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Channel Contract Behavior: The Role of Risk Attitudes, Risk Perceptions, And Channel Members' Market Structures

I. Introduction

Risk and uncertainty influence many channel decisions, especially those in turbulent channels with uncertain pay-offs. Managing or reducing such risk involves managing the vulnerability and volatility of cash flows to help create shareholder value (Srivastava, Shervani, and Fahey 1998). Such an effort requires the integration of finance and marketing (Rappaport 1986). A key question is how risk reduction behaviors are influenced by risk perceptions, risk attitudes, and the market structure across the buying side and the selling side of the channel. Understanding and anticipating the resulting changes is especially important in commodity and in technology industries where risk continually fluctuates (Anderson 1982). It is also critical in industries where unpredicted events—such as product recalls or food safety concerns—dramatically influence channel supply and demand of products with prescribed characteristics (Pennings, Wansink, and Meulenberg 2002).

Research on risk management in channel situations often assumes risk aversion and focuses on either risk perceptions or on risk attitudes. Seldom, however, have these two constructs—risk

By integrating elements of both marketing and finance, we show how risk influences channel contract behavior. We model risk behavior as the interaction between risk attitude and risk perception (IRAP). An analysis of the joint channel decisions of 208 producers, wholesalers, and processors provides three results. First, risk attitudes significantly vary across different levels of channel members. Second, IRAP – in combination with the channel member's market structure on the buying and selling side – is a strong predictor of contract behavior. Third, increases in channel power strengthen the impact of IRAP on channel contract behavior.

perceptions and risk attitudes—been investigated simultaneously. Yet, channel members are not homogeneous and differences in risk attitudes and their risk perceptions may vary quite dramatically up and down the channel. These differences in risk attitudes and risk perceptions may be played out in different channel contract strategies. In addition, channel contract behavior may be also influenced by the market structure in which channel members operate and by their relative channel power.

Consistent with the notable work of Pratt (1964) and Arrow (1971), we investigate how the interaction between risk attitude and risk perception (IRAP) influences channel members' contract decisions. Understanding this interaction provides us with a tool to better understand how risk management behaviors (such as using fixed-price contracts) vary across different market structures and different levels of channel power. This is tested by examining the probability with which a channel member (such as a producer, wholesaler, or processor) employs various channel contract strategies to manage their risks. In this paper, we specifically examine the use of three common strategies: 1) establishing spot contract relationships on both the buying and selling side, 2) establishing fixed-price contract relationships on both the buying and selling side, and 3) establishing asymmetric contract relationships. Asymmetric contract relationships are characterized by the use of spot contracts on the buying side and fixed-price contract contracts on the selling side, or vice versa.

This paper begins with an overview of how risk attitudes and risk perceptions, combined with channel market structure, influence the behavior of channel members. Following this, hypotheses are derived that relate the interaction of risk attitudes and risk perceptions to contracting behavior.

The empirical findings, based on personal computer-guided interviews with 208 channel members, show that risk attitudes and risk perceptions differ widely across the three channel levels. Furthermore, the interaction between risk attitude and risk perception (IRAP), in combination with the channel member's market structure, is shown to be a useful predictor of a channel member's contract behavior. This influence of IRAP on channel contract decision behavior is strengthened as channel power increases.

II. The Interaction between Risk Attitude and Risk Perception

Risk may be perceived differently across channel members, and how channel members cope with perceived risk will depend on their risk attitude. Before a channel member can respond to risk, risk must first be perceived or identified (Trimpop 1994). Stone, Yates, and Parker (1994) modeled the identification of risks as a cognitive process of identification, storage, and retrieval. While a market might be considered
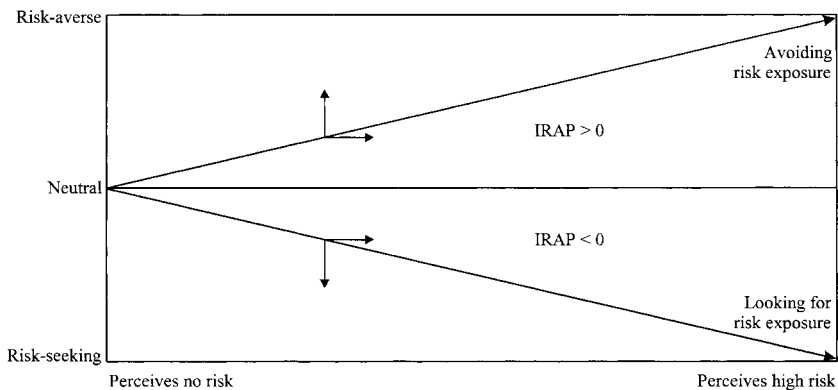
Fig. 1.—How the interaction between risk attitude and risk perception influences behavior.

turbulent by economic standards, the level of risk it presents to a channel member depends on his or her risk perception. A channel member who believes that he or she can predict the market price will perceive the market as less risky than a channel member who believes he or she is unable to predict the market price.

Risk perception reflects the channel member's interpretation of the likelihood of exposure to the content of the risk (e.g., price fluctuations) and is defined as a channel member's assessment of the risk inherent in a particular situation. On the other hand, *risk attitude* reflects the channel member's general or consistent predisposition toward risk. It is important to emphasize that risk attitude and risk perceptions are two different concepts. Whereas risk attitude deals with the decision-maker's interpretation of the content of the risk, and how much he or she dislikes risk, risk perception deals with the decision-maker's interpretation of the likelihood of being exposed to the content of a particular risk.

We do not expect risk attitude and risk perception to individually have a direct impact on the contract strategies employed by channel members. Instead, as shown in Figure 1, we believe it is the *combination* of risk attitude and risk perception that influences behavior. After all, regardless of one's individual risk attitudes a channel member will not change his or her behavior if no risk is perceived in a given situation.

When risk-averse channel members perceive risk, they will exhibit risk management behavior (i.e., behavior to decrease their risk exposure). Risk-seeking channel members, on the other hand, will exhibit risky behavior when they perceive risk, or they may even seek out ways to increase their risk (because of the corresponding expected pay-off). The interaction between risk attitude and risk perception (IRAP) represents how the channel member intends to cope with risks in the

channel, along with the risks his or her own actions generate. As such, the concept is related to risk behavior intention.[1]

This basic hypothesis that the interaction between risk attitudes and risk perceptions is related to behavior is consistent with the notable research that Pratt (1964) and Arrow (1971) conducted on the analysis of risk management behavior (See Appendix A). Both risk attitude and risk perception are continuous variables. Risk attitudes range from extremely risk-averse (i.e., refusing any risk under any condition) to extremely risk-seeking (i.e., always preferring a risk-carrying outcome). Risk perceptions, on the other hand, range from perceiving no risk to perceiving high risk.

In this study, we define IRAP as positive when channel members perceive risk *and* are risk averse. We define it as negative when channel members perceive risk *and* are risk seeking. We define it as zero when channel members either do not perceive any risk or when they are risk neutral (see Figure 1). A channel member's IRAP profile should reveal how he or she is going to react to future situations. It should also reflect channel members' predispositions to dealing with the risks inherent to the stimuli they receive and the risks their actions generate.

III.   Channel Member's Contract Behavior on Both the Selling and Buying Side

While there are many motivations to manage risk, a notable one involves the creation of shareholder value. Srivastava, Shervani, and Fahey (1998, 1999) argue that lower volatility and vulnerability reduce the risk associated with cash flows. This may result in a lower cost of capital and a lower discount rate, thereby potentially contributing to the creation of shareholder value. A channel member's objective is to reduce *profit* volatility, which does not necessarily mean reducing *price* volatility, because profit is a composite of all cash flow streams (prices of inputs and outputs). That is, the channel member is interested in the risk that remains after parts of the cash flow risks from buying and selling products and services have been cancelled out. (Anderson and Danthine 1980, 1981; Zilcha and Broll 1992). This remaining risk, which equals profit risk, is often referred to as residual risk. Hence, risk management behavior must take an integrative perspective, and must include both the buying and selling markets of

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1. An analogue can be made with the multi-attribute attitude theory introduced by Fishbein and Azjen (1975). In this theory, the attitude towards an object (e.g., a risk management strategy) leads to the intention to choose that object, and, ultimately, to choice. IRAP is on the intention level (as opposed to the attitude level) and reflects a latent behavior to deal with risk.
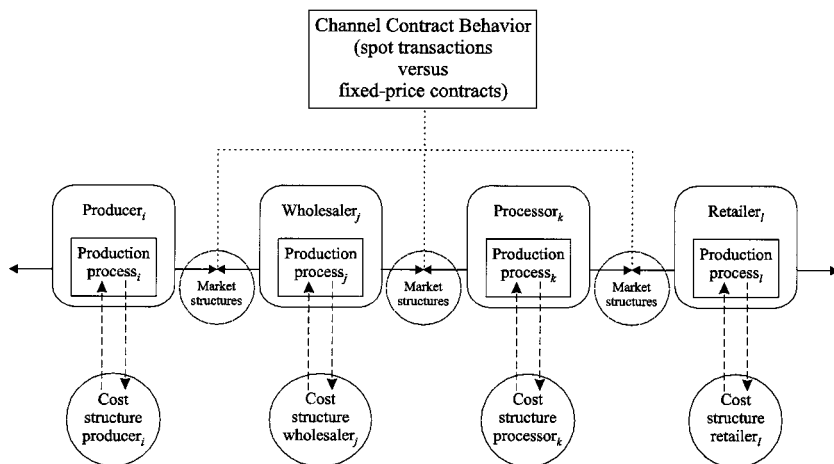
Fig. 2.—Research framework

channel members. Each market may generate different levels of risk, due to structural differences.

Channel members can manage their risk by buying from several suppliers and by using a risk-reducing channel-contract strategy within the channel. In this paper, we elaborate on how channel members use contracts on both the buying and selling side to reduce profit risk. By doing so, they reduce the fluctuations in their net cash flow stream.

The research framework shown in Figure 2 consists of the buying and selling side of four types of channel members: 1) the producer, 2) the wholesaler, 3) the processor, and 4) the retailer. The solid arrows represent the cash flow streams between channel members generated by channel contracts (e.g., spot transactions versus fixed-price contracts). The dashed arrows represent cash flow streams that are generated by the channel member's cost structure (variable versus fixed costs) and reflect the channel member's production process. The relationship between the cash flows on the buying and selling side is influenced by the market structures in which channel members operate and the production processes employed. In this paper we focus on how the channel member's IRAP profile and the channel member's market structures on the buying and selling side drive channel contract behavior.

A. Spot Contracts versus Fixed-price Contracts

Different channel contract strategies carry different levels of risk (e.g., Lusch and Brown 1996). A channel member can influence the level of price risk exposure by carefully selecting his or her channel contract strategy when selling and when buying. In this paper, we focus on two broad classes of price-related channel contracts: 1) spot contracts (also

referred to as spot transactions), and 2) fixed-price contracts. Spot contracts define the price at the moment of the transaction (at time $t+1$), based on the spot market. Cash flows resulting from such contracts are uncertain at time t. Fixed-price contracts, on the other hand, fix the price at the moment that the contract is initiated (at time t). Hence, the cash flow generated at the time of actual delivery (time $t+1$) is certain. Thus, a fixed-price contract reduces the volatility of cash flows between channel members (e.g., Crocker and Masten 1991).[2] The role of fixed-price contracts in industrial marketing channels is significant, as many channel relations are characterized by a chain of fixed-price contracts between two or more channel members.

B. Channel Members' Market Structures on the Buying and Selling Side: Cash Flow Relationships

It has been argued that the motivation for risk reduction is not to reduce the *price risk* of a single asset or commodity but to reduce the *residual risk* of all aggregate contracts (Anderson and Danthine 1980; Rolfo 1980; Anderson and Danthine 1981; Zilcha and Broll 1992; and Pennings and Leuthold 2001). Channel members are interested in the *profit* resulting from all contract relationships, not just a single contract relationship. The profit is the result of the channel member's entire production process; all the goods and services he or she purchases and sells. The volatility of this profit is determined by the cash flow relationships between inputs and outputs, and this volatility increases when there is a negative correlation between the cash flow of inputs and outputs. In such a case, the volatility in the cash flow streams is increased because the combined profit volatility is higher than the cash flow volatility of the separate inputs or outputs. In contrast, when there is a positive correlation between the cash flow of inputs and outputs, profit volatility decreases, because the cash flow fluctuations (partly) neutralize each other. This is a situation often referred to as a natural hedge (Pennings and Leuthold 2001).[3]

The correlation (ρ) between the cash flow streams reflects the channel member's cash flow relationships and is an important factor when understanding channel behavior.[4] The correlation between the cash flows is determined by the market structures on the buying and selling side. Besides being influenced by competition (pure competition vs. oligopoly), the correlation between the cash flows is

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2. In the work of Lusch and Brown (1996), fixed-price contracts can be described as *explicit, hard* and *discrete* contracts (e.g., Dwyer, Schurr, and Oh 1987).

3. A natural hedge expresses a condition in which an exposure to a risk factor is offset or partly offset by an opposite exposure to that risk factor.

4. Cash flow relationships are not only important when understanding firm's channel contract behavior but also to understand the value of the firm (Brick, Frierman and Kim 1998).

influenced by the firm's cost-structure (ratio between variable and fixed costs), which is closely related to the production system employed by the channel member. Figures 2 visualizes how the market structure influences the cash flows (i.e., the solid arrows) and how the production process (i.e., the firm's cost structure) influences the cash flows (i.e., the dashed arrows). Variations in the correlation (ρ) between the cash flow streams for the same category of channel members are attributed to variations across dissimilar production systems. Channel members with similar production systems, such as wholesalers of commodities (whose "production system" is rather simple, as it entails trading the commodity), will show a relatively low variation in the correlation (ρ) between the cash flow streams, whereas channel members with heterogeneous production systems show a relatively higher variation in (ρ).

C. Channel Members' Market Structures & Channel Members' IRAP Profiles

A channel member's market structure profile is reflected by the relationships between the cash flows generated on the selling and the buying side. It is the interaction between a channel member's market structure profile and his or her IRAP profile that ultimately determines the final contract behavior (i.e., whether spot contracts or fixed-price contracts are used to manage risk).[5] While a channel member's market structure profile reflects the net cash flow volatility, the IRAP profile reflects the channel member's propensity towards this net cash flow (profit) volatility. Hence, the IRAP profile and the correlation (ρ) between the cash flows on the buying and selling side play a crucial role in understanding channel contract behavior. Let us consider each individually:

1. *The channel member's IRAP profile.* When IRAP > 0, the channel member perceives risk, while being risk averse. We expect this channel member to be inclined to decrease his or her profit volatility. When IRAP < 0, the channel member perceives risk, while being risk seeking. We expect this channel member to be inclined to increase his or her profit volatility.
2. *The correlation ρ between the cash flows from the buying and selling side.* When $\rho < 0$, there is reinforcement of the cash flow volatilities from the buying and selling side. When $\rho > 0$, the cash flow volatilities from the buying and selling side are (partly) neutralized, resulting in a natural hedge.

TABLE 1   **Hypothesized Contract Relationships Across Various Market Structures and Channel Members' IRAP Profiles**

Channel Member's	Channel Manager's IRAP Profile	
Market Structure (Correlation between input and output cash flows—ρ)	IRAP > 0 (*The motivation is to decrease the volatility in the net cash flow stream*)	IRAP < 0 (*The motivation is to increase the volatility in the net cash flow stream*)
$\rho > 0$ (Natural hedge situation)	Buying side → Spot contracts Selling side → Spot contracts	Buying side → Fixed-price contracts Selling side → Spot contracts *or* Buying side → Spot contracts Selling side → Fixed-price contracts
$\rho < 0$ (No natural hedge)	Buying side → Fixed-price contracts Selling side → Fixed-price contracts	Buying side → Spot contracts Selling side → Spot contracts

In this paper, a channel member is assumed to decide on contract relationships for purchases and sales simultaneously, based on the economic principle of the coordination of channel contract relationships on the buying and selling side in order to maximize profit, discounted by risk (i.e., maximizing shareholder value). Table 1 illustrates three channel contract strategies: 1) establishing spot contract relationships on both the buying and selling side, 2) establishing fixed-price contract relationships on both the buying and selling side, and 3) establishing asymmetric contract relationships. The latter contract strategy includes spot contracting relationships on the buying side and fixed-price contract relationships on the selling side or vice versa. In the empirical part of this study, we classify channel members' contract strategies along the dimensions of their IRAP and market structure.

Table 1 shows how the different combinations of these key variables are hypothesized to influence channel contract relationship behavior. It shows that spot contracting occurs on the buying and selling side, when there is a positive correlation between the cash flows on the buying and selling side and when the manager has a positive IRAP. The reason for this is that a spot contract strategy decreases risk exposure by using the "natural-hedge" effect (whereby cash flow fluctuations on the selling side (partly) neutralize the cash flow volatility on the buying side). Under these conditions, the use of fixed-price contracting on both the buying and selling side would also reduce risk exposure. Yet, whether a channel member uses spot contracts or fixed-price contracts in this situation depends on the size of the natural

hedge. If the natural hedge is large enough to reduce the net cash flow volatility sufficiently, the channel member will prefer to use the less complex natural hedge. In case of a negative IRAP, the channel member is motivated to increase or even maximize the volatility of the net cash flow stream. This can be accomplished by using asymmetric contract relationships on the buying and selling side.

Table 1 also addresses the situation when $\rho < 0$; that is, when the cash flow volatility of the buying side and selling side reinforce each other (leading to increased profit volatility). In this situation, a manager with a positive IRAP will hypothetically use fixed-price contracts on the buying and selling side. In general, we hypothesize the following:

H_1: The interaction between a channel member's IRAP profile and market structure is related to the probability of using a particular channel contract strategy.

Based on Table 1, we can refine H_1 as follows:

H_{2A}: If a channel member's IRAP is positive and natural hedge market structures exist ($\rho > 0$), spot contracts on both the selling and buying side will be the dominant channel contract strategy (upper left cell of Table 1).

H_{2B}: If a channel member's IRAP is negative and natural hedge market structures exist ($\rho > 0$), asymmetric channel contract relationships will be the dominant channel contract strategy (upper right cell of Table 1).

and

H_{3A}: If a channel member's IRAP is positive and *no* natural hedge market structures exist ($\rho < 0$), fixed-price contracts on both the selling and buying side will be the dominant channel contract strategy (lower left cell of Table 1).

H_{3B}: If a channel member's IRAP is negative and *no* natural hedge market structures exist ($\rho < 0$), spot contracts on both the selling and buying side will be the dominant channel contract strategy (lower right cell of Table 1).

D. Channel Power

The type of trading strategy used by channel members may also depend on their channel power. Consistent with El-Ansary and Stern (1972) and Frazier (1983), power is defined as the ability of one channel member to influence another's marketing strategy. In the context of this study, power can be used to influence the price term in a contract on two dimensions—the price level and the price variability

(Gaski and Nevin 1985; Kale 1986; Anderson, Lodish, and Weitz 1987; Frazier, Gill, and Kale 1989; and Buchanan 1992). In this study, power refers to a channel member's ability to influence the price discovery process in the channel. If a channel member can influence the price formation process, he or she is said to have power.[6]

Channel members who exert power over the price formation process can do so on two dimensions. First, they can influence prices, by trying to realize the highest (lowest) price level possible when selling (purchasing). Second, risk-averse channel members with a market structure of $\rho < 0$ who perceive risk (i.e., with positive IRAP) can try to reduce net cash flow variability by shifting the price risk to other channel members by using fixed-price contracts. In contrast, channel members with a negative IRAP will instead use risk-shifting power to accumulate risk in this situation. Hence, we expect the influence of IRAP on channel contract strategy to increase as channel power increases:

H_4: The more (less) power the channel member has, the larger (smaller) the effect of IRAP on the probability of using a particular channel contracting strategy.

IV.   Research Method

A.   Empirical Domain

To test the proposed hypotheses effectively, we needed a channel context with minimal channel coordination, minimal channel integration, and multiple channel members at multiple channel levels. Also we needed a competitive environment with a wide range of heterogeneity among the channel members. The Dutch pork industry was found to meet all these requirements. It consists of three types of channel members: producers (hog farms, where piglets are raised to slaughter-ready hogs), wholesalers (wholesalers of live hogs), and processors (slaughterhouses, which are usually also meat packers), who sell their meat products to the retailers.

Producers face an oligopolistic market structure on the buying side (there are relatively few suppliers of mixed feed) and a competitive market structure on the selling side (there are relatively many wholesalers). Wholesalers face a competitive market on the buying side and a oligopolistic market structure on the selling side (there are relatively few processors). Processors also face a competitive market on the buying side (there are relative many wholesalers), and an oligopolistic market

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6. The channel member's power to influence the price term of a contract may come from the fact that the channel member is able to manipulate other contract terms, such as place or time of delivery, and quality (e.g., Betancourt and Gautschi 1998).

structure on the selling side (there are only five large retail organizations that buy meat products from processors in the Netherlands).

The producers are heterogeneous as to their production methods, and they use either an "open production system" (OPS) or a "closed production system" (CPS). In the OPS, both piglets and feed is purchased, and piglets are then raised to slaughter hogs in three months. The CPS is similar to the OPS, except that in CPS the producer breeds the piglets instead of buying them. The "production" process of wholesalers is rather simple and homogeneous: they trade the hogs and serve as intermediaries between producers and processors. Processors have rather homogeneous production processes, although innovations in slaughtering techniques may cause some small differences in labor productivity (computer-guided cutting equipment versus manual labor). Since we study behavior on the level of the individual channel member, we can test the relationship between market structure and members' channel contracting behaviors empirically.

B. Sample and Data Collection Procedure

The Dutch pork industry consists of 20,000 hog farmers, 150 hog wholesalers and 65 slaughterhouses. A sample was randomly drawn from directories kept by the Dutch Agricultural Association for hog farms, the Dutch Union of Livestock Wholesalers, and the Dutch Pork Association, for the processors. Before sending a written request to participate in the computer-guided interview, preliminary phone calls were made to assure up-to-date contact information and to obtain precommitment for completing the study (Sudman and Wansink 2002). Response rates were 80% among producers ($n = 128$), 60% among wholesalers ($n = 50$), and 60% among processors ($n = 30$). The personal computer-guided interview was developed and 30 test interviews were conducted to ensure that the questions were interpreted correctly. All interviewers had prior experience and were trained in the assessment procedures. The interviews took place at the channel member's enterprise and were conducted during the first half of 1998. The interviews lasted about 35 minutes, during which the channel members worked through several assignments and questions.

C. Measures

1. Spot Contracts versus Fixed-price Contracts

It was coded whether channel members used fixed-price contracts or spot transactions with their main contract parties, for both the selling and the buying side.[7] Fixed-price contracts, in this context, refer to

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7. In the Dutch hog industry, managers usually purchase or sell all their products through either fixed-price contracts or the spot market. Mixed strategies are scarce.

agreements in which prices are determined before delivery or reception of the commodity. Spot contracts refer to sales or purchases in the spot market, where transaction and price determination take place at the same moment.

2. Channel Members' Market Structures

Channel members were asked to indicate whether the cash flow streams of the buying and selling side generated by their main contract party were moving together (e.g., positive correlation), had no relation (e.g., correlation of zero), or were moving in opposite directions (e.g., negative correlation). We divided the market structure into two classes: 1) a structure with a natural hedge present (e.g. positive correlation) and 2) a structure without a natural hedge (e.g., no correlation or negative correlation).

3. Channel Power

Following the work of Butaney and Wortzel (1988), we focused on the perceived market power of the channel members in determining the allocation of power between the channel members. Brown, Johnson, and Koening (1995) found that the direct approach of measuring channel power resulted in measurements with good construct validity. Therefore, the power perceived by a channel member was measured by asking him or her to indicate the perceived extent to which he or she has power over the price discovery process (relative to the other channel member). To obtain an accurate measurement, each respondent was asked to distribute 100 points among his or her own enterprise and the other channel member, where more points indicated more power.

V. Assessing Risk Attitude, Risk Perception, and IRAP

The IRAP cannot be measured directly because of its composite structure (i.e., the combination of risk perception and risk attitude). In the context of our study, risk perception refers to the risk that managers perceive with respect to their profits (net cash flow stream). Risk attitude is a domain-specific concept (MacCrimmon and Wehrung 1986; March and Shapira 1992). Since our domain constitutes both purchasing and sales transactions, we elicited risk attitude in the domain of financial (market) risk. While the two concepts, risk attitude and risk perception can easily be discerned in a theoretical perspective, operationalization of the two concepts is a challenge. Following Pennings and Smidts (2000), we used a revealed behavior method to elicit risk attitude. In this method the channel member's utility function is elicited and the curvature of the utility function is used as a measure for risk attitude. This elicitation procedure is conceptually

consistent with the Pratt and Arrow framework outlined in Section II, yet it uses a scaling procedure to measure risk perception.[8] We will now first describe the risk perception and risk attitude measures, followed by the IRAP measure.

A. Risk Perception

We measured risk perception through a scale that we developed according to the iterative procedure recommended by Churchill (1979). First, based on the literature, we generated a large pool of items, taking care to tap the domain of the risk perception construct as closely as possible. Next, we tested the items for clarity and appropriateness in personally administered pretests with 30 channel managers. The respondents were asked to complete a questionnaire, to provide general feedback, and to indicate any ambiguities or other difficulties in responding to the items. Based on their feedback, we eliminated some items, modified others, and developed additional items. The resulting scale measures the extent to which channel members perceive their own financial performance (which is reflected in their net cash flow stream) as risky. The composite reliability (α) is 0.82, indicating a reliable construct measurement (e.g., Hair et al. 1998). (See Appendix B for a detailed description of the scale).

B. Risk Attitude

In this study, we have used the recent findings of Pennings and Smidts (2000) and Pennings and Garcia (2001) to measure risk attitude, as related to the expected utility model (von Neumann and Morgenstern 1947). In the expected utility model, the curvature of the utility function $u(x)$ reflects risk attitude (Keeney and Raiffa 1998). Fundamental to this approach is that the utility function, and hence, risk attitude, is assessed through the certainty equivalence method by means of lotteries.[9]

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8. Some researchers have measured risk perception by assessing the probability function of respondents, using the interval technique (see for an application Smidts (1997), and for a detailed description of these techniques Farquhar (1984), and Hershey and Schoemaker (1985)). A drawback of this measurement is that it requires a great deal of effort and time from the respondents, and it is extremely costly when conducted on a large scale.

9. In the certainty equivalence method (cf. Keeney and Raiffa 1998), the respondent compares the lottery $(x_l, p; x_h)$ with a certain outcome, where $(x_l, p; x_h)$ is the two-outcome lottery that assigns probability p to outcome x_l and probability $1-p$ to outcome x_h, with $x_l < x_h$. The certain outcome is varied until the respondent reveals indifference (this certain outcome is denoted by CE(p)). By application of the von Neumann-Morgenstern utility $u(x)$ we obtain: $u(CE(p)) = pu(x_l) + (1-p)u(x_h)$. When eliciting utilities, two outcomes are fixed first, such that the range of outcomes between them includes all outcomes of interest. Second, one may set $u(x_L) = 0$ and $u(x_H) = 1$ where x_L and x_H denote the upper and lower bound respectively of the outcome range. The certainty equivalence method used in this study concerns a bisection framework by only using probability 0.5. First, the certainty equivalent CE(0.5) with utility 0.5 is found as above. Then the outcome CE(0.25) is

Several authors have provided conditions and useful generalizations to minimize response bias, often caused by experiments that do not match the real decision situations of the subjects under consideration (Hershey, Kunreuther, and Schoemaker 1982; Tversky, Sattath, and Slovic 1988; and Pennings and Smidts 2000).[10] Following Pennings and Smidts (2000), we constructed choice sets that closely match the choices that these channel members make on a daily basis. The dimensions of the ''lottery'' constitute an important design issue. Specifically, what probability and outcome levels should be used to elicit risk preferences? Consistent with the financial literature perspective that prices follow a random walk path (prices can go up or down with equal probability), we used a probability of 0.5 to express this random walk (Working 1934; Kendall 1953; and Cargill and Rausser 1975). Since Dutch hog prices have fluctuated between 2.34 and 4.29 Dutch Guilders during the period 1990–1998, this range is used in our experimental design. The certainty equivalence technique was computerized. Channel members could select between a lottery, a fixed price, or they could state their indifference. Alternative A consisted of a 50/50 lottery. Alternative B consisted of a fixed price, whereby the initial fixed price was randomly generated by the computer within the initial upper and lower bounds. Alternative C consisted of the statement that they were indifferent to alternative A or B. For each lottery, the channel member was asked to assess the fixed price (i.e. the certainty equivalent) by choosing between A or B, until the channel member chose C, after which a new lottery would start. As such, the assessment of the certainty equivalent was an iterative process.

The measurement procedure took approximately 20 minutes. Nine points of the utility curve were assessed. Based on the assessed utility curve, the Pratt-Arrow coefficient of absolute risk aversion was derived as a measure of risk attitude. The widely-used negative exponential function was fit to each subject's outcomes (Tsiang 1972).[11]

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obtained with utility 0.25 through an indifference $CE(0.25) \sim (x_L, 0.5; CE(0.5))$. The indifference $CE(0.75) \sim (CE(0.5), 0.5; x_H)$ yields certainty equivalence $CE(0.75)$, with utility 0.75, etc. Former responses to lotteries are used in the assessment of subsequent responses. A large number of CEs can be found after a sufficient number of questions, in which each question involves a bisection of a particular interval.

10. In the economics literature, Binswanger (1982) argued that biases in the elicitation procedure may come from, negative preferences toward gambling, absence of realism in the game setting, and compounding of errors in the elicitation process. Binswanger (1982) stresses the importance of choice set construction when obtaining the decision-maker's utility function. We designed the elicitation procedure such that the choice sets corresponded to the channel members' daily decisions.

11. Tsiang (1972) refers to Arrow (1971), who provides four conditions for an acceptable utility function: 1) the marginal utility of wealth is positive, 2) the marginal utility of wealth decreases with increasing wealth, 3) absolute risk aversion is constant or decreasing with increasing wealth, and 4) proportional risk aversion is constant or increasing with increasing wealth. The negative exponential function meets all four conditions.

After scaling the boundaries of this function, estimation of just one parameter is sufficient to characterize a respondent's risk attitude.[12] After having measured the risk attitude and the risk perception for each channel member, we were able to compose each channel member's IRAP. The IRAP of channel member i is calculated by:

$$IRAP_i = RA_i * RP_i \qquad (1)$$

where RA is the channel member's risk attitude (positive if the channel member is risk averse, zero if risk neutral, and negative if risk seeking), and RP the channel member's risk perception. Because risk attitude and risk perception were measured on two different scales, we standardized the risk attitude and risk perception of each channel member prior to calculating the IRAP (Nunnally and Bernstein 1994).

VI. Analysis and Results

A. Measurement Results of Risk Attitude and Risk Perception

The parameters presented in Table 2 display the curvature of the channel member's utility curve obtained through the certainty equivalence task and reflect the channel member's preference for risk. For the producers, wholesalers, and processors, the mean squared errors (MSE) of their utility curves were 0.028, 0.032, and 0.012, respectively, and their mean R-square values were 0.87, 0.87, and 0.91. This indicates a good fit with channel members' responses to the certainty equivalence tasks. Risk attitude varied widely among producers, indicating that it is not valid to assume risk aversion or risk neutrality across all producers. The same pattern was found for the wholesalers and processors. The mean risk attitude parameter (mean $\alpha = -0.462$) implies that the average producer exhibits risk-seeking behavior.[13] In contrast to the producers, we find that, on average, the wholesalers and processors are risk averse (with means of $b = 0.118$ and $c = 0.316$, respectively).[14]

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12. See Smidts (1997) for a detailed procedure regarding the estimation of the risk parameters using the negative exponential function.

13. These results are in line with previous results from Miller, Kets de Vries, and Toulouse (1982), who found that CEOs from small firms were more inclined towards risk taking. Several explanations of risk-taking behavior have been advanced depending on the specific domain. For example, Jaworski and Kohli (1993) found that responding to market developments entails some degree of risk taking. Han, Kim, and Srivastava (1998) found that greater market orientation leads to higher degrees of risky, innovative behavior.

14. The hypothesis that the means of the risk attitude measures of manufactures, wholesalers and processors are equal was rejected at the 5% level, using an ANOVA analysis, thereby further substantiating that different channel members have different levels of risk attitude.

TABLE 2   **Risk Attitude Estimates for each Channel Member**

	Producers	Wholesalers	Processors
	a	*b*	*c*
Parameter			
Mean	−0.462	0.118	0.316
Median	−0.217	0.093	0.289
st.dev.	1.232	0.669	0.796
Fit indices[a]			
Mean MSE	0.028	0.032	0.012
Mean R^2	0.872	0.874	0.913
Classification of respondents[b]			
on the basis of the t-value[c]			
Risk Averse	39%	63%	78%
Risk Neutral	4%	3%	4%
Risk Seeking	57%	34%	18%

[a] MSE = Mean Squared Error; R^2 is calculated by squaring the Pearson correlation between actual values and the values predicted from the model.
[b] If *a, b* or *c* > 0, the respondent is said to be risk averse and if *a, b* or *c* < 0, risk seeking.
[c] A respondent is classified as risk neutral when the parameter is not significantly different from zero at the $p = 0.05$ level.

Two consistency checks were built into the elicitation procedure to assess whether the channel members were consistent in their choices. Two measurements at $u(x) = 0.5$ and two measurements at $u(x) = 0.625$ were obtained in order to test the internal consistency of the assessments. If channel members responded in accordance with expected utility theory, similar certainty equivalents should result. As expected, the assessed certainty equivalents for the same utility levels were similar (pairwise test = $p > 0.99$) for both consistency measurements.

These findings support the notion that the channel members were consistent in their choices. The findings further substantiate that the research design closely resembles the real business context of the channel members, thereby minimizing response mode effects (Payne 1997; Shapira 1997).

The parameter estimates from Table 2 are illustrated in Figure 3, which shows the average utility curves for producers, wholesalers, and processors. In this figure, a convex curve (a negative parameter in the negative exponential function) indicates risk-seeking behavior, whereas a concave curve (a positive parameter in the negative exponential function) indicates risk-averse behavior.

The risk perception scores were 8.0 for producers, 7.8 for wholesalers, and 6.9 for processors. This suggests that the channel members agree that the markets in which they sell are risky (see Table 3). Implicitly, these empirical findings show that risk attitudes and risk perceptions differ across different levels in the channel. Furthermore our data indicate that channel members' risk perceptions and risk
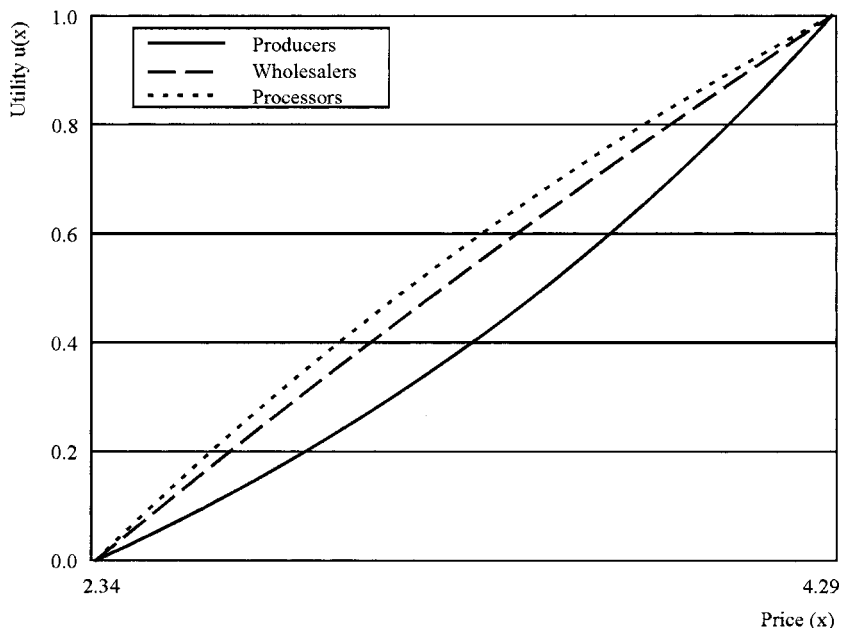
Fɪɢ. 3.—The average utility function for producers, wholesalers and processors

attitudes are not significantly correlated ($\rho = 0.16$, $p = 0.12$), confirming the conceptual notion that risk attitude and risk perception are different concepts.

B. Descriptive Findings: Actual Channel Member Behavior

In line with previous findings (Pennings and Smidts 2000), Table 4 shows that the majority of processors are risk averse and perceive risk (IRAP > 0). This is in contrast to the producers, who are willing to take risks (53.9% of the producers show a negative IRAP).

The market structure differs for the three types of channel members. Wholesalers are operating in a market structure dominated by a natural hedge situation. This might be explained by the fact that wholesalers

TABLE 3   **Results of Risk Perception Scale** [1]

	Producers	Wholesalers	Processors
Mean	8.05	7.77	6.89
Median	5.00	7.00	6.00
Standard Deviation	1.67	2.13	2.23

[1] The average sum score of the risk perception scale is presented (some items were re-coded, so that a relatively high score indicates the perception of relatively high levels of risk). See appendix B for a detailed description of the scale.

TABLE 4   **Characteristics of Sample & Channel Members' Contract Relationships**

	Producers (n =128)	Wholesalers (n =50)	Processors (n =30)
IRAP			
• IRAP > 0 (n =103)	46.1%	50.0%	63.3%
• IRAP < 0 (n =105)	53.9%	50.0%	36.7%
Market Structure			
• Natural hedge situation	42.2%	80.0%	53.3%
• No natural hedge situation	57.8%	20.0%	46.7%
Channel Power (self-perceived)			
• Low channel power	51.6%	52.0%	36.7%
• High channel power	48.4%	48.0%	63.3%
Channel Contract Relationship			
• Spot contracting on both buying and selling side	28.9%	24.0%	16.7%
• Fixed-price contract relationships on both the buying and selling side	39.1%	34.0%	50.0%
• Asymmetric contract relationships	32.0%	42.0%	33.3%

only move the product through the chain, without minimal modifi-cation. Producers and processors face both natural and non-natural hedge situations. Market channel members at the same level in the channel (producers, wholesalers or processors) show greater homo-geneity in the correlation between input and output cash flows (ρ) than across the three channel categories. The extent of homogeneity of ρ within a channel category varies with the variation in cost structures (reflected in the production systems employed) of these channel mem-bers. The homogeneity in the correlation between input and output cash flows (ρ) for wholesalers is explained by the fact that they face a similar market structure and have similar cost structures. Producers and pro-cessors show less homogeneity in ρ because of more dissimilarities in the cost structures.

The majority of producers perceive their channel power as low, whereas a majority of the processors believe that they have power in the marketing channel.

The differences in market structures and IRAP profiles among the three types of channel members are played out in different chan-nel contract relationship strategies. Interestingly, all types of channel contract strategies are employed by the three types of channel mem-bers, showing that the heterogeneity in channel contract relationship strategies is not solely driven by the type of channel member, but also by risk behavior (IRAP profile) and environment (market structure).

C. Procedure for Testing the Hypotheses

To test the hypotheses reflected in Table 1, we classified the re-spondents according to their channel contract strategy, IRAP, market

structure, and channel power. Respondents were classified as having relatively low power, if they had allocated less than 50 points to themselves (and hence more than 50 points to their trading partner), and as having relatively high power, if they had allocated more than 50 points to themselves. Table 5 shows the observed frequencies of channel members using spot contracting on both the buying and selling side, fixed-price contracting on both the buying and selling side, or asymmetric contract relationships. This study was designed so that the hypotheses, as reflected in Table 1, could be related to the empirical results in Table 5. The market structure of the majority of the channel members was characterized by the presence of a natural hedge; that is, there was a positive correlation between the cash flow streams generated by selling and buying activities. This phenomenon occurs often in commodity channels in which products are "moved" through the channel with little modification. Indeed, we have found that natural hedges are more common among wholesalers than for producers and processors.

D. *IRAP, Market Structure and Their Influence on Contract Behavior*

Consistent with H_{2A}, Table 5 clearly shows that the majority of channel members with IRAP > 0 engage in spot contracting relationships on both the selling and the buying side (87%) if a natural hedge is present. Using a one-sample multinomial test (Bain and Engelhardt 1987), the correctly-classified hypothesized contract relationships were found to be significant.[15] Consistent with H_{2B}, the majority (78%) of the channel members with IRAP < 0 choose asymmetric contracting relationships in a natural hedge situation. Again, the correctly-classified channel contract relationships were found to be significant. The results confirm the general hypothesis (H_1) that the interaction between IRAP profile and market structure drives channel contract relationships on both the buying and selling side.

Consistent with H_{3A}, if no natural hedge is present in the market structure (lower part of Table 5), the majority of channel members (92%) with IRAP < 0 choose fixed-price contract relationships on both the buying and selling side. In contrast, the majority of channel members (72%) with IRAP > 0 chose spot contracting on both the buying and

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15. There are c possible types of channel relationships, $A_1, A_2, \ldots, A_c$. In our case $c = 3$ and A_1 = spot contract relationships on both the selling and buying side; A_2 = fixed-price contract relationships on both the buying and selling side; A_3 = Asymmetric contract relationships in a sample of size n (the sum of a column in Table 5). Let $o_1, \ldots, o_c$ denote the number of observed outcomes of each channel member. We assume probabilities $P(A_j) = p_j$, $j = 1, \ldots c$, where $\sum_{j=1}^{c} p_j = 1$, and we wish to test the completely specified hypothesis H_0: $p_j = p_{jo}, j = 1, \ldots c$. Under H_0 the expected values for each type are given by $e_j = np_{jo}$. The chi-square statistic can then be written as: $x^2 = \sum_{j=1}^{c}(o_j - e_j)^2/e_j$. The limiting distribution of this statistic is chi-squared with $c = 1$ degrees of freedom, so an approximate size α test is to reject H_0 if $x^2 > x^2_{1-\alpha}$ (c − 1).

TABLE 5   Classification of Channel Members' Channel Contract Relationships by IRAP, Market Structure and Channel Power

Market Structure	IRAP > 0 (n = 103)			IRAP < 0 (n = 105)		
ρ > 0 (Natural hedge exists)						
Incidence of Channel Contract Relationships:	All channel members	Low-power members	High-power members	All channel members	Low-power members	High-power members
Spot contracting on both buying and selling side	27*	12*	15*	5	5	0
Fixed-price contract relationships on both the buying and selling side	2	2	0	12	12	0
Asymmetric contract relationships	2	1	1	62*	43*	19*
Correctly classified channel members	87%	86%	94%	78%	72%	100%
ρ ≤ 0 (No natural hedge exists)						
Incidence of Channel Contract Relationships:	All Channel members	Low-power members	High-power members	All channel members	Low-power members	High-power members
Spot contracting on both buying and selling side	3	2	1	18*	12*	6*
Fixed-price contract relationships on both the buying and selling side	66*	12*	54*	3	3	0
Asymmetric contract relationships	3	2	1	5	0	0
Correctly classified channel members	92%	75%	96%	72%	86%	100%

* Indicates that the percentage of correctly classified channel members, based on the observed contract relationship, is significant at $p < 0.05$, employing a one-sample multinomial test (e.g. Bain and Engelhardt 1987).

selling side (H$_{3B}$). Here too, the correctly-classified channel contract relationships were found to be significant.[16] Interestingly, channel members with a negative IRAP profile show risk-increasing channel contract behavior. A comment from one of the channel members who operates in a market structure without natural hedges and who uses spot contracting relationships on both the buying and selling side illustrates their motivation: "In our business, input prices and output prices do not have a positive relationship, in fact they often move in opposite directions. We use spot contract relationships on both sides, so that we may take advantage if the gap between input and output prices widens".

E. Does Channel Power Strengthen the Influence of IRAP?

Recall that H$_4$ claims that channel power strengthens the influence of IRAP. To test this, we distributed the channel members' contract relationships along the dimensions of low and high channel power, as shown in Table 5. Table 5 shows that if IRAP > 0 and a natural hedge situation exists, the percentage of correctly-classified channel contract relationships increases from 87% to 94% (compare column 2 with column 4 in upper right part of Table 5). Similar results are found for the other cases: IRAP < 0 and natural hedge situation (78% vs. 100%), IRAP > 0 and no natural hedge situation (92% vs. 96%), and IRAP < 0 and no natural hedge situation (72% vs. 100%). This confirms H$_4$. These empirical results suggest that channel members use channel power to shift risk when IRAP > 0, or they use channel power to accumulate risk when IRAP < 0.

VII. Discussion and Conclusions

Marketing has a long tradition of studying the (optimal) structure of marketing channel relationships. Concepts such as trust and channel power play an important role in this context. In contrast, finance has focused on raising and allocating financial funds. The financial performance of a firm, often expressed in terms of its capacity to generate shareholder value, has often been the dependent variable in finance research. As a result, concepts such as cash flow volatility and risk play an important role in financial literature. In this paper, we begin to integrate the principles of marketing and finance in the context of contract relationship management between suppliers and buyers. The results show that the marketing and finance approach can be tied to the channel member's IRAP profile and market structure on the buying and selling side.

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16. The number of observations in the cells corresponding to a market structure with no natural hedge and negative IRAP is lower than for the market structure characterized by a natural hedge situation, thereby weakening the Chi-square test.

Although previously neglected in the channel literature, IRAP is an important variable in trying to understand channel behavior, particularly in turbulent markets. When market researchers suspect the domain to entail some level of risk, it is recommended that they take IRAP into account when analyzing channel behavior. The impact of IRAP appears to become even more important when there is power asymmetry in the channel.

When channel members perceive risk, they use their power to either shift it away from them, when they are risk averse, or to accumulate it, when they are risk seeking. They do so through various channel contract strategies. Based on the cash flow consequences of channel contracts, we make a distinction between three types of channel contract strategies: 1) establishing spot contract relationships on both the buying and selling side, 2) establishing fixed-price contract relationships on both the buying and selling side, 3) establishing asymmetric contract relationships.

Our empirical study reveals that risk attitudes and risk perceptions differ across channel members, and that this results in different types of risk management behavior for upstream and downstream channel members. Channel contracting behavior is driven by the interaction between IRAP and the channel member's market structure on the buying and selling side.

Channel members have a wide range of risk reduction instruments and risk reduction strategies available. Knowing and recognizing the IRAP profile of other members within the channel seems valuable, since IRAP, in combination with the marketing channel member's market structure, reflects a channel member's contract preference structure. Conducting business with other channel members depends heavily on the way one expects the other channel member to behave. To gain insight into the behavioral pattern of channel members, it is necessary to understand the IRAP profile and the market structure of other channel members. In the empirical study, the IRAP profiles and the channel market structures of producers differ from that of wholesalers and processors. This results in substantially different channel contracting behavior between them.

In this study, risk perception was measured with a self-report scale, thereby lacking the advantages of the revealed-preference methods which were used to elicit risk attitude. Using a revealed-preference method for risk perception, such that the respondent's cumulative probability distribution function were elicited (e.g., Farquhar 1984; Jia, Dyer, and Butler 1999), would further enhance our measurements of IRAP and would reinforce our conclusion that IRAP is a critical variable in understanding channel behavior. An elicitation technique measuring the respondent's cumulative probability which can be

conveniently applied in a channel setting is the interval technique.[17] This technique can be used for encoding the channel member's subjective probability function, and is, as such, closely related to Pratt and Arrow's conceptualization of risk perception. Having elicited some points of the cumulative probability function for the channel member, one might fit a distribution function (e.g., lognormal or Weibull) to the points and use the parameters or the moments of the distribution for further analysis. Combining these results of the interval technique with the certainty equivalence technique will result in a strong predictor (i.e., IRAP) of channel contract behavior.

An important strain of channel research literature uses the transaction cost model. Usually, a channel member has the opportunity to sell or buy his or her goods through different marketing channels, such as traders, wholesalers, retailers, or even to sell directly to the final customer. This choice of distribution channel, therefore, determines the extent of price risk exposure. When selling or buying, we expect channel members to choose marketing channels that fit their IRAP profiles. Klein, Frazier, and Roth (1990) found the transaction cost model to have low predictive power in classifying export firms in terms of their channel choices. This suggests that such a model might be incomplete (cf. Heide and John 1988). Given this flaw in the transaction cost model, IRAP could be a valuable complement that may increase its predictive accuracy. Moreover, this integration of IRAP into the transaction cost model is supported by the literature on market entry, which suggests that factors related to political and economic risks influence channel integration and channel choice (Keegan 1984).[18]

Appendix A

The Role of the Interaction between Risk Attitude and Risk Perception in Risk Management

In Pratt and Arrow's work, risk management, reflected in the risk premium π, is a function of risk attitude (risk aversion r), the situation (base wealth W) and

perceived risk (with a mean of $\bar{\varepsilon}$ and variance σ^2 of source of additional wealth ε). In their analysis, risk management is determined by the statement that the risk premium leaves the decision-maker indifferent between holding the perceived risky asset or holding its mean value minus the risk premium. That is, $EU(W + \varepsilon) = EU(W + \varepsilon - \pi)$, where EU is the expected utility. In the expected utility model this translates into:

$$EU(W + \varepsilon) = \int U(W + \varepsilon)f(\varepsilon)d\varepsilon = U\left(W + \int \varepsilon f(\varepsilon)d\varepsilon - \pi\right), \quad \text{(A1)}$$

where $U(.)$ is the von Neumann-Morgenstern utility function and $f(.)$ the probability density function of additional wealth ε. By taking Taylor series approximation around W, the behavioral equation is approximately equivalent to

$$EU(W + \varepsilon) = U(W) + U'(W) \int \varepsilon f(\varepsilon)d\varepsilon + \frac{1}{2}U''(w)\int \varepsilon^2 f(\varepsilon)d\varepsilon$$

$$= U(W) + U'(W)\left\{ \int \varepsilon f(\varepsilon)d\varepsilon - \pi \right\}. \quad \text{(A2)}$$

For simplicity, assume that $\bar{\varepsilon} = 0$, then, solving for the behavioral risk premium, we obtain

$$\pi = \frac{1}{2}\int \varepsilon^2 f(\varepsilon)d\varepsilon \frac{-U''(W)}{U'(W)} \quad \text{(A3)}$$

which can be written as:

$$\pi = \frac{1}{2}\sigma^2 r(W), \quad \text{(A4)}$$

where $r(W) = -U''(W)/U'(W)$, the Pratt-Arrow coefficient of absolute risk aversion. From (1)–(4), it follows that risk management behavior depends on the interaction of perceived risk and risk aversion. The right hand side of expression (4) for the behavioral risk premium equals IRAP, that is IRAP $\equiv \sigma^2 r(W)$.[19]

Appendix B

Description of Risk Perception Scale

Confirmatory factor analysis was used (using LISREL 8) to examine the measurement quality (Jöreskog and Sörbom 1993). In this study, channel members

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19. We thank James Hess for his discussion.

were asked to indicate their agreement with the following items through a nine-point scale ranging from "strongly disagree" to "strongly agree":

1) I am able to predict hog prices
2) The hog market is not risky at all
3) I am exposed to a large amount of risk when I am buying/selling hogs

Construct Reliability: 0.82

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