal-seeking behaviors and the creation of a deal-seeking “culture” among travelers (Carroll & Siguaw, 2003; CKC report, 1996; Dela Cruz, 2002; Olearchick, 2003; Shapiro, 2003; Tofa, 1998). An increasing number of price-conscious, deal-seeking travelers, who demonstrate an increasing level of sophistication, have access to more information and online tools to help them find the best possible deals (Sullivan, 2009). These deal-seeking travelers present a special challenge to revenue management policies. Their advanced price-conscious booking decision process was explored by Chen and Schwartz (2006, 2008a, 2008b) and Schwartz (2000, 2006, 2008). This study takes a closer look risk perceptions, focusing on those elements that are used by hotel revenue management policies to affect consumer booking behavior. We propose that these risk perceptions may have a counterintuitive impact, one that has not been addressed by past studies. Some level of perceived risk—along with the negative outcomes associated with this risk—may be perceived by deal-seeking consumers as beneficial, because these dangers enhance the pleasurable or hedonic aspects of the deal-seeking process. Consequently, when hotels generate levels of risk stimuli that inadequately manipulate consumer behavior, these risk perceptions may have unintended results, i.e., search and booking behavior that is undesirable to the hotel.

This paper begins by introducing the hedonic and utilitarian motivations involved in risk perception. It explains the dual—and, possibly, contradictory—impact they may have on the way risk perception among hotel customers affects the Expected Utility of searching for a better deal and subsequent search and book behavior. The implication section discusses the major practical contribution of this study. It demonstrates how revenue management policies, designed to affect
customers’ behavior by controlling risk perceptions, need to be adjusted and how this hedonic/utilitarian dual impact may provide a better explanation for several empirical observations about consumer behavior in the context of revenue management. The last section includes a summary, limitation, and venues for future research.

HEDONIC AND UTILITARIAN MOTIVATIONS OF DEAL SEEKING

Consumers are motivated by both hedonic and utilitarian outcomes. Studies across consumption phenomena (Batra & Ahtola, 1991; Childers, 2001; Crowley, Spangenberg, & Hughes, 1992; Dhar, 2000; Engel, Blackwell, & Miniard, 1993) suggest that the motivation for consumption involves expectations for experiential (hedonic) outcomes and instrumental (utilitarian) outcomes. Early studies described distinct types of consumers in which those motivated by utilitarian considerations were described as task-oriented and rational, while those motivated by hedonic outcomes were described as more playful and fun seeking (Babin, William, & Griffin, 1994). Recent research suggests that, although they are distinct concepts, the two outcomes often coexist as motivators for the same customer and the same consumption experience.

This paper contends that, in the context of consumer perceptions of risk, these two outcome motivations have a unique impact on advanced booking behavior. It is unique because risk perceptions have two possibly contradictory outcomes: one is associated with utilitarian motivation, and the second with hedonic motivation. It follows that understanding this unique role, and the distinct dual impact, is critical for hotels and other tourism services providers that attempt to affect their consumers’ behavior as part of their revenue management policy.
Figure 1 illustrates the framework of this study. The consumers’ Expected Utility, which determines their booking behavior, is impacted by risk perceptions. These risk perceptions may have a different impact on Expected Utility, depending on the consumer’s expected benefit. We argue that revenue management policy, which aims at changing behavior by manipulating the consumers’ risk perception, must take into account the possibly contradictory effects of risk perception on behavior, a contradiction that results from the difference between the hedonic and utilitarian motivations.

Figure 1

Travelers’ search-for-a-better-deal risk perceptions, Expected Utility, and deal seeking behavior.

Utilitarian benefits of deal seeking

The traditional approach to modeling travelers’ deal-seeking behavior, as demonstrated, for example, in the Advanced Booking Decision Model, (Schwartz, 2006) assumes a utilitarian
motivation. According to this approach, the deal-seeking traveler’s desired outcome for the
search activity is that s/he reserves the travel service at a reduced cost. That is, the traveler
expects to pay a smaller amount for the same (or very similar) travel service. Given this
utilitarian motivation, risk perceptions—in particular, consumer perceptions about the likelihood
of an undesirable outcome—heavily affect consumers’ deal-seeking behavior. This assessment
of the likelihood and magnitude of an undesirable outcome affects the decision regarding
whether to engage in, and how long to continue, the deal-seeking activity. There exists an
obvious negative relation between the travelers’ Expected Utility from the search for a better
deal and the level of perceived risk: the higher the perceived uncertainty (and, consequently, the
likelihood and magnitude of an undesirable outcome), the lower the Expected Utility. An
example of this negative relation between Expected Utility and perceived level of risk (in terms
of an undesirable outcome) is illustrated by the hotel sellout element of the Advanced Booking
Decision Model. The model assumes utilitarian motivation, and, for customers who select the
search strategy, the higher the likelihood of the hotel selling out before they book their room, the
lower their Expected Utility from the search strategy. This analytical prediction about the
connection between the likelihood of an undesirable outcome and consumers’ search behavior
was supported by Chen and Schwartz’s (2008a) empirical test.

A negative outcome is generated by the likelihood of an undesirable event or condition
occurring, and the monetary damage associated with it. Thus, the negative impact of a hotel
selling out while the consumer is searching for a better deal is given by the probability that the
hotel will sell out, multiplied by the additional cost associated with having to reserve a room in a
less desirable hotel. This additional cost could be associated with a higher room rate,
inconvenience due to the alternative hotel’s inferior location, or the lack of desired amenities in
the alternative hotel, among other possibilities. For the sake of simplicity, it is assumed in this
discussion that the damage is given, and we focus on the probability, that is, the likelihood that
undesirable condition will materialize.

The economic law of diminishing marginal utility holds that additional units of one good
or service add successively smaller increments to the total utility (DeSerpa, 1985). The law is
based on the rationality assumption, according to which people put each unit to the best possible
use. It follows that the next consumed unit of the product must then go to a less important use.
Accordingly, this study assumes that the relation between Expected Utility and the likelihood of
an undesirable outcome is one of diminishing marginal utility, and it is, therefore, described by a
non-linear (concave) function. For this study we propose\textsuperscript{i} the simple relation of

\[ EB_u = C - R^2 \]

where \( EB \) denotes the expected benefit

\( C \) is a constant

\( R \) denotes the perceived risk\textsuperscript{ii}

This non-linear, monotonically decreasing function (Figure 2) implies that, as perceived
risk increases, the rate at which the Expected Utility decreases accelerates. In other words, at
lower levels of perceived risk, an increase of one perceived risk unit results in a relatively small
Expected Utility decrease. The decrease in response to a risk unit change is larger at higher
levels of risk.

Figure 2
Expected utilitarian benefit as a function of perceived risk

Hedonic benefits of deal seeking

In line with the emerging literature on hedonic motivations, this study proposes that some consumers enjoy the process of seeking the best deal and that the perceived risk, as an element of the search activity, generates the consumers’ expectations for excitement and hedonic benefits. Numerous studies suggest that uncertainty—in particular, risk (the likelihood of an undesirable outcome)—is often perceived to be a “fun” ingredient that generates arousal, excitement, and, consequently, motivation to take part in the activity (Apter, 1992). As explained in the following section, it is speculated that this “pleasure risk” aspect of the activity also has a positive impact on the Expected Utility from being engaged in a search for a better deal.
Hedonic motivation is often associated with a high level of customer involvement (Bloch & Richins, 1983; Hirschman, 1983). Regarding the particular case of risk-induced excitement, Apter (1992) observed that personal involvement leads to skill development in a certain area, which, in turn, strengthens confidence and allows one to take greater risks and enjoy even higher levels of excitement. Interestingly, for many price conscious customers, searching for the best travel deals is a long, involved, and methodical process. In fact, on the consumer buying decision continuum (Lamb, Hair, & McDaniel, 2009), it falls under the extensive category. Searching for a better deal involves a high level of involvement, long time, internal and external information search, as well as a high, non-monetary cost. A recent testimony posted online, entitled “How to Get the Best Deal Booking Travel Online” (Ben, 2009), underscores the notion of high customer involvement in the search for a better deal. The posting describes an elaborate five-step process. It starts by comparing prices from several “primary” travel booking sites, providers’ own websites, and discount travel booking sites. The process continues by participating in online bidding (e.g., Priceline.com), but only after determining what the competitive bid should be by checking more websites, such as BiddingForTravel.com, and changing online identities to enable the placement of multiple bids. Another important consideration in this search for the best deal is the optimal time to book or to place a bid. Online websites, such as Microsoft’s Bing travel farecast technology, provide information on the optimal time to reserve the travel service; that is, they recommend how long to wait with the reservation in order to book at the “right” time, paying the least amount of money. Clearly, this process is long and somewhat tedious, obviously characterized by high consumer involvement. At the same time, this process is risky. Travelers who decide to continue searching and not book immediately may realize that the price quoted earlier is no longer offered. Other travelers may find that they have waited too long, and the hotel
they wished to stay with is now fully booked. On the other hand, travelers who rushed to book the travel service early may realize that lower rates are now offered, but that they cannot switch to the lower rates because of strict cancelation policies associated with their reservations. We argue here that this uncertainty may add elements of positive tension, excitement, and enjoyment to the process, making the search for the best travel deal a more attractive activity to travelers. This connection between perceived risk, leisure excitement, and behavior (risk-based hedonic motivations) in situations of high involvement is well established in the literature, and it manifests itself in various areas of human activity. Brown (1988), Bruce and Johnson (1995), Pantalon, Maciejewski, Desai, and Potenza (2008), and the commission on the review of national policy towards gambling (Commission on the Review of National Policy towards Gambling, 1976), have all documented the connection between pleasurable excitement seeking (and related constructs) and betting and gambling. In the financial markets, Dorn, Dorn, and Sengmueller (2008) explored the question of why people trade stocks and other financial instruments. They surveyed 1,300 clients of discount brokers, and they found that people who stated that they "enjoy risky propositions" traded twice as much as their peers. Similar findings relating perceived risk, excitement, and behavior were reported in outdoor recreation and adventure tourism (Alexandris, Kouthouris, Funk, & Giovani, 2009; Cater, 2006; Prayag & Jankee, 2009), as well as in extreme sports (Breivik, 1996; Levenson, 1990; Robinson, 1985; Rossi & Cereatti, 1993; Schneider, Butryn, Furst, & Masucci, 2007; Slanger & Rudestam, 1997; Straub, 1982; Yates, 1992; Yong, Hyewon, & Claussen, 2008; Zuckerman, 1994). These and other studies clearly underscore the notion that people generally enjoy higher utility in activities and in the consumption of goods and services in which they experience excitement associated with some level of perceived risk.
Specifically, this study proposes that, in the context of deal seeking, the relation between Expected Utility and the level of perceived risk is shaped like an inverse U. This shape reflects the intuitive notion that while at the lower range, increased risk perception might induce more excitement, there is a point (a tipping point) at which the risk level is too high. Beyond a certain threshold, the odds of an undesirable outcome are so high that the person feels that it is futile, or perhaps too dangerous, to engage in this risky activity. At this threshold level, the risk no longer generates excitement, the positive feelings associated with the hedonic motivation to engage in the risky activity. Instead, this high level of risk generates anxiety—a negative feeling that might dissuade the consumer from engaging in the search activity. Alluding to this threshold in the context of outdoor adventure education, Davis-Berman and Berman (2002) stated that “if the perceived risks of a situation are too high for a participant, the impact might be counterproductive at best and damaging at worst.”

Apter (1992) explains that the switch from excitement to anxiety occurs when the person crosses what he calls the “protective frame line,” moving from the “Danger Zone” into the “Trauma Zone.” Hence, in the context of this discussion about the risk associated with the search for a better deal, we argue that the shift from arousal/excitement to arousal/anxiety occurs when the perceived risks become too high. As is the case with the utilitarian motivation, the law of diminishing marginal utility also applies to the hedonic motivation. The difference is that a certain tipping point exists with the hedonic motivation. That is, the increasing part of the relation (up to the protective frame line) is characterized by the traditional diminishing marginal utility concave curve: the higher the risk, the higher the utility with successively smaller increments. The second part of the relation (once the protective frame line has been crossed) is similar to the utilitarian motivation one.
Accordingly, we formally propose that the expected hedonic benefit, $EB_h$, is given by

$$EB_h = (\alpha - \beta R)R$$  \hspace{1cm} (2)

where

$\alpha$ and $\beta$ are coefficients

This inverse U shape relation between $EB_h$ and $R$ is illustrated in Figure 3.

Figure 3

Expected hedonic benefit, as a function of perceived risk

Total Expected Utility of deal seeking

It is assumed in this paper that the consumer’s total Expected Utility, $EU$, is the summation of the utilitarian and hedonic expected benefits:

$$EU = EB_u + EB_h$$  \hspace{1cm} (3)
and it follows that

$$EU = C - R^2 + (\alpha - \beta R) R$$  \hspace{1cm} (4)$$

As shown in Figure 4, the Expected Utility function is concave, it intersects the Y axis at

$EU = C$ (for details see Appendix A), and it peaks at $[R^*, EU^*]$ where

$$R^* = \frac{\alpha}{2(1 + \beta)} \quad \text{and} \quad (5)$$

$$EU^* = C + \frac{\alpha^2}{4(1 + \beta)} \quad \text{(for details see Appendix B).} \quad (6)$$

**Figure 4**

Expected Utility and hedonic and utilitarian benefits, as a function of perceived risk

**REVENUE MANAGEMENT IMPLICATIONS**

The effectiveness of risk perception-inducing strategies
The most striking implication has to do with the effectiveness of hotel revenue management strategies, in particular, the strategies aimed at curtailing customers’ deal-seeking behavior by amplifying their perception of risk. One of these hotel strategies is to emphasize the scarcity of rooms and, consequently, the risk of a sellout. Recent studies (Chen & Schwartz, 2006; Schwartz, 2000) have demonstrated that customers may have a higher propensity to book a room when they assume that a larger percentage of the hotel’s rooms have been already booked. This higher propensity to book means that they are less likely to keep searching for a better deal due to the intensified perception of the risk that the hotel will sell out while they are still searching. Another strategy employed by hotels to increase the perception of risk is to impose higher and/or stricter cancelation policies. These cancelation fees magnify the cost of an undesirable result for people who booked but continue to search for a better deal after they booked. These deal-seeking customers hope to find a better deal and to cancel their first reservation if they do find a better deal. Hence, higher or stricter cancelation fees make the search strategy of these price-conscious customers more costly, and thus more risky. It is more risky because with higher cancelation fees they are less likely to actually find a better deal. In other words, the likelihood of finding a deal that is so much better that it justifies absorbing the cancelation fees is considerably diminished with higher/stricter cancelation fees.

Figure 5 illustrates why the effectiveness of such risk perception-inducing strategies is called into question when the hedonic motivations are incorporated into the model. Consider a customer whose perceived risk is given by $R_1$, with a corresponding Expected Utility of $EU_1$. According to the assumption that prevailed prior to this study, the consumer is motivated only by utilitarian consideration. As such, any induced increase in the customer’s risk perception will result in a decrease in that customer’s Expected Utility from the search for a better deal.
Consequently, it is reasonable to assume that the customer is likely to reduce her propensity to search and increase her propensity to book in response to an increase in her risk perception. In Figure 5, this risk/Expected Utility relation is shown by the shift of the consumer’s risk perception from $R_1$ to $R_2$ (where $R_1 < R_2$), which is accompanied by the shift of the Expected Utility from $EU_1$ to $EU_2$ (where $EU_1 > EU_2$).

**Figure 5**

Risk perception amplifying strategies and the consumer’s Expected Utility when hedonic motivation is considered
However, if the customer is motivated by hedonic reasons as well, the results of the hotel’s effort to induce higher perceptions of risk will be quite different. Assume the same initial state of a risk perception of \( R_1 \). With the modified Expected Utility function, the Expected Utility is now \( EU_3 \). An induced increase of the perceived risk to \( R_2 \) will generate an Expected Utility of \( EU_4 \). This new Expected Utility is higher than the initial Expected Utility (\( EU_4 > EU_3 \)). In other words, an induced increase in the perception of risk will generate higher expectation for benefits, thereby increasing the customer’s propensity to search for a better deal instead of reducing it. Thus the hotel strategy will be unlikely to generate the desired results. It is clear that to generate the desired results, the hotel must induce a considerably larger perception of risk. According to Figure 5, it should be at least \( R_3 \)—the lowest risk to generate Expected Utility, which is equal to, or lower than, the initial Expected Utility of \( EU_3 \). Exactly how much should risk perception increase (\( \Delta R \)) to ensure a decrease in the Expected Utility?

\[
\Delta R = R_3 - R_1 \tag{7}
\]

Since (for details see Appendix C)

\[
R = \frac{\alpha \pm \sqrt{\alpha^2 + 4(1 + \beta)(C - EU)}}{2(1 + \beta)} \tag{8}
\]

it follows that

\[
\Delta R = \frac{\alpha + \sqrt{\alpha^2 + 4(1 + \beta)(C - EU)}}{2(1 + \beta)} - \frac{\alpha - \sqrt{\alpha^2 + 4(1 + \beta)(C - EU)}}{2(1 + \beta)} \tag{9}
\]

and the smallest increase in risk perception, required to induce the desirable behavioral change, is given by

\[
\Delta R = \frac{\sqrt{\alpha^2 + 4(1 + \beta)(C - EU)}}{1 + \beta} \tag{10}
\]
To summarize, hotels wishing to impact their customers’ search behavior by increasing their customers’ risk perception must ensure that the change in risk perception they induce is at least of the size given by equation (10). A change smaller than the calculated \( \Delta R \) will fall within the range of elevated excitement and Expected Utility. As such, this less-than-the-minimally-required increase in risk perception is more likely to encourage the customer to search for a better deal instead of causing them to book, the more desirable outcome.

**Additional insights**

In addition, the conceptual contribution of this proposed model is to provide alternative explanations for empirically observed consumer behavior, underscoring the need to intensify revenue management policies that are aimed at impacting consumer behavior. Consider, for example, “Visual Guilt,” a term coined by the travel arm of American Express to describe the results of their study of customers’ propensity to seek the best travel deals (Limone, 2002). American Express found that the same travelers tend to be more price-conscious and spend more time and effort looking for the best deal when they book their travel directly and less so when they use the services of a travel agency. Their explanation had to do with the travelers’ supposedly intensified feeling of guilt (of not doing enough to find cheaper travel services) when they can only blame themselves for the “failure.” The hedonic/utilitarian model proposed in this study suggests that the reason does not have to be “guilt”; instead, it could be “fun.” When travelers book their travel services directly, they are more involved and are more likely to enjoy the risk associated with the search. Another example has to do with the “cancelation fee paradox” empirically observed by Chen, Schwartz, and Vargas (2008). The findings of that study
demonstrated that the smaller cancelation fee did not impact the advanced booking behavior of deal-seeking customers, while the larger cancelation fee did. In other words, when it comes to affecting customer behavior, a small cancelation fee did not differ from no cancelation fee at all. This finding is surprising: the fee was described as small because it was the smaller of the two fees tested but, in absolute terms, the fee was rather large, equaling the daily room rate. Intuitively, this amount should have been large enough to generate some reduction in the propensity to search for a better deal. The hedonic motivational element and the model outlined above provide a possible explanation for this paradox. It may be that, at this level, the cancelation policy induced enough risk perception to generate excitement about the task of finding a better deal.

CONCLUSION LIMITATIONS AND FUTURE RESEARCH

This study explored the notion that hedonic motivation may characterize the way in which price-sensitive travelers experience and appreciate the risk element as a part of the process of searching for the best deal. When combined with the more traditional view of perceived risk elements as utilitarian, the resulting hybrid model is of an inverse U shape where the Expected Utility rises with higher levels of risk and then drops. The practical implication is clear and significant. If indeed both hedonism and pleasure are impacting the behavior of deal-seeking customers and if the model outlined above characterizes the way in which deal seekers respond to various levels of perceived risk, then hotels and other hospitality and travel companies must take this information into account each time they attempt to impact their customers’ booking and search behavior by creating a sense of risk. It is clear that the induced perceived risk must be
larger than a certain threshold. Failure to cross this threshold will result in the policy inducing undesirable booking and search behavior.

Being a conceptual model, the major limitation of this study is that it is only the first step in a quest to fully understand the investigated phenomenon. While many of the assumptions are grounded in theory and previous empirical tests, and while the model follows basic conventions in analytical modeling, direct and relevant empirical tests must be conducted for the model to gain wide acceptance.

Future analytical research efforts should examine the robustness of the model proposed here in terms of the assumptions about shape of the Expected Utility functions and determine the impact that relaxing or changing these assumptions may have on the model’s outcomes. More theoretical research could explore ways to expand the Advanced Booking Decision Model by incorporating the dual motivation approach, according to which both utilitarian and hedonic aspects are considered. Such research will replace the more traditional view currently assumed in the model, where only utilitarian motivation is addressed. Obviously, empirical research should follow the theoretical modeling efforts of this study. These empirical studies should test the assumptions, as well as the predictions, of this analytical model. Beyond merely testing the theoretical model, the results of such empirical tests could provide the building blocks for further improvements of the theoretical model.
REFERENCES


**APPENDIX A**

If \( R = 0 \)

it follows that

\[
EU = C - R^2 + (\alpha - \beta R)R = C - 0^2 - (\alpha - \beta 0)0 = C
\]
APPENDIX B

\[ EU = C - R^2 + \alpha R - \beta R^2 \]

\[ \frac{\partial EU}{\partial R} = -2R + \alpha - 2\beta R = 0 \]

\[ 2R(1 + \beta) - \alpha = 0 \]

\[ R^* = \frac{\alpha}{2(1 + \beta)} \]

\[ EU^* = C - R[R(1 + \beta) - \alpha] \]

Substituting \( \frac{\alpha}{2(1 + \beta)} \) for \( R \) we get

\[ EU^* = C - R[R(1 + \beta) - \alpha] = C - \frac{\alpha}{2(1 + \beta)} \left[ \frac{\alpha(1 + \beta)}{2(1 + \beta)} - \alpha \right] = C - \frac{\alpha}{2(1 + \beta)} \left( \frac{\alpha}{2} - \alpha \right) = C + \frac{\alpha^2}{4(1 + \beta)} \]

APPENDIX C

\[ EU = -(1 + \beta)R^2C - \alpha R + C \]

\[-(1 + \beta)R^2C - \alpha R + C - EU = 0 \]

\[ R = \frac{\alpha \pm \sqrt{\alpha^2 + 4C + 4\beta C - 4EU - 4\beta EU}}{2(1 + \beta)} \]

\[ R = \frac{\alpha \pm \sqrt{\alpha^2 + 4\left[ C(1 + \beta) - EU(1 + \beta) \right]}}{2(1 + \beta)} \]

\[ R = \frac{\alpha \pm \sqrt{\alpha^2 + 4\left[ (1 + \beta)(C - EU) \right]}}{2(1 + \beta)} \]
There is no particular reason behind this specific form other than an attempt to use a simple one. Several other forms could have been used instead. Empirical studies would best indicate which form is most appropriate.

Note that this manuscript uses the term “perceived risk” and the “likelihood of an undesirable outcome” interchangeably. This is a narrow and specific use of the term “risk,” a term that is often used in the literature to describe uncertainty in general where both positive and negative outcomes are considered.