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ENTERPRISE RISK MANAGEMENT: THE CASE OF UNITED GRAIN GROWERS

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For many corporate risk managers, "risk management" refers to the management of so-called "pure" risks, such as losses arising from property damage, liability suits, and worker injuries. These risks are typically managed individually through a combination of loss control (efforts to reduce the likelihood or magnitude of losses) and loss financing (either with internal funds or through the purchase of insurance). To many *financial* managers, however, risk management refers to the management of *price* risks, such as exchange rate risk, interest rate risk, commodity price risk, and credit risk. These risks are usually managed through derivative contracts, such as options, forwards, futures, and swaps. Most corporations manage financial risks separately from pure risks, often within different departments, and the terminology and methods used in price risk management differ from those used in pure risk management.

In the latter part of the 1990s, however, many consultants and risk management professionals began to question this "silo" approach to risk management. They argued that a firm should identify and (when possible) measure *all* of its risk exposures—including operational and competitive risks—and manage them within a single *unified* framework. This idea came to be known as enterprise risk management (ERM). To facilitate ERM, some corporations established a new position—the chief risk officer.[1]

United Grain Growers (UGG), based in Winnipeg, Manitoba, was one of the first corporations to change its risk management practices to reflect ERM. UGG provides commercial services to farmers, and markets agricultural products worldwide. Although UGG hedged most of its currency and commodity price risk and purchased insurance against property and liability losses, its earnings continued to exhibit substantial volatility. After an extensive risk identification and measurement process, UGG's managers found that the firm's earnings volatility was largely attributable to volatility in the volume of grain that it shipped, which in turn was heavily affected by variation in weather. The firm considered using weather derivatives to hedge the risk, but instead entered into an insurance contract that provided payment to UGG if its grain volume was unexpectedly low in a given year. The innovative structure of this contract mitigates moral hazard by basing payoffs not on UGG's grain shipments but on industry grain volume. In addition, the contract bundles UGG's grain volume coverage with its traditional insurance coverages. In this fashion, UGG integrated its insurance coverage for pure risk with a previously unhedged operational risk.

In the next section, we discuss the potential advantages and disadvantages of ERM. We then go on to describe the ERM process at UGG and the initial outcome of the ERM process—UGG's innovative insurance transaction. We conclude with a discussion of the lessons to be learned from UGG's experience with ERM, and of the extent to which the approach used by UGG could prove useful in other contexts and in other firms.

*The authors appreciate the information and time provided by managers at United Grain Growers (especially Mike McAndless and Peter Cox) and Willis Group Ltd. (Jim Davis, Michelle Bradley, and John Bugalla), the research assistance from Tae Ho, and the travel support from the Spencer Educational Foundation.

1. Examples include St. Paul, Duke Energy, and Credit Agricole Indusuez; see James Lam, "The CRO Is Here to Stay," *Risk Management*, April 2001, pp. 16-22.

ENTERPRISE RISK MANAGEMENT

Before discussing the potential advantages and disadvantages of ERM, it is useful to step back and review why risk reduction can increase value for well-diversified shareholders—investors for whom a loss in one investment is generally offset by a windfall in another. The well-known Modigliani and Miller proposition tells us that, in a perfect capital market, the method used to finance losses—whether it be internal funds, new equity capital, new debt capital, insurance indemnity payments, or payoffs from derivative contracts—does not affect firm value. The explanation for how risk reduction can add value must be found in the various market imperfections faced by firms, principally transaction costs, taxes, and the costs of financial distress.

Modern risk management theory posits that risk reduction can add value to well-diversified shareholders (1) by reducing the likelihood that the firm will have to raise costly external capital, which in turn can influence investment decisions, (2) by reducing expected tax payments because of different marginal tax rates at different levels of income or because certain institutions are taxed differently (such as insurers versus non-insurers), or (3) by reducing the likelihood of financial distress, which in turn can improve contractual terms with other parties such as employees, suppliers, debtholders, and customers.[2] These explanations for why risk reduction adds value do not depend on the source of risk. The theory holds regardless of whether the variation in cash flows or earnings arises from pure risks, price risks, or some other type of risk.

To illustrate, consider the first reason for risk reduction listed above—the desire to avoid raising costly external capital. Assume that a firm has an investment project that requires an initial investment of $50 million and that the project has a net present value of $5 million if financed with internal funds. Suppose, however, that the cost of raising external capital (transaction costs and underwriter underpricing costs) would exceed the net present value of the project. Without available internal funds, the firm might forgo the project.

Now step back in time and consider the firm's decision to hedge its currency risk or liability risk exposures. The managers know that an unexpected reduction in internal funds might cause the firm to forgo the new project, regardless of whether the reduction in funds arises from a judgment in a liability suit or a change in exchange rates that caused lower than expected cash flows. Consequently, if an unexpected reduction in internal funds occurs, shareholders would experience a loss beyond the direct cash flow loss; they would also lose the net present value of the new project. For this reason, reducing the likelihood of large losses (by purchasing liability insurance and by hedging currency exposures) can increase shareholder wealth, although the cost of insuring or hedging the risk must be factored in.

The Silo Approach Can Be Inefficient

While the previous discussion implies that risk reduction can be value enhancing, insuring or hedging each risk exposure separately can be inefficient. Under some circumstances, companies would be better off insuring (hedging) bundles of exposures.

Saving on Transaction Costs. Negotiating, writing, and purchasing insurance and derivative contracts involve transaction costs for both the provider and the purchaser of the hedging vehicle. If there are fixed costs associated with this process, then using a single contract that covers multiple sources of risk can reduce transaction costs.

Bundling exposures for risk transfer purposes can also reduce *proportional* transaction costs, although the argument is slightly more complex. To illustrate with a simple example, suppose that a firm's cash flows are subject to two uncorrelated sources of variability—liability risk and exchange rate risk. The distribution for liability losses is as follows:

$$\text{Liability Loss} = \begin{cases} \$50 \text{ million with probability } 0.02 \\ \$25 \text{ million with probability } 0.04 \\ \$0 \text{ million with probability } 0.94 \end{cases}$$

For simplicity, assume that the losses from exchange rate risk have the same distribution:

2. For further discussion, see Kenneth Froot, David Scharfstein, and Jeremy Stein, "A Framework for Risk Management," *Journal of Applied Corporate Finance*, Vol. 7 (Fall 1994), pp. 22-31; and Rene Stulz, "Rethinking Risk Management," *Journal of Applied Corporate Finance*, Vol. 9 (Fall 1996), pp. 8-24. Efficiencies associated with bundling risk bearing services with other services (such as loss control and claims processing) can also be a source of value creation; see Neil Doherty and Clifford Smith, "Corporate Insurance Strategy: The Case of British Petroleum," *Journal of Applied Corporate Finance*, Vol. 6 (Fall 1993), pp. 4-15.

In the latter part of the 1990s, many consultants and risk management professionals began to question the "silo" approach to risk management. They argued that a firm should identify and (when possible) measure *all* of its risk exposures—including operational and competitive risks—and manage them within a single *unified* framework.

$$\text{Exchange Rate Loss} = \begin{cases} \$50 \text{ million with probability } 0.02 \\ \$25 \text{ million with probability } 0.04 \\ \$0 \text{ million with probability } 0.94 \end{cases}$$

To capture the idea that corporate hedging programs are designed mainly to avoid large losses, assume that the managers do not want total retained losses to exceed some critical value, say $40 million (perhaps because the firm would then violate a debt covenant or be forced to raise costly external capital).[3] The firm can insure or hedge the loss exposures to achieve its objective, but assume that the contracts are priced so that the firm must pay 120% of the contract's expected payout, implying a 20% loading or transaction cost. This transaction cost can make the cost of separately managing each exposure greater than the cost of managing the bundled exposure.

If the firm hedges each exposure separately, it can achieve its objective (total retained losses less than $40 million) by purchasing a contract on each exposure that reimburses the firm for losses in excess of $20 million.[4] In insurance jargon, the firm would want to purchase $30 million of coverage excess of $20 million. In the language of options, the firm would want to purchase an option "spread"—that is, buy a call option with an exercise price of $20 million and sell a call option with an exercise price of $50 million. The expected payout on either contract equals

$$(\$30 \text{ million} \times 0.02) + (\$5 \text{ million} \times 0.04) = \$600{,}000 + \$200{,}000 = \$800{,}000.$$

Therefore, the transaction costs on each policy would equal $160,000.

Panel A of Table 1 summarizes the results of purchasing separate contracts on each exposure. The first four columns list all the possible combinations of outcomes and the associated probabilities. The later columns indicate the coverage provided by the separate contracts. Recall that the firm was willing to retain losses of up to $40 million. If the coverage provided by the separate contracts results in a payout from the counterparty (insurer or option writer) and retained losses are less than $40 million, then the firm has purchased coverage that, after the fact, it did not really need. For example, if there is a $50 million liability loss and no exchange rate loss, the insurance company pays $30 million and the firm absorbs $20 million. But the firm was willing to absorb $40 million, and so it paid for $20 million in "redundant" coverage—coverage that was not really required. The final column indicates the amount of redundant coverage. Since there are positive transaction costs associated with purchasing the coverage, the extra coverage is an unnecessary expense.

Now suppose that the firm could purchase a contract that would indemnify the firm based on *total* losses. To achieve its objective of absorbing losses of only up to $40 million, the firm could use one contract with an aggregate retention level of $40 million and an aggregate limit of $60 million. The outcomes with this contract are summarized in Panel B of Table 1. With such a contract, there is no "redundant" coverage. The expected payout on such a policy is $472,000, which makes transaction costs equal to $94,400 (0.2 × $472,000). The firm achieves its desired coverage, but at a lower cost ($94,400 vs. $320,000) when total losses are indemnified in aggregate versus indemnifying individual losses separately.

This example illustrates that an important benefit of viewing all the firm's exposures in the same framework and structuring contracts based on aggregate exposures is that the firm purchases "better" coverage; that is, the firm is less likely to purchase costly redundant coverage.[5]

Moral Hazard. A completely bundled policy would have only an aggregate retention level and an aggregate limit; consequently, the source of a loss would not matter for the contract's payoff. The problem with such a policy, however, is that once a firm's aggregate retention level were reached, any additional loss (up to the aggregate limit) would be covered. Such a policy would therefore greatly reduce the insured's incentive to reduce additional

3. More generally, managers could be assumed to have some value-at-risk constraint, as when they want the probability that losses exceed $40 million to be less than one percent.

4. Other combinations of contracts would also achieve the stated objective, but the point of the example would be unchanged.

5. Obtaining the desired coverage using separate insurance policies is analogous to purchasing a portfolio of two separate options, and obtaining the desired coverage using one bundled insurance policy is analogous to purchasing one option on the portfolio of risks. The option on the portfolio will have lower volatility and therefore have a lower price (expected payout is lower). With proportional transaction costs, the firm is better off purchasing the option on the portfolio as opposed to the portfolio of options.

TABLE 1

PANEL A: OUTCOMES FROM HEDGING TWO EXPOSURES WITH SEPARATE CONTRACTS ($ MILLIONS). RETENTION FOR EACH EXPOSURE IS $20 MILLION AND COVERAGE LIMIT IS $30 MILLION.

Liability Loss	Exchange Rate Loss	Total Loss	Probability	Liability Coverage	Exchange Rate Coverage	Total Coverage	Total Retention	Redundant Coverage
0	0	0	0.8836	0	0	0	0	0
25	0	25	0.0376	5	0	5	20	5
50	0	50	0.0188	30	0	30	20	20
0	25	25	0.0376	0	5	5	20	5
25	25	50	0.0016	5	5	10	40	0
50	25	75	0.0008	30	5	35	40	0
0	50	50	0.0188	0	30	30	20	20
25	50	75	0.0008	5	30	35	40	0
50	50	100	0.0004	30	30	60	40	0
Expected Value =				0.8	0.8	1.6	2.4	1.128

PANEL B: OUTCOMES FROM HEDGING TWO EXPOSURES WITH ONE CONTRACT ($ MILLIONS). AGGREGATE RETENTION IS $40 MILLION AND AGGREGATE COVERAGE LIMIT IS $60 MILLION.

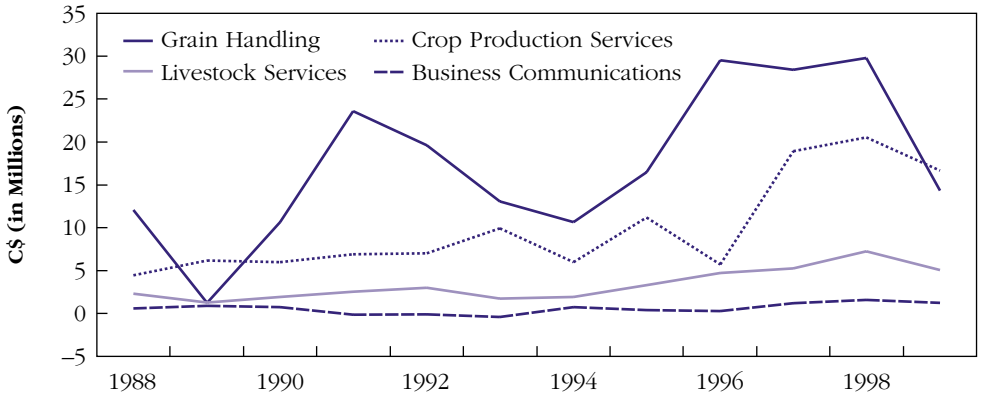
Liability Loss	Exchange Rate Loss	Total Loss	Probability	Combined Coverage	Total Retention	Redundant Coverage
0	0	0	0.8836	0	0	0
25	0	25	0.0376	0	25	0
50	0	50	0.0188	10	40	0
0	25	25	0.0376	0	25	0
25	25	50	0.0016	10	40	0
50	25	75	0.0008	35	40	0
0	50	50	0.0188	10	40	0
25	50	75	0.0008	35	40	0
50	50	100	0.0004	60	40	0
Expected Value =				0.472	3.528	0

losses once the retention level was reached. (An aggregate deductible would create the same problem.) Incorporating deductibles for each type of loss exposure would mitigate this moral hazard problem.

Costs Associated with a More Complex Contract. A disadvantage of bundling multiple exposures into one contract is that the parties need to have an understanding of all of the risk exposures *and* their correlations. For several reasons, the cost associated with performing this analysis can increase the transaction costs relative to those on separate contracts for each type of exposure. Since only a limited number of counterparties are likely to have the expertise to price a complicated bundled contract, the lack of competition could increase the cost of a bundled policy. Also, institutions that possess the modeling expertise to price such a policy may not have expertise in other areas, such as loss control and claims processing. A bundled policy could therefore result in a lower quality of service. Finally, there is a large body of insurance contract law that has the effect of reducing the transaction costs associated with settling coverage disputes and claims for standard policies. Until a similar body of law is developed for bundled policies, transaction costs for these policies could be higher.

Although much of UGG's current business could be characterized as a commodity business, UGG tries to distinguish itself from competitors by creating products with brand names and by providing ongoing services to customers. Stability in the firm's cash flows would increase the likelihood of being able to capitalize on past investments in brand name products and customer service.

FIGURE 1
EARNINGS BEFORE INTEREST AND TAXES FOR UGG'S FOUR BUSINESS SEGMENTS FROM 1988-1999



Understanding Risk Exposures. Perhaps the most valuable aspect of enterprise risk management is as a source of information about the firm's operating environment. Proponents of enterprise risk management suggest that the exercise of identifying and measuring all of a firm's risk exposures is useful in and of itself. It provides managers with a better understanding of their business and events that can prevent the firm from accomplishing its strategic objectives. Thus, another potential benefit of ERM is that managers will make better operating decisions as a result of having a better understanding of the firm's risk.

Consistent with this logic, several organizations concerned with corporate governance have recommended that companies engage in a comprehensive risk assessment process and manage their risks appropriately. For example, both the 1994 Dey Report issued by the Toronto Stock Exchange and the 1999 Turnbull Report issued by the London Stock Exchange recommended that boards of directors of listed corporations identify the corporation's principal risks and implement appropriate systems to manage those risks.[6]

ENTERPRISE RISK MANAGEMENT AT UGG

UGG, with 1999 revenues of 209 million Canadian dollars, was founded in 1906 as a farmer-owned cooperative, and became a publicly traded company on the Toronto and Winnipeg stock exchanges in 1993. Although UGG is a public company, it retains some of its farmer cooperative roots. The company has both members and shareholders. Members are generally farmers who do business with UGG. Although a member is not entitled to share in any profit or distribution by the company (unless the member is also a shareholder), members have control rights. Of the 15 people on UGG's board of directors, 12 must be "members" who are elected by delegates representing members from various geographical regions.

UGG has four main business segments: Grain Handling Services, Crop Production Services, Livestock Services, and Business Communications. UGG's four business units help farmers plan, produce, and market their products. Figure 1 shows earnings before interest and taxes (EBIT) for each of the business units over time. The two largest segments, Grain Handling Services and Crop Production Services, typically account for more than 80% of UGG's earnings in a given year. The figure also illustrates the substantial earnings volatility in the main business segments.

The role of UGG's Grain Handling Services unit is to identify sources of grain and oilseeds and deliver them to exporters and to domestic end users, such as food processors. In 1999, UGG was the third largest provider of grain handling services in western Canada, with about a 15% market share. Grain handling involves the operation of grain elevators to which farmers bring their production of grain and oilseeds. From the elevator, the product is shipped to a domestic consumer (a mill, for example) or to an export terminal. UGG historically owned hundreds of relatively small "country" elevators, but began replacing them in the 1990s with a smaller number of large, high-throughput, more efficient elevators.

6. See Lam (2001), cited earlier, for further discussion.

TABLE 2 ■ CONSOLIDATED FINANCIAL HIGHLIGHTS*

	1994	1995	1996	1997	1998	1999
OPERATING						
Gross profit and revenue from services	$156,030	$185,637	$198,749	$216,260	$224,953	**$209,227**
Earnings before interest, taxes and depreciation	25,538	30,573	40,198	54,788	60,577	**42,423**
Operating income	12,612	15,151	24,090	38,452	43,335	**21,636**
Earnings before income taxes and unusual items	3,772	282	8,065	24,744	31,926	**8,067**
Net earnings	153	–7,385	5,851	9,059	16,332	**3,575**
Cash flow provided by operations	12,533	16,177	21,322	32,770	35,871	**29,853**
Capital expenditures and business acquisitions	27,725	43,894	26,826	21,904	53,760	**91,002**
FINANCIAL						
Working capital	$75,028	$44,573	$71,557	$101,790	$136,155	**$119,249**
Net investment in capital assets	153,228	182,079	190,308	193,323	226,304	**287,442**
Total assets	564,043	544,284	531,416	489,214	515,209	**554,322**
Shareholders' equity	140,516	130,620	133,694	161,290	234,611	**233,182**
RATIOS						
Total debt to net assets	59.11%	57.72%	55.36%	36.01%	26.24%	**36.76%**
Return on average common equity, before unusual items	0.06%	–2.20%	4.30%	8.51%	8.69%	**1.17%**
PER SHARE						
Earnings (loss), before unusual items (net of taxes)	$0.01	–$0.24	$0.45	$0.89	$0.91	**$0.15**
Cash flow from operations	1.30	1.47	1.94	2.66	2.08	**1.72**

*For the years ended July 31; amounts are in thousands of Canadian dollars except per share amounts.

The farming industry in Canada is heavily regulated by several government agencies. The Canadian Wheat Board (CWB) markets human consumable grains on behalf of farmers. About 85% of the wheat and 45% of the barley produced in Canada is sold through the CWB. The CWB must ensure that the sales it has arranged are available to customers at the agreed-upon site and date. Thus, the CWB contracts with companies like UGG to collect, store, and deliver grains. About 60% of UGG's grain handling unit's business is on behalf of the CWB. The prices paid to farmers and the prices for storage and transportation of "board grains" are determined by the CWB. Thus, to some extent, regulation reduces volatility in the prices that UGG receives for its services, although it does pose risk associated with changes in regulation or the regulatory process.

Table 2 contains selected information from UGG's balance sheet, income, and cash flow statements. Note that UGG increased capital expenditures substantially in 1998 and then again in 1999. Most of these expenditures were for the large, high-throughput grain elevators mentioned above. Also, the percentage of the firm's total assets financed with debt increased in 1999 with the issuance of another $50 million in long-term debt.

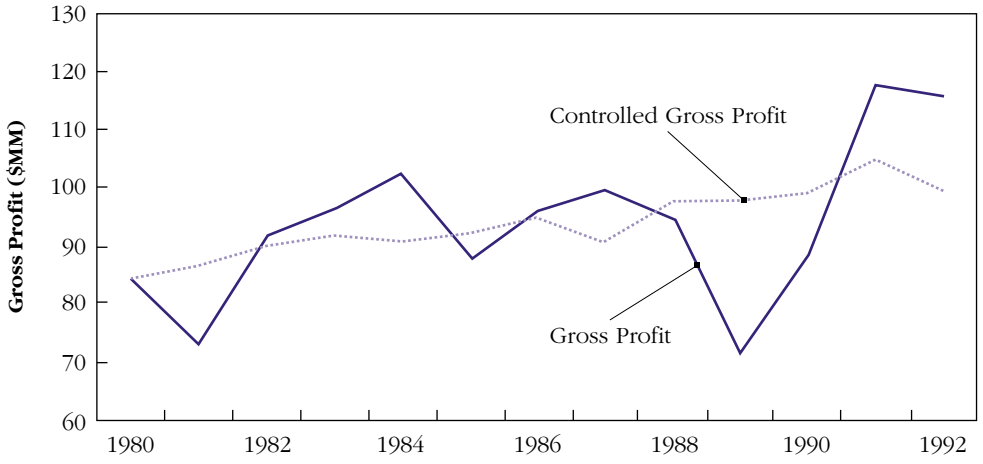
ERM Process at UGG

Several factors led UGG to investigate enterprise risk management. The previously mentioned listing requirement of the Toronto Stock Exchange was one factor. Other factors included increased requirements for disclosure of risk exposures, increased emphasis on risk management by credit rating agencies, and UGG's perception that equity analysts' recommendations were sensitive to earnings results that deviated from forecasts.

UGG started by forming a risk management committee, which consists of the CEO, CFO, risk manager, treasurer, compliance manager (for commodity trading), and manager of corporate audit

Since UGG's needs would require contracts designed specifically for UGG, the costs of hedging with derivatives would likely be high and the contracts would be illiquid. In addition, basis risk was a concern.

FIGURE 2
ACTUAL GROSS PROFIT COMPARED TO CONTROLLED GROSS PROFIT (WEATHER RISK REMOVED)



services. This committee, along with a number of UGG employees, then met with a representative from Willis Group Ltd., a major insurance broker, for a brainstorming session to identify and qualitatively rank the firm's major risks. This process identified 47 exposure areas, from which the top six were chosen for further investigation and quantification. The six risks were (1) environmental liability, (2) the effect of weather on grain volume, (3) counterparty risk (suppliers or customers not fulfilling contracts), (4) credit risk, (5) commodity price and basis risk, and (6) inventory risk (damage to products in inventory).

Willis Risk Solutions, a unit of the Willis Group Ltd., took on the task of gathering data and estimating the probability distribution of and correlations among losses from each of the six risk exposures. These probability distributions were then used to quantify the impact of each source of risk, both alone and in combination, on several measures of UGG's performance, including return on equity, economic value added (EVA), and earnings before interest and taxes (EBIT).

The analysis conducted by Willis Risk Solutions led to the conclusion that, of the six risks originally identified, UGG's main source of unmanaged risk was weather. Willis and UGG therefore focused their energies on understanding how weather affected UGG's performance. More specifically, they conducted an in-depth regression analysis of data from the period 1960-1992 on how crop yields in each province of western Canada were influenced by temperature and precipitation. Among the monthly temperature and precipitation variables, the average temperature in June and the average rainfall in July were the most significant. Of course, crop yields have increased over time, reflecting productivity gains. These three factors (June temperatures, July rainfall, and time trends) explain roughly 60-70% of the annual variation in assorted crop yields in the various provinces (see the Appendix).

The next step in Willis's analysis was to estimate the relationship between crop yields and UGG's grain volume. They found that UGG's grain volume in any given year was highly correlated with overall crop yields in the previous year, due to the natural time lag between grain growing and harvesting as well as UGG's July 31 fiscal year-end. Using UGG's internal data on gross profit per tonne of grain shipments, the analysts could then link profits to grain volume.

To summarize, the analysis established a relationship between weather and UGG's gross profit by linking weather to crop yields, crop yields to grain volume, and grain volume to profit:

Weather → Crop Yields → UGG's Grain Volume → UGG's Profit

Using these estimated relationships, Willis illustrated UGG's results by graphing its actual gross profit over time and what gross profit would have been with the effects of weather removed. Willis's graph, which is reproduced in Figure 2, shows clearly the impact of weather on UGG's earnings volatility.

UGG'S Decision on Managing Weather Risk

UGG considered three options for managing its weather risk. One approach was to maintain the

status quo and simply retain the exposure, thus subjecting earnings to large swings due to weather variation. Accepting this volatility had several disadvantages. First, UGG planned to continue making large investments in high-throughput grain elevators. The ability to finance these capital expenditures from internally generated funds would allow the firm to avoid the costs associated with raising external capital. To the extent external capital would be needed, the rate that the firm would have to pay on borrowed funds would likely be higher if it retained the weather risk. Also, since greater earnings volatility reduces the optimal proportion of the firm financed with debt, retention would prevent UGG from using more debt financing and therefore prevent it from gaining additional interest tax shields.

Although much of UGG's current business could be characterized as a commodity business, UGG tries to distinguish itself from competitors by creating products with brand names and by providing ongoing services to customers. Stability in the firm's cash flows would increase the likelihood of being able to capitalize on past investments in brand name products and customer service. In addition, the importance of supplier and customer relationships is likely to increase in the coming years as the marketplace for agricultural products adjusts to scientific advances. Analysts have predicted that over the next decade, food producers will demand specific genetically engineered crops, which in turn would require farmers to plant specific seeds. The coordination of these activities between farmers and food producers would require a sophisticated information, storage, and transportation network. Stability and experience would enhance UGG's attractiveness as a provider of these intermediary services to end users and producers.

The disadvantages of risk retention led UGG to consider hedging its exposure using weather derivatives. In 1999, the weather derivatives market was beginning to emerge. Several dealers, including Goldman Sachs, Merrill Lynch, Enron, and Duke Energy, were willing to take on weather-related risks. However, most of the existing weather derivative deals involved utilities and were based almost exclusively on heating- and cooling-degree days, or deviations in average daily temperature above and below 65 degrees Fahrenheit, respectively. Since UGG's needs would require contracts designed specifically for UGG, the costs of hedging with derivatives would likely be high and the contracts would be illiquid. In addition, basis risk was a concern. The statistical relationships linking weather variables to UGG's profit were significant, but measurement error and unexplained variation still remained.[7]

After many months of analyzing how weather affected UGG's profit, the CFO and risk manager considered an alternative approach. They reasoned that weather was important because it affected the amount of grain produced and therefore the amount of grain that UGG shipped. Therefore, perhaps it would be better to design a contract that directly reimbursed UGG when its grain shipments were lower than expected.

The obvious problem with such a contract is the moral hazard problem arising from the fact that grain shipments are in part a function of UGG's pricing and service. The solution to the moral hazard problem was to use industry-wide grain shipments as the variable that would trigger payments to UGG. Industry shipments were highly correlated with UGG's shipments, implying relatively low basis risk. In addition, relative to a contract based on weather, a contract based on grain shipments had the advantage of hedging against non-weather risks that might affect grain volume (such as regulatory policies and exchange rates). And because of its relatively low market share, UGG's shipments would have minimal effect on the value of industry-wide shipments, thus significantly reducing the moral hazard problem.

As in the case of weather derivatives, a contract based on industry grain volume would have to be designed and priced, which would be costly. One of the CFO's objectives was to manage the weather/grain volume exposure without substantially increasing the firm's risk management costs. UGG

7. Also, UGG's managers were concerned about the accounting treatment of the derivatives contracts. If the value of the derivatives contracts were marked to market at UGG's fiscal year-end, July 31, then the derivatives could actually increase the volatility of reported earnings. To illustrate, suppose that the derivatives contracts were based on weather conditions in June and July. Also suppose that in a particular year, the weather in these months indicated that crop yields would be poor and therefore that the weather derivative contract would have a positive payoff. The increased value of the derivative contract as of July 31 would then be recognized in earnings. However, the lower crop yields as a result of the bad weather in June and July would not affect operating earnings until the next fiscal year when the crops were harvested and shipped. Thus, if UGG hedged using the weather derivative, its earnings would increase in one fiscal year and decrease in the subsequent fiscal year relative to expected earnings. If UGG were unhedged, then its earnings would have dropped only in the subsequent fiscal year, leading to lower earnings volatility.

The solution to the moral hazard problem was to use industry-wide grain shipments as the variable that would trigger payments to UGG. Industry shipments were highly correlated with UGG's shipments, implying relatively low basis risk.

therefore considered integrating its grain volume "coverage" with its other traditional property and liability coverages to take advantage of the potential efficiencies from an aggregate deductible and an aggregate limit (discussed earlier). UGG asked Willis to design a risk-transfer vehicle with the desired structure and to obtain proposals from several major insurers on a bundled policy.

The Contract

Grain Volume Coverage. UGG eventually entered into an integrated policy contract with Swiss Re. According to the terms of the contract, a grain volume "loss" occurs, and UGG receives a payment from Swiss Re, if industry grain volume in a given year is lower than the average industry grain volume over the previous five-year period. Thus, the contract is essentially a put option on grain volume.

To specify the grain volume loss to UGG, the difference between the industry grain volume in the current year and the five-year average industry grain volume is multiplied by 15%, which was UGG's approximate market share. (The contract adjusts for changes in UGG's market share over time.) To translate the volume number into a dollar figure, the volume differential is multiplied by UGG's gross margin per tonne of grain shipments.

Integration of Coverages. The grain volume coverage was integrated with a number of UGG's other property and liability insurance coverages. The policy has an annual aggregate retention and limit and a term aggregate limit for the three-year policy period. Without disclosing the actual figures, the policy takes the following form: In the event UGG incurs either a property, liability, or grain volume loss, Swiss Re is obligated to compensate UGG for annual losses of up to $35 million after retention, regardless of whether the loss was a property loss, a liability loss, or a grain volume loss. The term aggregate limit provides for Swiss Re to pay losses of up to $80 million over the three-year period.

For reasons discussed earlier, the policy also specifies per-occurrence limits and retentions. Each of the separate property coverages (property in transit, extra expense, boiler and machinery) and each of the separate liability coverages (environmental impairment liability, charterer's liability) have a per-occurrence sublimit. The grain volume coverage (for which an occurrence is defined as the annual loss) has a per-occurrence (annual) limit and retention as well as a term limit. The combined property coverages also have an annual retention, as do the combined liability coverages. Within the property coverages and liability coverages, there are maintenance deductibles if the annual retentions are reached.

Figure 3 presents a conceptual view of how the insurance coverage was changed. Instead of separate retention levels and limits for each type of coverage, the new policy has retentions based on aggregate property losses and aggregate liability losses. The new policy also incorporates coverage for grain volume losses. In addition, there is an annual aggregate limit and a term aggregate limit for all the coverages.

Benefits to UGG

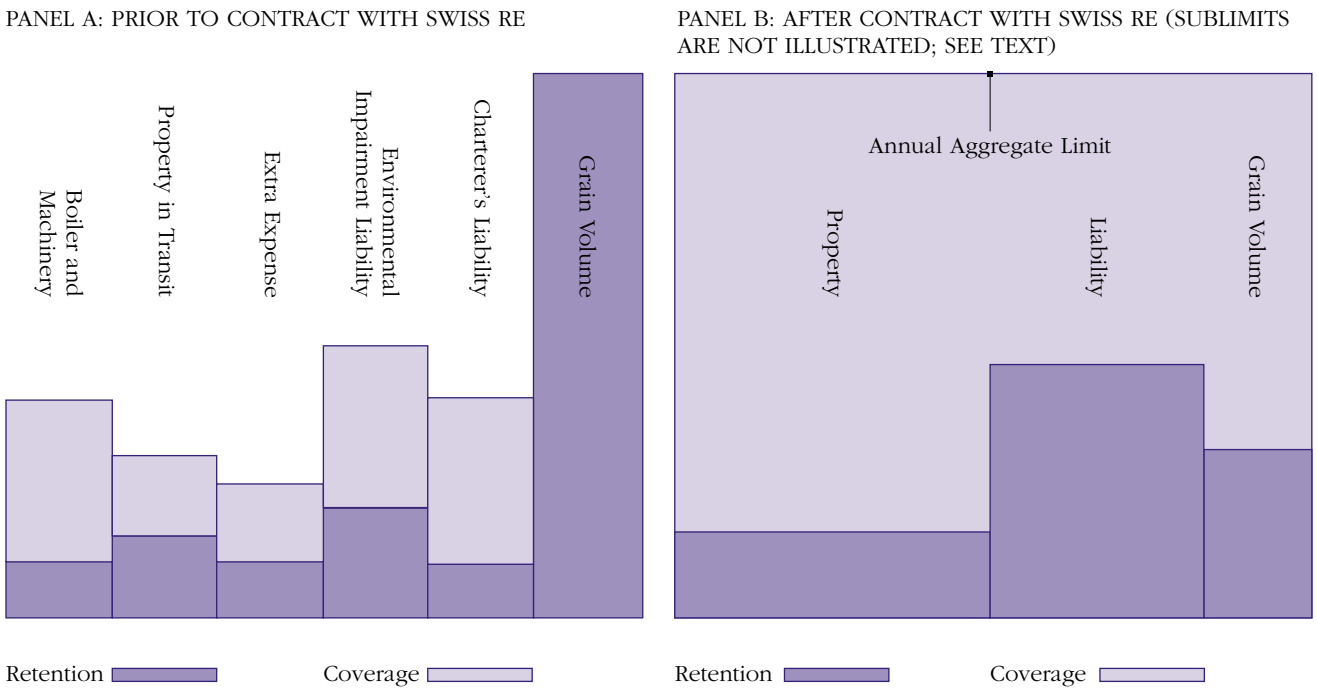
UGG managers continue to work on an enterprise approach to risk management. They view the insurance contract entered into with Swiss Re as the initial step in an ongoing process. They continue to evaluate other exposures with an eye toward integrating coverage for these exposures into their insurance contracts.

Despite its ongoing nature, UGG's initial foray into the enterprise risk management area has yielded several benefits. The insurance contract provided coverage for a risk that the firm previously did not (and could not) hedge. By hedging this risk, UGG is more likely to have the internal funds necessary to carry out its capital expenditure plan and to establish itself as a leading intermediary between farmers and end users. Also, it is in a better position to borrow additional capital and to increase its debt-to-equity ratio, and thereby benefit from additional tax shields.

These benefits were achieved without increasing the firm's cost of risk, as measured by the sum of insurance premiums and expected retained losses. The integration of the firm's insurance coverages with the grain volume coverage allowed the firm to rearrange its coverages and keep its cost of risk roughly constant.

Finally, discussions with UGG's managers clearly indicate that they found the risk identification and measurement *process* highly valuable in itself, quite apart from the decision to hedge the firm's grain volume coverage and integrate that coverage with the firm's other coverages. The managers feel that the process has given them a better understanding of the firm's risks and that communication about such risk exposures has improved within the firm.

FIGURE 3 ■ CONCEPTUAL ILLUSTRATION OF UGG'S COVERAGE



LESSONS FOR OTHER FIRMS

The characteristics of the grain handling business that make UGG's multi-line insurance coverage a value-adding strategy are likely to be present in other industries as well. In particular, the grain handling business is a low-margin, high-volume business with large fixed costs. In such cases, unexpected drops in volume can severely hamper the firm's ability to generate revenue to cover total costs. This problem is exacerbated when the firm has large capital expenditures, because unexpected drops in volume can prevent a firm from financing the investment with internal funds, forcing it to either forgo the investments or access external capital markets at inopportune times.

In designing a program like UGG's, however, a key consideration is whether there are industry volume indices that are sufficiently highly correlated with the firm's own volume but that cannot be substantially influenced by the firm that is seeking the coverage (in other words, the firm has a relatively low market share). Whether industry indices with these properties exist for other high-volume, low margin businesses is an empirical question, but our own intuition suggests that industries like retailing and stock brokerage are potential candidates.

Discussions with UGG's managers indicate that an enterprise risk management approach requires cooperation from many individuals across the firm. To achieve this cooperation, top managers must "buy in" to the idea and demonstrate their support. Enterprise risk management can also take time and patience to implement. UGG spent over three years from the initial brainstorming session to the signing of the insurance contract. To be sure, subsequent enterprise risk management endeavors undertaken by Willis have taken considerably less time (on the order of 6-12 months), but the need for top level "buy-in" and firm-wide cooperation remains unchanged.

Technical expertise is also important. Someone must estimate the probability distributions of various exposures (and how they are related) and also quantify how the exposures affect the firm's results. Although the complex statistical and actuarial analyses can be provided by consultants and brokers, internal managers must be knowledgeable enough to provide input and to interpret the output. Nonetheless, the approach underlying UGG's grain volume coverage is likely to be applicable to other firms.

Discussions with UGG's managers clearly indicate that they found the risk identification and measurement *process* highly valuable in itself, quite apart from the decision to hedge the firm's grain volume coverage and integrate that coverage with the firm's other coverages.

APPENDIX

Examples of the regression analysis conducted by Willis are presented in Table 3. The table provides the results of estimating a regression equation where the dependent variable is the crop yield (bushels per acre) for either wheat or oats, and the explanatory variables are a time trend (to capture productivity increases over time), the average June temperature, and the average July precipitation. The analysis was conducted using data from 1960 to 1992 for the provinces of Alberta, Manitoba, and Saskatchewan. These results are similar to the actual results obtained using stepwise regression where temperature and precipitation readings from each month were considered. In general, among all the monthly temperature and precipitation variables considered, June average temperature and July average precipitation were the most statistically significant. A similar analysis was also conducted for other grains and seeds.

To illustrate the results, consider the first row of the Table 3. The positive and statistically significant coefficient on the time trend variable indicates that Alberta wheat yields have increased over time. The negative and statistically significant coefficient on the average June temperature variable indicates that wheat yields in Alberta are negatively related to the average June temperature. Finally, the positive coefficient on the average July precipitation variable indicates that crop yields increase, on average, with rainfall in July. The R^2 indicates that about 68% of the annual variation in Alberta wheat yields is explained by these three variables. Although there are some exceptions, the remainder of Table 3 indicates that the regression results just described hold for other crops and provinces.

TABLE 3
RESULTS OF SELECTED REGRESSION ANALYSES OF CROP YIELDS (BUSHEL PER ACRE) AND WEATHER CONDITIONS IN THREE CANADIAN PROVINCES USING DATA FROM 1960–1992*

Dependent Variable			Explanatory Variables				
Province	Crop		Intercept	Time Trend	Avg. June Temp.	Avg. July Precip.	R^2
Alberta	Wheat	Coef:	59.88	0.33	–0.76	2.70	0.68
		t-stat:	4.49	6.19	–3.19	2.63	
Manitoba	Wheat	Coef:	79.34	0.42	–0.98	1.00	0.65
		t-stat:	5.70	5.94	–4.38	0.95	
Saskatchewan	Wheat	Coef:	55.6	0.19	–0.69	4.80	0.61
		t-stat:	4.02	2.65	–3.01	4.44	
Alberta	Oats	Coef:	43.53	0.69	–0.17	4.70	0.72
		t-stat:	1.89	7.59	–0.41	2.71	
Manitoba	Oats	Coef:	121.02	0.65	–1.50	5.30	0.64
		t-stat:	4.89	5.16	–3.77	2.96	
Saskatchewan	Oats	Coef:	74.07	0.24	–0.76	9.30	0.56
		t-stat:	2.93	1.91	–1.82	4.70	

*Temperature is measured in degrees Fahrenheit and precipitation in inches. The time trend variable equals (year – 1960); thus, for the year 2000 the time trend equals 40.

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